RESEARCH ARTICLE

Trade, Foreign Direct Investment and Agriculture in Developing Countries

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Abstract: Agriculture continues to make significant contributions to developing countries in the presence of globalisation. Thus, international trade and foreign capital flows are important to developing countries. The authors used data on 115 developing countries from 1995 to 2020 to investigate the effect of inward and outward foreign direct investment (FDI) on trade in the agricultural sector of developing countries. Inward FDI enhanced exports, imports, and trade openness. However, outward FDI did not affect exports, imports, and trade openness. To escalate international trade in agricultural products, developing countries must continue to promote the inflow of FDI into agriculture (*AIFDI*). This requires paying attention to appropriate management of the macroeconomy, keeping down the inflation rate, optimising the currency exchange rate, and keeping interest rates down to boost investment among others. Whilst these would enhance *AIFDI* that would promote trade, these would directly promote trade. As developing countries have often suffered foreign exchange pressures, they must enhance foreign exchange receipts through increased exports. Increasing human capital can increase exports. Unlike existing studies, the authors used more current data covering many developing countries and accounted for endogeneity.

Keywords: Agricultural exports; Agricultural imports; Agricultural trade openness; Capital flow; Foreign capital

1. Introduction

Agriculture can contribute to ending severe impoverishment, encourage shared wealth, and feed a projected 9.7 billion people by 2050 [1]. Progress in the agriculture sector is between two to four times more useful in growing incomes among the most impoverished relative to other sectors [1]. Further, agriculture is also essential to economic progress: representing 4% of global gross domestic product

(GDP) and exceeding 25% of GDP in some developing countries. As global investment needs are in the range of $5 trillion to $7 trillion per year, the estimates for investment needs in developing countries are between $3.3 trillion and $4.5 trillion per year [2,3]. The developing countries would require foreign investments to meet this need.

Foreign direct investment (FDI) is an investment made by an occupant firm in one economy to find a long-term interest in a firm that is a denizen in another economy. The long-term interest infers the presence of a lasting relationship between the direct investor and the direct investment firm and a significant degree of influence on the leadership of the firm. The basis of the long-term relationship is the control of 10% or more of the firm by a direct investor [4-8]. Under the directional principle, direct investment is shown as either direct investment abroad (outward, OFDI) or direct investment in the reporting economy (inward, IFDI) [4,8]. Developing countries have pursued varied policies to attract FDI into their respective agricultural sector to stimulate local investment and supply of funds, increase export capacity, increase employment, and enhance technology transfer [2,9-13]. Regarding exports, Aihu and Chedjou [14], Harding and Javorcik [15] and Kang [16] did find that IFDI promotes exports for the total economy and the manufacturing sector. For imports, whilst Aihu and Chedjou [14] reported a positive effect of IFDI, Djokoto [17] and Latif and Younis [18] found a neutral effect. The effects of IFDI on trade openness are most inconsistent; Aihu and Chedjou [14], Karaca, Güney, and Hopoğlu [19] and Yaoxing [20] found a positive effect, Umar, Chaudhry, Faheem, and Farooq [21] found a negative effect for lower-income and lower-middle-income countries, but the neutral effect for upper middle-income countries. Although developing countries are generally net recipients of capital flows [22-27], Sun and Zhang [28] found trade openness enhances the effect of OFDI from China. Considering these inconsistencies, what is the effect of FDI on trade in the agriculture sector in developing countries?

Existing studies on FDI and trade nexus have focused on the total economy [19,23]. Harding and Javorcik [15] and Kang [16] addressed manufacturing, only Djokoto [17] and Latif and Younis [18] studied agriculture. Whilst Djokoto [17] studied a single country, Latif and Younis [18] studied four countries with data from 1995 to 2017. Some limitations emerge especially, regarding agricultural studies. First, the dependent variable in the agriculture studies has been exports and imports and not trade openness, a more inclusive measure of trade. Second, the number of developing countries covered is limited, thus, the results of the studies cannot be generalised for developing countries. Third, although, the data used were current at the time,

these are not the most current now. Fourth, the studies did not account for endogeneity. This could have led to the correlation of the error term with some of the explanatory variables thereby violating an assumption of undergirding ordinary least squares. This could cause an inaccurate effect of FDI on trade. Finally, the analyses ignored the role of OFDI, the counterpart of IFDI, which also affects trade. This could result in omitted variable bias. We make up for these limitations as follows. Firstly, in addition to exports and imports, we assessed the effect of FDI on trade openness. Secondly, we covered 115 developing countries in Africa, Latin America and the Caribbean, Asia, and the Pacific. Thirdly, we used data from 1995 to 2020. In the fourth place, we took account of endogeneity in macroeconomic variables and finally, included OFDI in our model.

Inward foreign direct investment enhanced exports, imports, and trade openness. To escalate international trade in agricultural products, developing countries must continue to promote the inflow of FDI into agriculture (*AIFDI*). This requires paying attention to appropriate management of the macro economy; keeping down the inflation rate, optimising the currency exchange rate, and keeping interest rates down to boost investment among others. Whilst these would enhance *AIFDI* that would promote trade, these would directly promote trade. As developing countries have often suffered foreign exchange pressures, they must enhance foreign exchange receipts through increased exports. Increasing human capital can increase exports.

In what follows, we present the theories of trade and cross-border capital flows. We examined the pertinent literature on developing countries to assess the scope of knowledge on the title of the study, assess the differences and similarities among them and provide the information needed for the discussion section. In Section 3, the modelling is presented with a description of the data and estimation procedures. The results of the estimation are reported, and these are explained considering the relevant literature in Section 4. In the final section, we conclude the study with some policy recommendations.

2. Literature Review

2.1 Theoretical Review

The workhorse theory about trade and capital flows is the Hecksher-Ohlin framework [29,30]. In this framework, trade and capital flows are perfect substitutes under a two-country, two-factor model and two-commodity. This condition is sufficient to ensure factor price equilibrium and this equilibrium is adequate to guarantee commodity price equilibrium. Mundell [26] states, '….the ability to engage in commodity trade can eliminate the need for capital to

flow from the capital-abundant countries to the capital-scarce countries since the rate of return differences can be eliminated through trade alone'. In acknowledging the factor substitutability of FDI and trade, Mundell [31] noted that increasing trade restrictions enhances factor movements, and an increasing restriction to factors enhances trade. Notwithstanding the significant role of the Hecksher-Ohlin-Mundell framework in explaining trade and capital flows, it is constrained in its ability to provide a complete analysis of trade and capital flows and their collaboration under a rich set of circumstances. Specifically, capital mobility in the static two-country, two-factor, two-commodity framework is restricted to the apportionment of capital across countries, for a fixed level of world capital stock [26].

Despite the Hecksher-Ohlin-Mundell position of substitutability between trade and capital flows, Antras and Caballero [32] have however, shown the complementarity between trade and capital flows when relative advantages across countries are not decided only by factor endowments, but also by financial conglomeration.

2.2 Empirical Review

These theories have informed the developing country literature on the effects of FDI on trade that addressed agriculture [17,18], manufacturing [15,16], and the total economy [14,19-21,28,33]. The geographies included China [28], Cote d'Ivoire [20], Ghana [17], Jordan, Morocco, Egypt, and Thailand [18], BRICS-T [19], Africa [14], and developing countries [15,21]. Djokoto [17], Karaca et al. [19] and Yaoxing [20] employed Granger causality, Sun and Zhang [28], and Umar et al. [28] employed fixed effects, random effects, and general method of moments. Harding and Javorcik [15] applied the difference-in-difference method.

Inward FDI was positively related to trade openness [14,19,20]. However, Umar et al. [21] found a negative relationship for lower income (LIC) and lower-middle-income countries (LMIC) but a neutral effect for upper-middle-income countries (UMIC). Harding and Javorcik [15] reported a positive effect of FDI presence on exports of developing countries. The effect was stronger for developing countries than for developed countries. "A weaker and quantitatively smaller effect for developed countries is consistent with the view that foreign presence is closing a technology gap. For a developed economy, there is less of a technology gap to close, and the foreign presence has a minor effect on the unit values of exports." [15]. Aihu and Chedjou [14] reported positive effects of inward FDI on exports and imports in the total economies of Africa. Kang [16] found a positive effect of FDI on Korean manufactured exports to developing but a negative effect on manufactured exports to developed countries. In the only study that investigated the role of outward FDI (OFDI) on trade, Sun and Zhang [28] found a positive effect of China's OFDI on Belt and Road countries on trade in China.

The effect of population growth on trade openness was positive [19,34,28] but Osei et al. [33] found a neutral effect for LIC and LMIC. The effects of GDP growth on trade openness have been mixed. A positive effect [19,15,28,21]. Osei et al. [33] reported a positive effect for lower-income countries and a negative effect for lower-middle-income countries. Mbogela [34] matched the negative effect with evidence on African countries. Aihu and Chedjou [14] however, reported a neural effect on exports, imports, and trade openness. As in the case of GDP growth, the effect of population growth is also mixed. Whilst Osei et al. [33] did not find a significant effect of population growth on trade openness, Harding and Javorcik [15] found a negative effect on exports whilst Karaca et al. [19], Mbogela [34] and Sun and Zhang [28] found a positive effect of population growth on trade openness.

Mbogela [34] measured trade policy as the freedom to trade internationally and found that the variable did not significantly influence trade openness in Africa. However, Umar et al. [21] reported a positive effect on trade openness. Whilst the effect of inflation and domestic investment had a positive effect on trade openness, the effect of human capital was mixed; negative for lower-income countries [21], and neutral for lower-middle-income countries [21].

Djokoto [17] and Latif and Younis [18] are specific agricultural papers on FDI-trade nexus. In the only agricultural FDI-trade nexus paper, Djokoto [17] investigated the effect of FDI inflow on imports and exports in Ghana. Using Granger's instantaneous causality approach with data from 1961 to 2008, FDI substituted imports whilst FDI did not have a discernible effect on exports in the short-run. In the long run, imports and FDI complemented each other. Djokoto [17] explained that MNEs would need to import some capital items and raw from abroad including from parent companies. To some extent, employees of foreign firms would generally prefer goods from their home country that could drive up imports of finished goods. Latif and Younis [18] studied Jordan, Morocco, Egypt, and Thailand collectively using data from 1995 to 2017. Whilst FDI promoted net exports, exports and imports were not significantly affected by FDI.

It would be observed that the studies that investigated the effect of FDI on trade used FDI inflow, not FDI outflow except Sun and Zhang [28]. Although the two studies focused on agriculture, attention was given to exports and imports and not trade openness. Moreover, the analysis did not consider other variables that explain exports and

imports. We fill these gaps by investigating the effect of inward and outward FDI on exports, imports, and trade openness in agriculture in developing countries.

3. Data and Methods

3.1 Models and Data

Congruent to the literature on FDI and trade [14,33-35], we specify Equations (1)-(3).

$$
\begin{aligned}
AEX_{it} = {} & \alpha_0 + \alpha_1 AIFDI_{it} + \alpha_2 AOFDI_{it} + \alpha_3 AINV_{it} \\
& + \alpha_4 AGDPG_{it} + \alpha_5 EXRATE_{it} + \alpha_6 FTTRADE_{it} \\
& + \alpha_7 HC_{it} + \alpha_8 INFLA_{it} + \alpha_9 POPG_{it} + \omega_{it}
\end{aligned} \quad (1)
$$

$$
\begin{aligned}
AIM_{it} = {} & \beta_0 + \beta_1 AIFDI_{it} + \beta_2 AOFDI_{it} + \beta_3 AINV_{it} \\
& + \beta_4 AGDPG_{it} + \beta_5 EXRATE_{it} + \beta_6 FTTRADE_{it} \\
& + \beta_7 HC_{it} + \beta_8 INFLA_{it} + \beta_9 POPG_{it} + \varphi_{it}
\end{aligned} \quad (2)
$$

$$
\begin{aligned}
ATO_{it} = {} & \gamma_0 + \gamma_1 AIFDI_{it} + \gamma_2 AOFDI_{it} + \gamma_3 AINV_{it} \\
& + \gamma_4 AGDPG_{it} + \gamma_5 EXRATE_{it} + \gamma_6 FTTRADE_{it} \\
& + \gamma_7 HC_{it} + \gamma_8 INFLA_{it} + \gamma_9 POPG_{it} + \tau_{it}
\end{aligned} \quad (3)
$$

There are i developing countries and t years. The α, β and γ are parameters to be estimated. The ω, φ and τ are idiosyncratic error terms. Agricultural export (*AEX*) is the ratio of agricultural exports to agricultural value added. Agricultural import (*AIM*) is the ratio of agricultural imports to agricultural value added. The sum of *AEX* and *AIM* is agricultural trade openness (*ATO*). *AEX*, *AIM,* and *ATO* constitute measures of *TRADE*. Anderson [36], de Azevedo et al. [37], Djokoto [2,10,38,39], Kastratović [40], Narteh-Yoe, Djokoto and Pomeyie [41] and Osei, et al. [33] measured trade similarly. The inflow of FDI into agriculture in developing countries is *AIFDI*, measured as the ratio of FDI to agricultural value added. We measured *AOFDI* = 1 for observation of the outflow of FDI into agriculture and 0 otherwise. This is outward FDI out of agriculture in developing countries. The use of the dummy variable was necessitated by limited non-zero values reported for agricultural OFDI at the source. *AINV* is agricultural domestic investment measured as the ratio of agricultural gross fixed capital formation to agricultural value added [2,10,39,42]. We defined *AGDPG* as the annual growth rate of agricultural value at 2015 prices. Growth of the agricultural sector can absorb agricultural imports through the consumption of agricultural inputs and agricultural products as raw and intermediate goods for processing. Agricultural exports would be acquired from domestic agricultural production resulting from increased *AGDPG*.

The rest of the variables are not specific to the agricultural sector. The official exchange rate *EXRATE* is measured as the annual average of the number of the developing country's currency per US$ 1. A high *EXRATE* would raise the prices of agricultural imports and could dampen agricultural imports whilst promoting agricultural exports. Agricultural produce exporters would expect more revenue denominated in the domestic currency. Umar et al. [21] reported the effect of the exchange rate on agricultural trade. We define *FTTRADE* as the freedom to trade internationally [34]. *FTTRADE* is a composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. This is composed of the trade-weighted average tariff rate and non-tariff barriers. The weighted average tariff uses weights for each tariff based on the share of imports for each good. A low *FTTRADE* means a low prospect to trade than a high *FTTRADE*. Whilst the former would discourage *TRADE* [34] the latter would enhance international trade (*TRADE*). *HC* is human capital, defined as secondary school enrolment percent of gross enrolment. High *HC* contributes to high employment in the production of goods and services that can be exported. *HC* can be combined with imported goods to produce for domestic and the export market. *HC* has a relationship with trade [21,43,44]. *INFLA*, inflation, is measured as the annual growth rate of the consumer price index. High *INFLA* reduces the value of the developing country's currency. This could discourage imports as well as exports. However, Osei et al. [33] found that *INFLA* does not depress trade. *POPG* is the annual growth rate of the population of males and females. A high population increases the market for the consumption of imports as well as increased labour for production for exports. Therefore, *POPG* could influence *TRADE* [19,34].

Data for the study comprised 115 developing countries (Appendix) from 1995 to 2020. Aside from the availability of data, the period also covers increased foreign direct investment activity in developing countries. Data on *AEM*, *AIM*, *AGDPG*, and *AINV* were obtained from FAOSTAT [45] whilst World Development Indicators of the World Bank [46] was the source of *EXRATE*, *HC*, *INFLA* and *POPG*, The Heritage Foundation [47] is the source for *FTTRADE*.

3.2 Estimation Procedure

The panel structure of the data (large cross-section than time series) necessitated the application of the estimation of fixed and random effects estimators. However, as macroeconomic variables could be plagued with endogeneity, we employed the general method of moments (GMM) to take care of the possible endogeneity. We used *xtdpdgmm* [50] to reduce the number of instruments.[①]

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① We employed the Sargan test [51,52], to explore the overidentifying restrictions and the Arellano and Bond [48] test to test for the presence of second-order serial correlation.

4. Results and Discussion

4.1 Summary of the Data

The standard deviation of *ATO* is about two times that of *AIM* and close to three times that of *AEX* (Table 1). This suggests a larger spread of *ATO* than *AEX* and *AIM*. The mean of *AIFDI* is lower than its standard deviation suggesting over-dispersion of *AIFDI*. As *AOFDI* was defined as a dummy variable, the mean represents the percentage of observations with *AOFDI* as 1. Specifically, only 8% of the 2,462 observations recorded *AOFDI*. This small proportion is in line with the fact that outward FDI tended to originate more from developed countries than from developing countries and is underscored in the literature [22-27].

4.2 Results

We estimated Equations (1)-(3) and performed robustness checks on the estimates of the key coefficients (Table 2). The sign of the coefficients of *AIFDI* are positive and the magnitudes are similar across models 1-9. Similarly, the coefficients of *AOFDI* are similar in magnitude across models 1-9. These suggest the estimates of *AIFDI* and *AOFDI* are robust to the control variables.

In the case of agricultural imports (*AIM*) as the dependent variable, the coefficients of *AIFDI* and *AOFDI* are similar across models 10-18 suggesting the robustness of the estimates of *AIFDI* and *AOFDI* (Table 3). For agricultural trade openness, *ATO*, as the dependent variable, the coefficients of *AIFDI* and *AOFDI* are also similar across models 19-27 suggesting the robustness of the key estimates (Table 4). It would be observed that the estimates of *AIFDI* in Table 4 are about two times the magnitude of those in Table 2 and more than those in Table 3. Also, across Tables 2-4, the coefficients of the lag of the dependent variable, are positive, statistically significant, and similar in magnitude. Whilst the statistical significance confirms that the endogeneity has been cared for, the similarity across models suggests the robustness of the estimates to control variables.

The complete models in Tables 2-4 are assembled in Table 5. The probability of the second-order serial correlations tests is invalidated signifying no second-order correlation in the errors of models. The probability of the Sargan-Hansen test also shows values above 10%. This implies that the over-identifying restrictions imposed in the estimation are valid. Following these impressive model properties, the panel model estimated is appropriate. Whilst the estimates of the coefficients in Table 5 are similar, across the models, the estimates in model 27 ap-

Table 1. Summary statistics.

Variable	Observation	Mean	Standard deviation	Minimum	Maximum
AEX	2,462	0.8113	5.2582	0	96.7905
AIM	2,462	1.4886	7.3732	0.0208	118.4649
ATO	2,462	2.2999	12.5249	0.0594	214.5246
AIFDI	2,462	0.0052	0.0327	–0.1076	0.8139
AOFDI	2,462	0.0804	0.2720	0	1
AINV	2,462	0.1010	0.0642	0.0089	0.4896
AGDPG	2,462	0.0299	0.0882	–0.7022	1.2342
EXRATE	2,454	1.26e+07	2.22e+08	0.0028	5.60e+09
FTTRADE	2,462	64.6789	15.0331	0	94.8000
HC	2,347	63.4170	29.9712	5.2834	212.5903
INFLA	2,460	11.2421	102.4682	–16.1173	4145.106
POPG	2,462	1.9142	1.3267	–16.8806	17.3991

pear to be larger than those in models 9 and 18. This is not surprising as the dependent variable in model 27 (*ATO*) is the sum of the dependent variables in models 9 and 18 (*AEX* and *AIM*). The increased value of *ATO* resulted in higher coefficients than those in models 9 and 27.

4.3 Discussion of the Effects of Foreign Direct Investment on Trade

The coefficient of *AIFDI* of 0.6882 suggests a US$ 1 rise in agricultural inward FDI will raise exports by 69 cents (Table 5). Although this is inelastic, nevertheless, it shows that FDI in the agricultural sector of developing countries enhances trade. This can be attributable to multinational enterprises (MNEs) engaging in exports of their products to the parent company and other affiliates as well as non-affiliate customers outside the country. As many developing countries produce primary agricultural products, the exports to parent firms and other affiliates fit into the vertical integration of the MNEs. The export-enhancing role of *AIFDI*, *ceteris paribus* should improve the foreign exchange receipts of developing countries. Whilst the finding is contrary to the Hecksher-Ohlin-Mundell position of substitutability between trade and capital flows, it is consistent with the Antras and Caballero [32] position of complementarity of trade and capital flows. In the empirical space, our results conform to that of the manufacturing sector in developing countries [16] and the total economies of Africa [14]. But Djokoto [17] and Latif and Younis [18] reported a neutral effect of *AIFDI* on trade in Ghanaian agriculture and the agriculture of Jordan, Morocco, Egypt, and Thailand, respectively.

A US$ 1 increase in *AIFDI* will induce an 87 cents increase in imports. The investment codes of developing countries contain concessions on imports of raw materials

Table 2. Estimations and robustness checks for the effect of foreign direct investment on exports.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	*AEX*	*AEX*	*AEX*	*AEX*	*AEX*	*AEX*	*AEX*	*AEX*	*AEX*
L.AEX	1.0833***	1.0518***	1.0831***	1.0832***	1.0826***	0.3494*	1.0836***	1.0877***	0.3633*
	(0.0004)	(0.0233)	(0.0004)	(0.0004)	(0.0010)	(0.2103)	(0.0007)	(0.0037)	(0.1950)
AIFDI	0.8699	0.7516	0.8467	0.8647	0.8596	0.6825**	0.8699	0.8488	0.6882**
	(0.5739)	(0.5086)	(0.5978)	(0.5741)	(0.5645)	(0.2847)	(0.5753)	(0.6238)	(0.2855)
AOFDI	0.0576	0.0216	0.0591	0.0482	0.0543	−0.0020	0.0555	0.0282	−0.0047
	(0.0370)	(0.0724)	(0.0387)	(0.0345)	(0.0358)	(0.0328)	(0.0361)	(0.0528)	(0.0372)
AINV		7.2822							0.6663***
		(5.2882)							(0.2268)
AGDPG			−0.4083						−0.1026***
			(0.3494)						(0.0348)
EXRATE				−0.0000***					−2.41e-11
				(0.0000)					(1.65e-11)
FTTRADE					0.0018				0.0005
					(0.0019)				(0.0006)
HC						0.0052***			0.0046***
						(0.0016)			(0.0017)
INFLA							−0.0000		1.42e-07
							(0.0000)		(5.59e-06)
POPG								0.1547	0.0009
								(0.1527)	(0.0075)
CONSTANT	−0.0274***	−0.6810	−0.0157	−0.0261***	−0.1459	−0.1105	−0.0275***	−0.3267	−0.1823
	(0.0056)	(0.4604)	(0.0152)	(0.0055)	(0.1195)	(0.1099)	(0.0055)	(0.2971)	(0.1237)
Model diagnostics									
Observations	2,347	2,347	2,347	2,340	2,347	2,239	2,346	2,347	2,235
Countries	114	114	114	114	114	113	114	114	113

1. Values in parenthesis are Windmeijer's (2005) finite-sample correction as the default two-step standard errors are biased in finite samples due to the neglected sampling error in the weighting matrix. 2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 3. All models estimated with GMM (xtdpdgmm in Stata) using the collapse option to control for instrument proliferation.

Table 3. Estimations and robustness checks for the effect of foreign direct investment on imports.

	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
VARIABLES	*AIM*	*AIM*	*AIM*	*AIM*	*AIM*	*AIM*	*AIM*	*AIM*	*AIM*
L.AIM	1.0212***	0.9879***	1.0210***	1.0212***	1.0211***	1.0745***	1.0212***	1.0257***	1.0736***
	(0.0028)	(0.0247)	(0.0026)	(0.0028)	(0.0033)	(0.0103)	(0.0028)	(0.0026)	(0.0094)
AIFDI	0.3811	0.3617	0.3066	0.3805	0.3936	1.2703**	0.3719	0.1613	0.8694*
	(0.6453)	(0.5270)	(0.6224)	(0.6450)	(0.6776)	(0.6404)	(0.6480)	(0.6152)	(0.4866)
AOFDI	0.0367	−0.0502	−0.0519	0.0409	0.0331	−0.0673	0.0347	−0.0316	−0.0215
	(0.0810)	(0.1681)	(0.1074)	(0.0795)	(0.1029)	(0.0679)	(0.0856)	(0.0998)	(0.0732)
AINV		10.7769*							3.3783
		(6.2746)							(2.3380)
AGDPG			−1.1521***						−0.7748***
			(0.3969)						(0.2191)
EXRATE				−0.0000					−8.49e-12
				(0.0000)					(2.43e-11)
FTTRADE					0.0004				0.0044
					(0.0034)				(0.0030)
HC						0.0062			0.0053
						(0.0042)			(0.0050)
INFLA							0.0000		4.92e-05 (4.92e-05)
							(0.0001)		
									−0.0056
									(0.0184)
POPG								0.1739	−0.9352**
								(0.1859)	(0.3918)
CONSTANT	0.0248	−0.9496*	0.0638	0.0246	0.0017	−0.4263*	0.0252	−0.3057	−8.49e-12
	(0.0418)	(0.5194)	(0.0471)	(0.0414)	(0.2254)	(0.2590)	(0.0427)	(0.3289)	(2.43e-11)
Model diagnostics									
Observations	2,347	2,347	2,347	2,340	2,347	2,239	2,346	2,347	2,235
Countries	114	114	114	114	114	113	114	114	113

1. Values in parenthesis are Windmeijer's (2005) finite-sample correction as the default two-step standard errors are biased in finite samples due to the neglected sampling error in the weighting matrix. 2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 3. All models estimated with GMM (xtdpdgmm in Stata) using the collapse option to control for instrument proliferation.

Table 4. Estimations and robustness checks for the effect of foreign direct investment on trade openness.

	(19)	(20)	(21)	(22)	(23)	(24)	(24)	(26)	(27)
VARIABLES	*ATO*	*ATO*	*ATO*	*ATO*	*ATO*	*ATO*	*ATO*	*ATO*	*ATO*
L.ATO	1.0482***	1.0174***	1.0480***	1.0482***	1.0479***	1.1107***	1.0483***	1.0528***	1.1116***
	(0.0011)	(0.0188)	(0.0010)	(0.0011)	(0.0019)	(0.0181)	(0.0011)	(0.0033)	(0.0181)
AIFDI	1.5770	1.3055	1.4877	1.5777	1.5557	2.5702**	1.5339	1.4261	2.0284**
	(1.0206)	(1.0604)	(1.0466)	(1.0235)	(1.0434)	(1.0243)	(1.0205)	(0.9688)	(0.9029)
AOFDI	−0.0052	−0.2510	−0.0952	−0.0093	−0.0237	−0.1339	−0.0219	−0.0905	−0.0792
	(0.1194)	(0.4114)	(0.1177)	(0.1223)	(0.1323)	(0.1423)	(0.1235)	(0.1701)	(0.1202)
AINV		16.7347*							4.4784
		(9.1374)							(2.8000)
AGDPG			−1.5769**						−0.9604***
			(0.7245)						(0.2828)
EXRATE				−0.0000***					−8.04e-11**
				(0.0000)					(4.00e-11)
FTTRADE					0.0018				0.0064*
					(0.0062)				(0.0036)
HC						0.0068			0.0058
						(0.0046)			(0.0049)
INFLA							0.0000		3.35e-05
							(0.0000)		(2.58e-05)
POPG								0.3380	0.0169
								(0.3292)	(0.0267)
CONSTANT	−0.0078	−1.5124*	0.0532	−0.0067	−0.1196	−0.5035*	−0.0079	−0.6356	−1.2819***
	(0.0355)	(0.7926)	(0.0604)	(0.0361)	(0.3792)	(0.2719)	(0.0350)	(0.6162)	(0.4048)
Model diagnostics									
Observations	2,347	2,347	2,347	2,340	2,347	2,239	2,346	2,347	2,235
Countries	114	114	114	114	114	113	114	114	113

1. Values in parenthesis are Windmeijer's (2005) finite-sample correction as the default two-step standard errors are biased in finite samples due to the neglected sampling error in the weighting matrix. 2. *** p < 0.01, ** p < 0.05, * p < 0.1. 3. All models estimated with GMM (xtdpdgmm in Stata) using the collapse option to control for instrument proliferation.

Table 5. Complete models for exports, imports, and trade openness.

VARIABLES	(9) AEX	(18) AIM	(27) ATO
L.AEX	0.3633* (0.1950)		
L.AIM		1.0736*** (0.0094)	
L.ATO			1.1116*** (0.0181)
AIFDI	0.6882** (0.2855)	0.8694* (0.4866)	2.0284** (0.9029)
AOFDI	–0.0047 (0.0372)	–0.0215 (0.0732)	–0.0792 (0.1202)
AINV	0.6663*** (0.2268)	3.3783 (2.3380)	4.4784 (2.8000)
AGDPG	–0.1026*** (0.0348)	–0.7748*** (0.2191)	–0.9604*** (0.2828)
EXRATE	–2.41e-11 (1.65e-11)	–8.49e-12 (2.43e-11)	–8.04e-11** (4.00e-11)
FTTRADE	0.0005 (0.0006)	0.0044 (0.0030)	0.0064* (0.0036)
HC	0.0046*** (0.0017)	0.0053 (0.0050)	0.0058 (0.0049)
INFLA	1.42e-07 (5.59e-06)	4.92e-05 (4.92e-05)	3.35e-05 (2.58e-05)
POPG	0.0009 (0.0075)	–0.0056 (0.0184)	0.0169 (0.0267)
CONSTANT	–0.1823 (0.1237)	–0.9352** (0.3918)	–1.2819*** (0.4048)
Model diagnostics			
Observations	2,235	2,235	2,235
Countries	113	113	113
Probability of 2nd order serials	0.7288	0.4430	0.9352
Probability of the Sargan-Hansen test	0.3024	0.1282	0.1002

1. Values in parenthesis are Windmeijer's (2005) finite-sample correction as the default two-step standard errors are biased in finite samples due to the neglected sampling error in the weighting matrix. 2. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 3. All models estimated with GMM (xtdpdgmm in Stata) using the collapse option to control for instrument proliferation.

and other resources. The abuse of the system can cause an increase in imports of agricultural resources. Also, the expatriates as well as the growing middle class of developing countries' populations tend to develop a taste for foreign foods. These also contribute to an increase in agricultural exports. Our finding is consistent with the theoretical position of Antras and Caballero [32] of complementarity of trade and capital flows but contrary to those of the Hecksher-Ohlin-Mundell position. Our finding is also inconsistent with the findings of Djokoto [17] and Latif and Younis [18] on the agricultural sector of Ghana, Jordan, Morocco, Egypt, and Thailand, respectively. These reported negative and neutral effects, respectively.

The effect of *AIFDI* on trade openness is also positive. The elastic magnitude of 2.0284 implies that a US$ 1 increase in *AIFDI* would induce a more than US$ 1 increase in trade openness. The estimate turns out to be the highest among the statistically significant estimates. The elasticity can be attributable to the complementarity of *AIFDI* and imports and exports on one hand and the synergistic effect of imports and exports on the other. Theoretically, foreign direct investment and trade are related [29-31]. Whilst Hecksher [29], and Mundell [30,31], posited a substitution effect, Antras and Caballero [32] noted a complementary effect in line with our findings. Our findings are consistent with empirical evidence from developing countries [14,15,19,20]. Whilst Umar et al. [21] found a negative effect for lower-income countries and lower-middle-income countries, a neutral effect was reported for upper-middle-income countries. This result points not only to the presence of capital flows and trade in developing countries but also to a significant trade-enhancing role of *AIFDI* in developing country agriculture. As foreign capital and trade are proxies of globalisation [54-56], these pointers are evidence of the globalisation of agriculture in developing countries.

The coefficients of *AOFDI* on exports, imports and trade openness are negative and statistically insignificant. Recalling that the *AOFDI* was measured as a dummy, the negative sign suggests fewer observations of *AOFDI* than non-observation of *AOFDI*. This is not surprising as developing countries are not generally the source of foreign capital, rather they are recipients [22-27]. Dunning [57] and Dunning and Narula [58] theorised that developing countries are in stages I and II of development in which the inflow of FDI outstrips the outflow of FDI. Although empirical evidence shows some developing countries have moved to stage III [59-64], many developing countries are still far from becoming a net exporter of capital. Our finding is inconsistent with the theory of substitution [29,26,30] and complementarity [32] between capital flows and trade. Our findings also departed from the statistically significant positive effect of OFDI, and trade found by Sun and Zhang [28].

4.4 Discussion of Control Variables

The coefficients of *AINV* are positive but statistically significant for exports. Thus, a US$ 1 increase in *AINV*

will induce less than a US$ 1 (66 cents) increase in exports. Exports originate from the supply which also arises from production. *AINV*, therefore, contributes to agricultural exports. This is consistent with the findings of Osei et al. [33] and Tahir et al. [43].

The coefficients of *AGDPG* are negative and statistically significant for exports, imports, and trade openness. It was expected that an increase in output would contribute to the production, supply, and export of commodities, hence a positive effect. However, this did not turn out to be the case. Regarding imports, the negative sign suggests a substitution effect of agricultural growth and imports. An increase in agricultural output would lead to increased provision of agricultural goods that would otherwise have been imported. Whilst this is consistent with Mbogela [34] for African countries and Osei et al. [33] for lower-middle-income countries, others have reported a positive effect [15,19,21,28,43].

The negative coefficient of *EXRATE* suggests increasing currency value per US$ would discourage trade openness. Although increasing *EXRATE* would provide increased local currency sales revenue from exports, the cost of production for export would go up and ultimately discourage exports. For imports, it is a truism that increased *EXRATE* means imports become more expensive, discouraging imports. The combination of these explains the negative relationship between *EXRATE* and *ATO*, albeit a minuscule value. Umar et al. [21] found a positive sign for *EXRATE* for lower-middle-income countries but a neutral effect for lower-middle-income and upper-middle-income countries.

The coefficient for *FTTRADE* is positive for all three models in Table 5 but weakly significant for model 27. Thus, freedom to trade internationally enhances trade openness. This result is expected because the freedom to trade reduces the constraints to trade, thus, encouraging trade. The neutral effect of *FTTRADE* found by Mbogela [34] disagrees with our findings.

The coefficient of *HC* is positive for exports, imports, and trade openness. However, the magnitude is statistically indistinguishable from zero for the export model. *HC* contributes to labour. Recalling that the marginal productivity of labour is positive, HC would enhance production, the source of export supplies. Tahir et al. [43] and Umar et al. [21] also found a human capital-enhancing role in trade, albeit for trade openness. The positive finding of Umar et al. [21] was about upper-middle-income countries. For lower-income countries, however, Umar et al. [21] reported a neutral effect. Aihu and Chedjou [14] reported a neutral effect of *HC* for all the trade measures.

The coefficients of *INFLA* and *POPG* are statistically indistinguishable from zero regarding exports, imports, and trade openness. The results for inflation are contrary to the negative effects reported by Osei et al. [33]. Our results for the population are also consistent with those of Osei et al. [33] for trade openness. Whilst Harding and Javorcik [15] reported a negative effect on exports, Karaca et al. [19], Mbogela [34], and Sun and Zhang [28] found positive effects of population on trade openness. It must be noted that some results are inconsistent with the previous literature, such as the effect of inflation or population. This may be because all countries are considered for the analysis at the same time, and no differentiation is made at all. Consequently, the effect of certain variables on the data in specific types of countries remains obscured.

5. Conclusions and Recommendations

Following gaps in the trade and capital flow literature regarding agriculture, we estimated the effect of FDI on exports and imports and trade openness, using 115 developing countries from 1995 to 2020 taking account of endogeneity in macroeconomic variables. Whilst *AIFDI* has a positive effect on *AEX* and *AIM*, the effect of the latter is higher than that of the former. The larger effect of the latter over the former would impose foreign exchange pressure on developing countries. The estimate of the coefficient of *AIFDI* on trade openness turns out to be the highest among the statistically significant estimates. Freedom to trade internationally enhanced trade openness. Agricultural output growth and exchange rate did not enhance trade, however, measured. Human capital enhanced exports. *AOFDI*, *INFLA* and *POPG* had no effect on trade however measured. To escalate international trade in agricultural products, developing countries must continue to promote *AIFDI*. This requires paying attention to appropriate management of the macro economy; keeping down the inflation rate, optimising the currency exchange rate, and keeping interest rates down to boost investment among others. Whilst these would enhance *AIFDI* that would promote trade, these would directly promote trade. As developing countries have often suffered foreign exchange pressures, they must enhance foreign exchange receipts through increased exports. Increasing human capital can increase exports. This would provide the needed labour for production and increase supplies that lead to increased exports. Developing countries must continue to support measures that promote freedom to trade. As many developing countries have acceded to the World Trade Organisation agreement, it provides a regimen that will compel developing countries to follow policies that make for more free trade among members.

A limitation of this study lies in the absence of partial

analysis by country groups, which would have provided a better understanding of the phenomenon under study. This study is also limited to developing countries that are net recipients of AIFDI. Further research can consider developed countries and transition economies.

Author Contributions

Charlotte Badu-Prah: Contributed data and analysis tools; Wrote the paper; Reviewed the paper. Akua A. Afrane-Arthur: Contributed data and analysis tools; Wrote the paper; Reviewed the paper. Ferguson K. Gidiglo: Contributed data and analysis tools; Wrote the paper, Reviewed the paper. Francis Y. Srofenyoh: Contributed data and analysis tools; Wrote the paper, Reviewed the paper. Kofi Aaron A-O. Agyei-Henaku: Contributed materials, and analysis tools; Wrote the paper, Reviewed the paper. Justice G. Djokoto: Conceived and designed the experiments, Analysed and interpreted the data Wrote the paper; Reviewed the paper.

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Data Availability

Data used in the study were extracted from publicly available international sources.

Conflict of Interest

All authors disclosed no conflict of interest.

References

[1] Agriculture and Food [Internet]. World Bank; 2023 [cited 2023 Apr 7]. Available from: https://www.worldbank.org/en/topic/agriculture/overview

[2] Djokoto, J.G., 2021. Level of development, foreign direct investment and domestic investment in food manufacturing. F1000Research. 10, 72.

[3] World Investment Report 2014 [Internet]. United Nations; 2014. Available from: https://unctad.org/system/files/official-document/wir2014_en.pdf

[4] Balance of Payments and International Investment Position Manual, Sixth Edition [Internet]. IMF; 2009 [cited 2023 Apr 26]. Available from: https://www.imf.org/external/pubs/ft/bop/2007/pdf/bpm6.pdf

[5] OECD, 1999. OECD benchmark definition of foreign direct investment, 3rd Ed. OECD Publishing: Paris.

[6] Punthakey, J., 2020. Foreign direct investment and trade in agro-food global value chains. OECD Food, Agriculture and Fisheries Papers, No. 142. OECD Publishing: Paris.

[7] World Investment Report 2009—Transnational Corporations, Agricultural Production and Development [Internet]. UNCTAD; 2009. Available from: https://reliefweb.int/report/world/world-investment-report-2009-transnational-corporations-agricultural-production-and?gclid=EAIaIQobChMI8_7P2OTk_wIVoAutBh2ZaABDEAAYASAAEgLhWvD_BwE

[8] UNCTAD 2023. Foreign direct investment: Inward and outward flows and stock, annual. [cited 2023 Apr 26]. Available from: https://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=96740

[9] De Mello Jr, L.R., 1997. Foreign direct investment in developing countries and growth: A selective survey. The Journal of Development Studies. 34(1), 1-34.

[10] Djokoto, J.G., 2021. Foreign direct investment into agriculture: Does it crowd-out domestic investment? Agrekon. 60(2), 176-191.

[11] Farla, K., De Crombrugghe, D., Verspagen, B., 2016. Institutions, foreign direct investment, and domestic investment: Crowding out or crowding in? World Development. 88, 1-9.

[12] Gallova, Z., 2011. Foreign direct investment in selected countries of Balkan, does it crowd out or crowd in domestic investment? Czech Financial and Accounting Journal. 6(4), 68-78.

[13] Oualy, J.M.R., 2019. Do Foreign Direct Investments (FDI) Crowd in or Crowd Out Domestic Investment in Cote d'Ivoire? [Internet]. Available from: https://ssrn.com/abstract=3505572

[14] Aihu, W., Chedjou, A.B., 2018. Effect of Chinese outward foreign direct investment on international trade of Africa. African Journal of Business Management. 12(7), 188-211.

[15] Harding, T., Javorcik, B.S., 2012. Foreign direct investment and export upgrading. Review of Economics and Statistics. 94(4), 964-980.

[16] Kang, K., 2012. Is the relationship between foreign direct investment and trade different across developed and developing countries? Evidence from Korea. Asian-Pacific Economic Literature. 26(2), 144-154.

[17] Djokoto, J.G., 2012. Does causal relationships exist between external trade and foreign direct investment flow to agriculture in Ghana? International Journal of Business and Management. 7(2), 179.

[18] Latif, B.F., Younis, A.A.A., 2020. The role of foreign direct investment in external agricultural trade of chosen developing countries to the period 1995-2017. Tikrit Journal of Administration and Economics Sciences. 16(49), 252-273.

[19] Karaca, T., Güney, N. & Hopoğlu, S. 2022. Ticari

Dışa Açıklık-Doğrudan Yabancı Yatırımlar-Ekonomik Büyüme İlişkisi: BRICS-T Ülkeleri Örneği (Turkish) [The relationship between trade openness-foreign direct investment and economic growth: The case of BRICS-T countries]. Bingöl Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi. 6(1), 109-146. DOI: https://doi.org/10.33399/biibfad.937591

[20] Yaoxing, Y., 2010. The relationship between foreign direct investment, trade openness and growth in Cote d'Ivoire. International Journal of Business and Management. 5(7), 99-107.

[21] Umar, M., Chaudhry, I.S., Faheem, M., et al., 2021. Do governance, foreign direct investment and human capital matter to bolster trade liberalization? Fresh insight from developing countries. Review of Economics and Development Studies. 7(3), 325-341.

[22] Dunning, J.H., 1977. Trade, location of economic activity and MNE: A search for an eclectic approach. The international allocation of economic activity. Macmillan: London. pp. 395-418.

[23] Dunning, J.H., 1988. The eclectic paradigm of international production: A restatement and some possible extensions. Journal of International Business Studies. 19(1), 1-31.

[24] Dunning, J.H., 2001. The eclectic (OLI) paradigm of international production: Past, present and future. International Journal of the Economics of Business. 8(2), 173-190.

[25] Hymer, S.H., 1976. The international operation of national firms, a study of direct foreign investment. MIT Press: Cambridge, MA.

[26] Mundell, R.A., 2010. International Trade and International Capital Flows: A Theoretical Perspective [Internet] [Accessed April 23rd, 2023]. Available at: https://personal.lse.ac.uk/jink/pdf/globalization_chapter.pdf

[27] Vernon, R., 1966. International investment and international trade in the product cycle. Quarterly Journal of Economics. 80(2), 190-207.

[28] Sun, K., Zhang, X., 2022. Study on the trade effects of China's outward foreign direct investment—data from the countries along the Belt and Road. Economic and Business Management. CRC Press: Boca Raton. pp. 49-54.

[29] Heckscher, E., 1919. The effect of foreign trade on the distribution of income. Ekonomisk Tidskriff. 21, 497-512.

[30] Ohlin, B., 1933. Interregional and international trade. Harvard University Press: Cambridge, MA.

[31] Mundell, R.A., 1957. International trade and factor mobility. The American Economic Review. 47(3), 321-335.

[32] Antras, P., Caballero, R.J., 2009. Trade and capital flows: A financial frictions perspective. Journal of Political Economy. 117(4), 701-744.

[33] Osei, D.B., Sare, Y.A., Ibrahim, M., 2019. On the determinants of trade openness in low-and lower-middle-income countries in Africa: How important is economic growth? Future Business Journal. 5(1), 2.

[34] Mbogela, C.S., 2019. An empirical study on the determinants of trade openness in the African economies. Advances in Management and Applied Economics. 9(3), 9-42.

[35] Nga, N.T.V., 2020. Analysis of the determinants of trade balance: A case study of Vietnam. Journal of Applied Finance and Banking. 10(3), 21-35.

[36] Anderson, K., 2022. Agriculture in a more uncertain global trade environment. Agricultural Economics. 53(4), 563-579.

[37] de Azevedo, D.S., Arruda, E.F., de Brito, A.C., et al., 2023. Dynamic elasticities of the trade balance of Brazilian agriculture in relation to the exchange rate. The International Trade Journal. 1-18.

[38] Djokoto, J.G., 2013. Openness and agricultural performance in Ghana. Journal of Science and Technology (Ghana). 33(2), 24-36.

[39] Djokoto, J.G., 2021. Drivers of agricultural foreign divestment. Studies in Agricultural Economics. 123(1), 43-51.

[40] Kastratović, R., 2023. The impact of foreign direct investment on agricultural exports: The evidence from developing countries. The Journal of International Trade & Economic Development. 1-18.

[41] Narteh-Yoe, S.B., Djokoto, J.G., Pomeyie, P., 2022. Aid, domestic and foreign direct investment in small states. Economic Research-Ekonomska Istraživanja. 1-18.

[42] Bekoe, B.B., Chen, J., Tougem, T.O., et al., 2023. Does domestic investment matter? A multivariate time series analysis of the energy-CO_2 emission-growth nexus in Ghana. Environmental Science and Pollution Research. 30(17), 49536-49550.

[43] Tahir, M., Hasnu, S.A.F., Ruiz Estrada, M., 2018. Macroeconomic determinants of trade openness: Empirical investigation of SAARC region. Journal of Asia Business Studies. 12(2), 151-161.

[44] Tsaurai, K., 2021. Determinants of trade openness in transitional economies: Does the complementarity between foreign direct investment and human capital development matter? International Journal of Economics & Business Administration (IJEBA). 9(1), 318-330.

[45] FAOSTAT, Data [Internet]. Food and Agricultural Organisation of the United Nations; 2023 [cited 2023 Mar 31]. Available from: https://www.fao.org/faostat/en/#data

[46] World Development Indicators [Internet]. World Bank; 2023 [cited 2023 Jan 30]. Available from: https://databank.worldbank.org/source/world-development-indicators

[47] 2023 Index of Economic Freedom. Explore the data [Internet]. The Heritage Foundation; 2023 [cited 2023 Apr 12]. Available from: https://www.heritage.org/index/explore?view=by-region-country-year

[48] Arellano, M., Bond, S., 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The Review of Economic Studies. 58(2), 277-297.

[49] Roodman, D., 2009. How to do xtabond2: An introduction to difference and system GMM in Stata. The Stata Journal. 9(1), 86-136.

[50] Kripfganz, S. (editor), 2019. Generalized method of moments estimation of linear dynamic panel data models. Proceedings of the 2019 London Stata Conference; 2019 Sep 5-6; London.

[51] Sargan, J.D., 1958. The estimation of economic relationships using instrumental variables. Econometrica: Journal of the Econometric Society. 26(3), 393-415.

[52] Sargan, J.D., 1988. Testing for misspecification after estimating using instrumental variables. Contributions to Econometrics: John Denis Sargan. 1, 213-235.

[53] Rosewarne, S. 2019. The structural transformation of Australian agriculture: Globalisation, corporatisation and the devalorisation of labour. Journal of Australian Political Economy. 84, 175-218.

[54] Fujie, S., Bevan, P., Frankowska, A., 2019. The impact of globalisation on agriculture in a coffee-producing rural community in Southern Ethiopia since 2011. International Journal of Ethiopian Studies. 13(1), 91-106.

[55] Nugroho, A.D., Lakner, Z., 2022. Impact of economic globalisation on agriculture in developing countries: A review. Agricultural Economics. 68(5), 180-188.

[56] Scoppola, M., 2021. Globalisation in agriculture and food: The role of multinational enterprises. European Review of Agricultural Economics. 48(4), 741-784.

[57] Dunning, J.H., 1981. Explaining the international direct investment position of countries: towards a dynamic or developmental approach. Weltwirtschaftliches Archiv. 117, 30-64.

[58] Dunning, J.H., Narula, R., 1996. The investment development path revisited. Foreign Direct Investment and Governments: Catalysts for Economic Restructuring. 1-41.

[59] Djokoto, J.G., 2021. The investment development path theory and small states. Research in Globalization. 3, 100048.

[60] Djokoto, J.G., Pomeyie, P., 2021. Level of income and the investment development path theory: Evidence from Africa. SAGE Open. 11(4), 21582440211061334.

[61] Dunning, J.H., 1986. The investment development cycle revisited. Weltwirtschaftliches Archiv. 122, 667-676.

[62] Duran, J.J., Ubeda, F., 2005. The investment development path of newly developed countries. International Journal of the Economics of Business. 12(1), 123-137.

[63] Frenken, J.H., Mbuvi, D., 2017. Country risk, FDI flows and convergence trends in the context of the Investment Development Path. UNU-MERIT Working Papers. 5, 1-17.

[64] Satoglu, E.B., 2017. Emerging through foreign investment: Investment development path estimation of MINT economies. Advances in Economics and Business. 5(5), 256-264.

Appendix 1. List of acronyms.

AEX	Agricultura exports
AGDPG	Agricultura GDP growth
AIFDI	Agricultural inward foreign direct investment
AIM	Agricultural imports
AINV	Agricultural investments
ATO	Agricultural trade openness
EXRATE	Exchange rate
FDI	Foreign Direct Investment
FTTRADE	Absence of tariff and non-tariff barriers on trade
GDP	Gross Domestic Product
HC	Human capital
IFDI	Inward foreign direct investment
INFLA	Inflation
LIC	Lower income
LMIC	Lower-middle-income countries
OFDI	Outward foreign direct investment
POPG	Population growth rate
TRADE	Trade
UMIC	Upper-middle-income countries

Appendix 2. List of developing countries in the data.

Afghanistan	Comoros	India	Morocco	Singapore
Algeria	Congo	Indonesia	Mozambique	Solomon Islands
Angola	Congo, DR	Iran	Namibia	South Africa
Bahamas	Costa Rica	Iraq	Nepal	Sri Lanka
Bahrain	Côte d'Ivoire	Israel	Nicaragua	Suriname
Bangladesh	Djibouti	Jamaica	Niger	Syria
Barbados	Dominica	Jordan	Nigeria	Tanzania
Belize	Dominican Rep.	Kenya	Oman	Thailand
Benin	Ecuador	Kiribati	Pakistan	Timor-Leste
Bolivia	Egypt	Kuwait	Panama	Togo
Botswana	El Salvador	Laos	Papua New Guinea	Tonga
Brazil	Equatorial Guinea	Lesotho	Paraguay	Trinidad and Tobago
Brunei Darussalam	Eswatini	Liberia	Peru	Tunisia
Burkina Faso	Ethiopia	Libya	Philippines	Türkiye
Burundi	Fiji	Madagascar	Republic of Korea	Uganda
Cabo Verde	Gabon	Malawi	Rwanda	UAE
Cambodia	Gambia	Malaysia	Saint Lucia	Uruguay
Cameroon	Ghana	Maldives	Saint Vincent and the Grenadines	Vanuatu
Central African Republic	Guatemala	Mali	Sao Tome and Principe	Venezuela
Chad	Guinea	Mauritania	Saudi Arabia	Viet Nam
Chile	Guinea-Bissau	Mauritius	Senegal	Yemen
China, mainland	Guyana	Mexico	Seychelles	Zimbabwe
Colombia	Honduras	Mongolia	Sierra Leone	
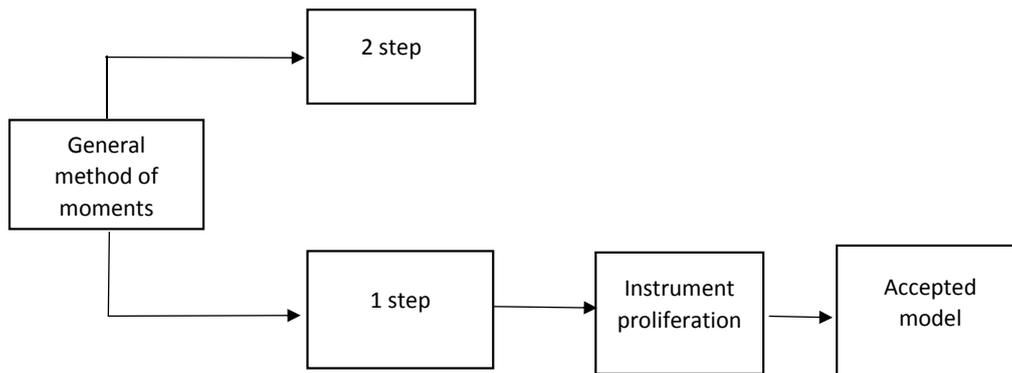
Appendix 3. Data analyses strategy.