Asian Journal of Empirical Research
Volume 11, Issue 4 (2021): 33-40.

http://www.aessweb.com/journals/5004

NEXUS BETWEEN FDI AND PRODUCTION INDICES: EVIDENCE FROM ASIAN COUNTRIES

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Article History
Received: 2 August 2021
Revised: 6 September 2021
Accepted: 21 September 2021
Published: 15 October 2021

Keywords
FDI
Production Index
Fertilizer
Crop
Food
Livestock
Cereal
Cropland.

ABSTRACT
This study aims to explore the effect of foreign direct investment on different types of production indices and some other variables. For this, panel data of 46 countries from Asia was accumulated for the time frame of 1991 to 2018. This paper employed the OLS, POLS, 2SLS, and GMM models. The study reveals that there is a favorable association between foreign direct investment and food production index and fertilizer consumption in all the models used in the study. Livestock production index has significant positive association with foreign direct investment in POLS and GMM models. Crop yield has major positive association with regards to foreign direct investment in all mentioned models except GMM. Land under cereal production has significant positive association in respect of foreign direct investment in OLS and 2SLS models. Crop production index has significant mixed association with foreign direct investment in different models. In POLS model, crop production index and foreign direct investment has significant inverse relationship and in GMM model, crop production index and foreign direct investment has significant positive correlation. Finally, permanent cropland has significant negative relationship with regards to foreign direct investment derived from OLS and 2SLS models.

Contribution/Originality: This study contributes to look at the impact of foreign direct investment on several types of production indices as well as a few other factors. Panel data from 46 Asian countries was gathered for this study, which spanned the years 1991 to 2018. The OLS, POLS, 2SLS, and GMM models were used in this study.

DOI: 10.18488/journal.1007.2021.114.33.40
ISSN(P): 2306-983X/ ISSN(E): 2224-4425
How to cite: Sujan Chandra Paul --- Nusrat Jahan --- Md. Mehedi Hassan --- Tandra Mondal (2021) Nexus Between FDI and Production Indices: Evidence from Asian Countries. *Asian Journal of Empirical Research*, 11(4), 33-40. 10.18488/journal.1007.2021.114.33.40

1. INTRODUCTION
In a panel structure, Slimane, Huchet-Bourdon, and Zitouna (2016) looked at the impact of foreign direct investments (FDI) on food security in 55 developing countries from 1995 to 2009. There are a variety of food security methods that employed in this study. Their primary focus was to generate a combined indicator that attaches the Food and Agriculture Organization's food indicators for measuring food availability and usage. Then, this empirical research was established upon a model that combines a food security equation with a crop production equation. The findings demonstrated that different types of FDI have varying impacts on food security. Food security is improved by FDI in agriculture, whereas food insecurity is increased by FDI in other sectors namely secondary and tertiary. A considerable FDI spillover to food security has been discovered through agricultural production. While in the secondary sector FDI exhibited a favorable effect, in the tertiary sector it has an opposite effect.

Based on an examination of the status quo in Jiangsu Province, Li and Wu (2010) used the Cobb - Douglas production function technique to explore the impact of FDI in the Jiangsu Province food sector on the development of mutual interactions in the food industry. The findings revealed that the food sector in Jiangsu Province is a capital-intensive industry, with FDI playing a greater role in its development than domestic capital.

Yao, Alhussam, Abu Risha, and Memon (2020) used correlation analysis, the specific-effect model, and the 2SLS technique to examine the correlation between food security and agricultural foreign direct investment (FDI) in countries of Belt and Road Initiative (BRI) applied in panel structure for the period of 2006–2015.The study's goal is to look at the interrelation between food security and agricultural FDI for each individual nation, by using the specific-effect model to observe if there is a direct link. Afterward, the 2SLS technique was used to see if there is a casual link based on agricultural output. Their findings reveal that the trend of the correspondence between agricultural FDI and food security varies significantly among tested nations. However, food security is being influenced directly and indirectly by agricultural FDI and this benefit is more evident when a country receives agricultural FDI on a consistent basis.

Slimane, Huchet, and Zitouna (2013) used a panel framework in 63 developing countries from 1995 to 2009 to demonstrate the straight and meandering effects of foreign direct investments in food security. There are a variety of food security methods that are employed. Their first contribution is the creation of a composite indicator that combines the FAO's three major indicators for assessing individual nutritional status. Second, they used a model that comprised a Cobb-Douglas agricultural production function and a food security equation in empirical investigation. Their results demonstrate that sectoral FDI indirectly affects food security. However, the result varied throughout the scenarios. Agricultural FDI and agricultural production showed indirect positive impact in secondary sector, negative effects in tertiary sector and apparently no impact in mining, correspondingly.

In investigating the impact of FDI on land used in agriculture across developing countries, Santangelo (2018) found the results differed based on investors place of origin. The eminent mainly focused in land grapping and impact of this from FDI on food security. Investors in developed countries could see beneficial impact in FDI inland since it increases expansion of land in crop production. Beside, national institutional pressure also respects the positive spillover in behavior of agriculture. However, developing countries experienced FDI inland negatively associated with food security since it reduces farmland due to conformation of domestic interest and policies of government by national institutional pressure which eventually leads to negative spillover.

In the light of the above-mentioned studies, this paper attempts to find out the relationship between FDI and production indices in Asian Countries. This paper comprises five parts, where the second part writes overview of literature, and third part describes the means of study. Moreover, part four sheds light on the findings and discussion, and finally, the paper concludes with some viable recommendations and conclusion.

2. LITERATURE REVIEW

The Chinese researchers (Jin, Chen, & Shi, 2021) investigated the overflow effect of FDI on Chinese food exports under firm heterogeneity. Their study involved first order difference on GMM models along with two-stage technique of Heckman for analysis at firm level. This was conducted due to the abundant existence of firm level panel data in China's food business. It has been found that positive overflow influence on indigenous food sector exports by horizontal FDI, though it was differed in food sub industries. In firm level analysis, the study also discovers a significant portion of promotional impact is played by thicker margin (motivation of exporting) rather than intense margin (quality of exports). The natural features of food businesses' heterogeneous export spillovers are also believed to rely on their characteristics, such as productivity, size, and ownership. Furthermore, export spillovers are proven to be influenced by the diversity of FDI origins and business purposes. The estimation findings are highly robust in requirements of regression types and measurement of variable replacement. These findings will lead experts to evaluate the impact of FDI and in devising strategies towards sustainable development of native food export.

According to Adom, Djahini-Afawoubo, Mustapha, Fankem, and Rifkatu (2018) public R&D improves agricultural productivity, but the effects inversed after 10 years. Although FDIs has proven direct positive benefits on production, the probable dependence pattern linked with FDIs lowers the likelihood of productivity potential in public R&D. Land, capital, and labor, these conventional inputs as well as strong political institutions, boost production, but unfavorable weather reduces output.

Developing countries are receiving plenty of FDI and rendering consequences in agricultural sector, but these countries are still suffering from destitution and food uncertainty. To identify this problem, Dhahri and Omri (2020) applied Baron and Kenny's (1986) step-approach to prove how FDI and foreign aids help to reduce poverty and warrant food security through growing agriculture. They used the data from 50 developing countries of 1995-2015. The study showed that FDI and foreign aids have optimistic and statistically important impacts on food security and poverty diminution. Moreover, it also found that FDI, social and infrastructure aid and agriculture-forestry-fishing aid also exert positive impacts on agricultural manufacture. Besides, agricultural production paves the mediating role between FDI, social and infrastructure aid, agriculture-forestry-fishing aid, and poverty reduction in rising nations. Therefore, the study concludes that eradicating poverty in developing nations is contingent on the growth of the agriculture sector, the inward FDI, and the foreign aids, respectively.

Abraham, Konings, and Slootmaekers (2010) examined the diverse reactions of Chinese manufacturing businesses to foreign direct investment using a novel longitudinal dataset of over 15,000 manufacturing enterprises. Total factor productivity is greater for domestic businesses working in sectors where foreign firms are also engaged. The size of horizontal spillovers, on the other hand, is determined by the structure and origin of foreign ownership, the export status of businesses, and the features of the special economic zones in which they operate.

Djokoto (2012) used a double logarithm functional form to examine how FDI reacts on food security in Ghana being an emergent nation. The study found that a negative correlation exists between daily energy consumption (hunger) and agricultural FDI and is substantial both in short and long run texture. Similarly, an adverse correlation exists between daily protein consumption (nutrition) and agricultural FDI and the result is statistically significant in both the short and long run. Therefore, this finding developed a harmful effect of agricultural FDI inflow on food security in Ghana. Though further enhancement in inward FDI to agriculture should not be overlooked for its positive benefits, specific interferences are essential to confirm that smallholders are not side-lined in production.

Food security is considered an extreme urgency in developing countries, they always aim to magnetize foreign inflow of capital to foster development and alleviate hunger and poverty. FDI generates diverse welfare benefits for food security and plays crucial role in this regard despite this investment in individual economic sectors has unrelated attributes. The study by Mihalache-O'Keef and Li (2011) considered the food security measures suggested by the Food and Agriculture Organization (FAO) and measured the data of FDI of 56 mounting and transitional economies during 1981 and 2001. It found a strong indication that manufacturing FDI fosters food security.

Jin, Guo, Delgado, and Wang (2017) used firm-level census data of 1998 upto 2007 to study the influence on factor productivity in Chinese food businesses (174,940 sample food firms) by FDI. They investigated intra-firm, intra-industry, and upright impacts. The productivity of Chinese food businesses is prone to be impacted by FDI and is highly dependent on its type and the countries of origin. Through vertical industry connection, non-HMT (Hong Kong, Macao, and Taiwan) areas driven by FDIs is able to improve the output of the invested business while simultaneously increasing the productivity of local food enterprises. Domestic food companies, on the other hand, maybe displaced by non-HMT venture in the similar industry. HMT investment produces result in positive productivity spillovers within industries, but inverse upright spillovers. They have shown the way for Chinese policymakers and governments of developing nations in crafting foreign investment policies.

By analyzing the time series data of 1981–2017 (Edeh, Eze, & Ugwuanyi, 2020) examined the direction of FDI on the agriculture in Nigeria. The Bounds test and Johansen test demonstrate the existence in the model of co-integration. Autoregressive Distributed Lagged (ARDL) model, Fully Modified Least Squares (FMOLS), and Dynamic Ordinary Least Squares (DOLS) were employed to gauge the estimates of the regression model. The study demonstrated that FDI motivates and influences on output of agricultural sector. The ARDL model, in particular, showed that this impact is more visible in the short run rather in the long run. Therefore, it has been suggested in the study that an increase in tax holidays (from the present 3 years to at least 6 years) has great likelihood of alluring potential foreign direct investors.

The agricultural sector has a significant role in economic growth to alleviate poverty. In this connection, Rashid and Razak (2016) examined the determinants of FDI in the agriculture sector in selected high-income OIC countries. It investigated agriculture investment and defines its prospective roles in some countries and used agricultural FDI as a dependent economic determinant, exchange rate, inflation, poverty, list of market size and infrastructure as independent variables in selected OIC Countries (Malaysia, Oman, and Brunei). The results showed that clarifying variables have a substantial outcome on FDI in the agricultural sector. Therefore, the government should pay attention to all the determinants, specifically, for lessening of poverty and market size as these two are the most significant with the FDI in the agricultural sector in OIC countries.

Furtan and Holzman (2004) conducted a study that aims to determine the association between trade and FDI in the Canadian agricultural and food industry. It found that there is a complementary relationship between FDI and product trade. FDI is desirable from an economic standpoint because increased growth is connected with an increase in exports. Canada has the lion share of trade and investment with the United States. As the US government's recent policy makes its boundaries more protected from bio-terrorism and food insecurity, Canada is concerned about its agriculture and food industry. The study revealed that if Canadian exports to the United States are impeded by higher border costs, this will sluggish the growth of the industry. It supported the view that in order to secure the food industry Canadian government needs to encourage US FDI in this industry by securing open access to the US market.

Hallam (2009) stated that the reason behind the lean productivity and food crisis in emerging nations is the absence of foreign investment in agriculture. Developing country agriculture needs at least $30 billion additional investments. In this aspect, in financing agricultural investments in these countries, FDI has a crucial role to play. They suggested that structures of foreign investment apart from land acquisition – such as contract manufacture, out-grower schemes, and other joint ventures – would produce development benefits towards host countries. These have to be appraised properly and followed by best practices.

Oloyede (2014) investigated the impact of FDI on the progress of the Nigeria's agricultural sector. It employed the Augmented Dickey-Fuller Test (ADF) test and granger causality test by taking time-series data from 1981-2012. It showed that both in the short and long run FDI has a positive influence on agriculture. FDI will boost the agricultural sector by begetting domestic income diversification. However, political instability affects adversely on agricultural investments in the long run.

In the year between 1999 and 2008, Yin, Gao, and Liu (2011) utilized the technique of analysis of the theory in the class in China agricultural products processing foreign direct investment and employment. Many whole test methods show that China's farm product processing sector has a long-term equilibrium of interactions in terms of FDI and employment and the panel of the measurement regression model to present of FDI in China's farm produce processing industry for current jobs are amazing; into effect on the issue of the output of employment is substantial.

The study by Licai and Zuhui (2006) examined the interconnection among agricultural trade and food industry as well as inward FDI in Chinese econometric models. The result revealed that there has positive co-integration

along with a strong corresponding relationship between FDI and exports. It also stated that FDI affects positively Chinese agriculture and food industry.

Chaudhuri and Yabuuchi (2010) specified in their paper that in many developing countries including India, one of the most provocative policy issues is the development of Special Economic Zone (SEZ) that utilizes farming land to stimulate industrialization. This study employed general equilibrium model of Harris-Todaro envisaged by three-sector to assess the significances of this policy that portray a developing country. It revealed that agriculture and SEZ can be expanded instantaneously if government employs a significant quantity of its resources towards infrastructural development and irrigation projects aimed to enhance the efficacy of land. Besides, the economy may also experience enhancement in agricultural wage and aggregate employment due to this policy.

Dhungana and Ghimire (2013) studied the impact of FDI on Indian agricultural sector. This sector renders employment opportunities to fifty-two percent workforce. Hence, FDI plays a pivotal role to expand job opportunities through commercialization and modernization in the agriculture sector. This very sector has an overall contribution of 15% in the national economy and yet there is ample scope in food processing, agriculture services, and infrastructure. It is observed here FDI growth and agriculture has opposite relation that implies still sufficient amount of FDI is not provided to the agriculture sector. Therefore, to boost agricultural productivity, the government should prioritize the agriculture sector that will address the growing need for food security and ensure the overall welfare of farmers. Moreover, to overcome the limitations of foreign investments strong regulatory framework should be developed for the protection of marginal farmers.

Gunasekera, Cai, and Newth (2015) investigated the possible impacts of FDI in agricultural sector of Africa by employing the dynamic Global Trade Analysis Project model (GDyn). This model examined the probable influences of enhancements in land productivity and FDI in that continent. This study demonstrated that joint efforts to foster land productivity coupled with escalation in FDI may enhance Africa's portion in global agricultural output and exports, predominantly in the field of oilseeds, sugar, and cotton.

3. METHODS

This paper conducted exploratory analysis by using following data and techniques.

3.1. Data

Secondary panel data of 46 countries in Asia during the period of 1991-2018 is compiled from the World Bank's World Development Indicators. The data comprises the information of 28 years of 46 countries (Appendix 1) that considers 8 variables. For conducting the analysis, the data are first log normalized. Afterwards, the data are first degree separated to eliminate the autocorrelation problem.

3.2. Methods

This paper conducted a step-by-step model-based combined analysis. At first, the Ordinary Least Squares (OLS) model is used to outline the relationship between FDI and some variables related to production indices among the 46 countries in Asia. Then the Pooled Ordinary Least Squares (POLS) model is employed to determine the relationship between FDI and some variables related to production indices. Afterwards, the two stage least square model (2SLS) is deployed to define the relationship between FDI and some variables related to production by using STATA 15. Finally, the Generalized Method of Moments (GMM) is used to classify important explanatory variables that can explain why FDI and some variables related to production are related.

3.3. Variables and Description:

Here, net inflow (BoP, current) is expressed in billion USD and lnFDI denotes log normal of foreign direct investment. LnCPI indicates log normal of crop production index and LnFPI denotes log normal of food production index. Moreover, LnLPI denotes log normal of livestock production index. In addition, LnCY indicates log normal of cereal yield and expressed in kg per hectare. Besides, LnFC means log normal of fertilizer consumption and expressed in kilograms per hectare of arable land and LnLCP denotes log normal of land under cereal production and expressed in hectares. Furthermore, LnPC denotes log normal of permanent cropland and expressed in percentage of land area.

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

All variables that are used in the descriptive statistics are listed below. For each statistic, the table depicts the number of measurements, mean value, standard deviations, minimum and maximum value.

Table 1 summarizes the data of 46 countries during 28 years which is based on nine variables. The prominent dependent variable, FDI, shows an average of 6.12 billion dollars for the countries surveyed, with a very high standard deviation of 2.36 billion dollars. This indicates that there is a significant deviation in FDI among the world's countries. The average crop production index among 46 Asian countries is 87.36, with a standard deviation of 33.08. The average food production index among 46 Asian countries is 82.34, with a standard deviation of 29.14. The average livestock production index among 46 Asian countries is 78.074, with a standard deviation of 30.09. The mean value of cereal yield which is expressed in kg per hectare is 3,454.80 with having 3,270.8 standard deviation. The average fertilizer consumption (expressed in kilograms per hectare of arable land) is 386.81 and the standard deviation is 1,313.80. The average land under cereal production is 7.29 million hectares with having 19.85 standard deviations. The mean value of permanent cropland is 3.45% of total land areas, having the standard deviations of 4.97%.

Table-1. Descriptive Statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI	1280	6.127e+09	2.364e+10	-1.018e+10	2.909e+11
CPI	1318	87.368	33.083	5.62	349.41
FPI	1318	82.34	29.143	3.26	377.17
LPI	1318	78.073	30.098	1.45	442.6
CY	1260	3454.805	3270.317	176.3	36761.9
FC	1176	386.611	1313.804	0	19171.846
LCP	1260	7291803.2	19857229	4	1.057e+08
PC	1318	3.459	4.978	.001	26.667

4.2. Pairwise Correlation Matrix

In order to identify the impact of FDI on agriculture and rural development, in Table 2, we analyze the correlations among the variables that are attained from literature. A combined correlation matrix is given below to report the variables.

Table-2. Matrix of correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) FDI	1.000							
(2) CPI	0.045	1.000						
(3) FPI	0.090	0.879	1.000					
(4) LPI	0.130	0.525	0.833	1.000				
(5) CY	0.111	0.252	0.154	0.015	1.000			
(6) FC	0.115	0.166	0.018	-0.047	0.372	1.000		
(7) LCP	0.561	-0.117	-0.083	-0.047	-0.013	-0.027	1.000	
(8) PC	-0.019	0.184	0.168	0.082	-0.052	0.376	-0.021	1.000

4.3. Econometric Models

The dependent (LnFDI) and independent variables (LnCPI, LnFPI, LnLPI, LnCY, LnFC, LnLCP, LnPC) are used in multiple regression models. The effects of such models are demonstrated and interpreted in the following section.

Table-3. Ordinary Least Squares (OLS) model.

LnFDI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnCPI	-0.369	0.55	-0.67	0.503	-1.448	0.711	
LnFPI	2.573	0.904	2.85	0.005	0.799	4.347	***
LnLPI	0.081	0.412	0.20	0.844	-0.726	0.889	
LnCY	0.77	0.119	6.45	0	0.536	1.005	***
LnFC	0.599	0.059	10.22	0	0.484	0.714	***
LnLCP	0.274	0.02	13.79	0	0.235	0.313	***
LnPC	-0.123	0.04	-3.05	0.002	-0.202	-0.044	***
Constant	-2.039	1.137	-1.79	0.073	-4.27	0.192	*
Mean dependent var		20.368	SD dependent var		2.548		
R-squared		0.407	Number of obs		1023.000		
F-test		99.584	Prob > F		0.000		
Akaike crit. (AIC)		4297.310	Bayesian crit. (BIC)		4336.754		

Note: *** p<.01, ** p<.05, * p<.1.

The ordinary least squares model (Table 3) shows the relationship between foreign direct investment and crop production index, food production index, livestock production index, cereal yield, fertilizer consumption, land under cereal production and permanent cropland. In this model, it is found that there is significant positive relationship between foreign direct investment and food production index, cereal yield, fertilizer consumption, land under cereal production and significant negative relationship between foreign direct investment and permanent cropland. It implies that a country having more foreign direct investment helps to increase food production index, cereal yield, fertilizer consumption, and land under cereal production. On the contrary, foreign direct investment is the reason for reducing permanent cropland under this model. Furthermore, other variables such as crop production index and livestock production index have the mixed relationship with foreign direct investment but insignificant in 10% level.

The pooled ordinary least squares model Table 4 shows the relationship between foreign direct investment and crop production index, food production index, livestock production index, cereal yield, fertilizer consumption, land under cereal production and permanent cropland. In this model, it is found that there is significant positive relationship between foreign direct investment and food production index, livestock production index cereal yield, fertilizer consumption and significant negative relationship between foreign direct investment and crop production index. It implies that a country having more foreign direct investment helps to increase food production index, livestock production index cereal yield, fertilizer consumption. On the contrary, foreign direct investment is the

reason for reducing crop production index under this model. Furthermore, other variables such as land under cereal production and permanent cropland have the mixed relationship with foreign direct investment but insignificant in 10% level.

Table-4. Pooled Ordinary Least Squares (POLS) model.

LnFDI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnCPI	-0.966	0.534	-1.81	0.07	-2.012	0.08	*
LnFPI	1.6	0.88	1.82	0.069	-0.124	3.324	*
LnLPI	1.527	0.431	3.55	0	0.683	2.371	***
LnCY	1.367	0.185	7.39	0	1.004	1.729	***
LnFC	0.305	0.078	3.91	0	0.152	0.458	***
LnLCP	0.1	0.062	1.61	0.106	-0.021	0.222	
LnPC	-0.001	0.107	-0.01	0.995	-0.211	0.21	
Constant	-2.54	1.611	-1.58	0.115	-5.697	0.617	
Mean dependent var		20.368	SD dependent var			2.548	
Overall r-squared		0.335	Number of obs			1023.000	
Chi-square		506.909	Prob > chi2			0.000	
R-squared within		0.333	R-squared between			0.330	

Note: *** p<.01, ** p<.05, * p<.1.

Table-5. Two stage least squares model.

Instrumental variables (2SLS) regression

LnFDI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnCPI	-0.369	0.55	-0.67	0.503	-1.448	0.711	
LnFPI	2.573	0.904	2.85	0.005	0.799	4.347	***
LnLPI	0.081	0.412	0.20	0.844	-0.726	0.889	
LnCY	0.77	0.119	6.45	0	0.536	1.005	***
LnFC	0.599	0.059	10.22	0	0.484	0.714	***
LnLCP	0.274	0.02	13.79	0	0.235	0.313	***
LnPC	-0.123	0.04	-3.05	0.002	-0.202	-0.044	***
Constant	-2.039	1.137	-1.79	0.073	-4.27	0.192	*
Mean dependent var		20.368	SD dependent var		2.548		
R-squared		0.407	Number of obs		1023.000		
F-test		99.584	Prob > F		0.000		

Note: *** p<.01, ** p<.05, * p<.1.

Table-6. Generalized method of moments (GMM) model.

Regression results of GMM model

Regression results

LnFDI	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
L.LnFDI	0.528	0.036	14.68	0	0.458	0.599	***
LnCPI	1.653	0.61	2.71	0.007	0.458	2.848	***
LnFPI	-2.093	0.979	-2.14	0.032	-4.011	-0.175	**
LnLPI	1.432	0.511	2.80	0.005	0.431	2.433	***
LnCY	0.169	0.173	0.98	0.328	-0.17	0.508	
LnFC	0.234	0.077	3.02	0.003	.082	0.385	***
LnLCP	-0.168	0.16	-1.05	0.296	-0.482	0.147	
LnPC	-0.103	0.189	-0.55	0.584	-0.474	0.267	
Constant	5.322	2.457	2.17	0.03	0.507	10.138	**
Mean dependent var		20.589	SD dependent var		2.316		
Number of obs		878.000	Chi-square		850.155		

Note: *** p<.01, ** p<.05, * p<.1

The two stage least squares model (Table 5) shows the relationship between foreign direct investment and crop production index, food production index, livestock production index, cereal yield, fertilizer consumption, land under cereal production and permanent cropland. In this model, it is found that there is significant positive relationship between foreign direct investment and food production index, livestock production index cereal yield, fertilizer consumption and significant negative relationship between foreign direct investment and crop production index. It implies that a country having more foreign direct investment helps to increase food production index, livestock production index cereal yield, fertilizer consumption. On the contrary, foreign direct investment is the reason for reducing crop production index under this model. Furthermore, other variables such as land under cereal production and permanent cropland have the mixed relationship with foreign direct investment but insignificant in 10% level. For more robustness, the next model is run.

The generalized method of moments (GMM) model (Table 6) shows the relationship between foreign direct investment and crop production index, food production index, livestock production index, cereal yield, fertilizer consumption, land under cereal production and permanent cropland. In this model, it is found that there is significant positive relationship between foreign direct investment and crop production index, livestock production index, fertilizer consumption and significant negative relationship between foreign direct investment and food production index. It implies that a country having more foreign direct investment helps to increase crop production index, livestock production index, fertilizer consumption. On the contrary, foreign direct investment is the reason for reducing food production index under this model. Furthermore, other variables such as cereal yield, land under cereal production and permanent cropland have the mixed relationship with foreign direct investment but insignificant in 10% level.

5. CONCLUSION

This paper investigated the effect of foreign direct investment on different type of production indices by using panel data of 46 Asian countries during the time frame of 1991 to 2018 and employed OLS, POLS, 2SLS, and GMM model. The study displayed a favorable association between foreign direct investment and food production index and fertilizer consumption in all the models used in the study. It furthermore showed livestock production index has significant positive association with foreign direct investment in POLS and GMM whereas crop yield has substantial positive relationship with foreign direct investment in all models except GMM model. Moreover, OLS and 2SLS model demonstrated significant positive association between foreign direct investment and land under cereal production, while crop production index has significant diversified relationship with foreign direct investment in different models. Furthermore, crop production index and foreign direct investment has significant negative relationship in POLS model, whereas, it has significant positive relationship with FDI in GMM model. Besides, OLS and 2SLS model depicted a significant negative relationship between FDI with permanent cropland.

This study has taken into consideration the data based merely on Asian countries for the time period of 28 years. However, the results would be more resounding if more than 28 years would be considered. Moreover, data were transformed for research purpose which could generate inconsistency and several factors were left out from this paper as well. Apart from this, further research should focus on determining the most significant determinants of FDI.

Funding: This study received no specific financial support.
Competing Interests: The authors declare that they have no competing interests.
Acknowledgement: All authors contributed equally to the conception and design of the study.

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Appendix-1. List of Countries.

Afghanistan	**Lao PDR**
Armenia	Lebanon
Azerbaijan	Malaysia
Bahrain	Maldives
Bangladesh	Mongolia
Bhutan	Myanmar
Brunei Darussalam	Nepal
China	Oman
Colombia	Pakistan
Cyprus	Philippines
Egypt, Arab Rep.	Qatar
Georgia	Saudi Arabia
India	Singapore
Indonesia	Sri Lanka
Iran, Islamic Rep.	Syrian Arab Republic
Iraq	Tajikistan
Japan	Thailand
Jordan	Timor-Leste
Kazakhstan	Turkmenistan
Korea, Dem. People's Rep.	United Arab Emirates
Korea, Rep.	Uzbekistan
Kuwait	Vietnam
Kyrgyz Republic	Yemen, Rep.