

The Role of Foreign Investment, Trade Liberalization, and Capital Formation in Shaping Industrial Employment: Evidence from Developing Asian Economies

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Abstract: In this study we tried to investigate the factors influencing industrial employment in the developing countries of Asia. The analysis is based on the impact of foreign direct investment, trade openness, education, gross capital formation, labor force participation rate, and urbanization on the share of manufacturing jobs in total employment. We used a quantitative panel data analysis approach covering nine countries from different parts of Asia. They are Bangladesh, India, Pakistan, Indonesia, Malaysia, Thailand, Vietnam, Kazakhstan, and Jordan. We have selected a time period from 1995 to 2019. For the final analysis we used a fixed effects 2SLS (IV) estimation with cluster-robust standard errors to deal with endogeneity, heteroskedasticity, and autocorrelation. Findings show that trade (% of GDP) has the strongest positive and significant impact on the share of manufacturing jobs. Gross capital formation also has a significant and positive influence. Contrary to conventional thought, the influence of FDI and urbanization on industrial employment are statistically insignificant. The impact of labor force participation rate is also insignificant. Surprisingly, there is a significant negative relationship between education and industrial employment, suggesting educated people are going to the service sector. Therefore, policies should be focused on stimulating domestic investment, managing urbanization with sustainable infrastructure development, and aligning education systems to meet the demands for both industry and service sector. For future research, this paper also points toward assessing the relative impact of FDI and knowledge intensive investments.

Keywords: Foreign direct investment, trade openness, gross capital formation, industrial employment, and two-stage least squares estimation.

Introduction:

Industry sector is an important sector for a developing country. According to Brady, Kaya & Gereffi (2011), the nature of work and the demographic layout of a society are shaped by industrialization. Manufacturing jobs generally offer higher wages and pulls people out of poverty. A panel study on 27 countries found that, as the share of manufacturing jobs increases, income inequality decreases (Mehic, 2018). It is important to understand the

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factors influencing industrial employment for the policymakers of developing nations. Our research tries to illustrate a clear understanding on this. We took FDI, gross capital formation, trade (% of GDP), urbanization, labor force participation rate, and average years of schooling as independent variables. The impact of these factors isn't linear. FDI is a tool for rich countries to offload jobs to cheaper labor markets (Andersen & Hainaut, 1998). Studies found that, FDI might create a reduction in the share of manufacturing jobs in total employment (Brady et al., 2011). Trade openness often shifts workers from permanent jobs to temporary contract jobs (Saha, Sen, & Maiti 2013). According to Meyer & Sanusi (2019), there is a strong and positive link between gross capital formation and employment creation. Chen & Wu (2007) found that, education creates skilled labor force and has a positive impact on employment. According to Degirmenci, Erdem, & Aydin (2024), urbanization is sometimes driven by industrial employment that results in concentration of labor, and in turn manufacturing growth is fueled. Labor force participation rate is directly linked to labor supply, so it also has a relationship with employment. To investigate the determinants of industrial employment in developing nations, we used a panel of nine countries from Asia. We have collected data from the year 1995 to 2019. This timeframe allows for examining long-term trends, and eliminates the economic disruptions caused by the COVID-19 pandemic. We deliberately avoid a narrow focus on a single sub-region to provide a comprehensive understanding. Bangladesh, India, and Pakistan are from South Asia, Indonesia, Malaysia, Thailand, and Vietnam are from Southeast Asia, Kazakhstan is from Central Asia, and Jordan is from the Western Asia. Data availability was also a concern while taking these countries. The findings are intended to offer valuable insights for policymakers.

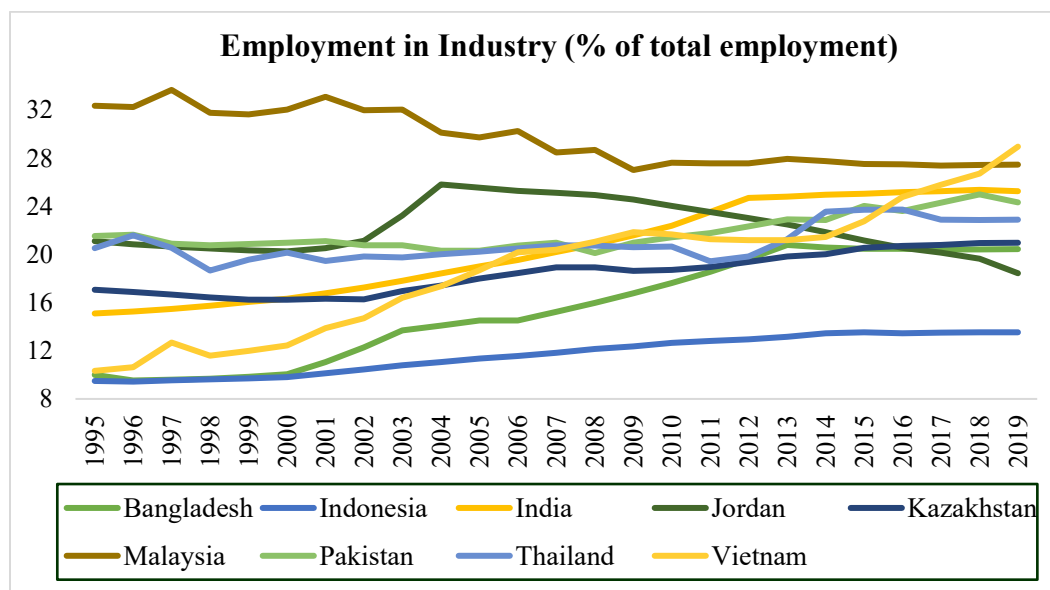


Figure 1: Employment in industrial sector as a share of total employment

Data Source: International Labour Organization (ILO)

Literature Review:

While investigating the influence of foreign direct investment (FDI) on employment in manufacturing sector, we found no simple answer in existing literature. The impact of FDI depends on a country's economic condition, its investment type, and the condition of its labor force. Khan et al. (2022) found that, in Pakistan, FDI created more job opportunities in both the short-run and long-run. Similarly, foreign investment was aimed at increasing efficiency, and became an important source of employment in industry sector in Macedonia (Nikoloski, 2017). Rozen-Bakher (2017) conducted a study on 116 developing countries and found that FDI helped to increase industrial employment. But this positive link isn't always found. Malik (2019) found that, FDI had minimal influence on employment in industry sector. The situation is more critical for developed countries. Foreign investment has been helped skilled workers while harming job prospects for less-skilled workers in the United Kingdom, showing a shift in the type of jobs available (Bailey & Driffield, 2006). Analysis on multiple advanced countries revealed that FDI pushed employment out of industry sector and into the service sector (Rozen-Bakher, 2017). Surprisingly, manufacturing employment levels has been attracted FDI in the long term in Singapore (Nyen & Cheong, 2011).

The relationship between trade openness and employment isn't straightforward. Ngouhouo & Nchofoung (2021) found a positive impact of trade openness on employment, driven by investment and industrialization. Similarly, trade openness is associated with long-term positive link to manufacturing growth in Malaysia (Chandran & Munusamy, 2009). Hwang & Lee (2019) conducted a broader cross-country analysis and found that, for labor intensive economies, trade significantly reduces unemployment in the long run. On the other hand, a study on 131 developing countries found that, trade openness has hurt industrial employment, especially in Sub-Saharan African and Latin American countries, and contributed to deindustrialization (Busse et al., 2024). Vashisht (2016) showed that, employment directly created by trade were canceled out by an indirect drop in labor demand in India. Yasmin & Khan (2011) conducted a study in Pakistan and found a weak connection between trade openness and manufacturing employment as firms invested in machinery over people. The impact of trade on employment largely depends on the nation's resources and labor market conditions.

The relationship between gross capital formation and manufacturing jobs is also complicated. Pasara & Garidzirai (2020) considered investment as a primary driver for boosting employment and the economy in South Africa. Sankaran et al. (2024) conducted a study in India and revealed that, increased capital formation led to increased industrial employment, suggesting it's a reliable way to generate manufacturing jobs. However, Pasara & Garidzirai (2020) found that, more investment was linked to fewer jobs in Tanzania because new machinery replaced human labor. Investment in high-tech industrial sector helped non-production white-collar staff but had inconsistent results for other workers in the United States (Berndt et al., 1992). Another studies found that, the impact of capital formation on industrial jobs was indirect, but worked through overall economic expansion (Giray & Ömür, 2022; Ongo & Vukenkeng, 2014).

The connection between education and manufacturing jobs isn't simple. Vocational education is the backbone of a competitive manufacturing workforce (Aizenman et al., 2018). Vocational training has increased the share of industrial employment in India, and

also has increased overall wages (Banerjee, 2016). According to Snell (2019), vocational training sector is important for the manufacturing sector in the United States. According to Aizenman et al. (2018), government investment in vocational education is linked to the manufacturing success of Singapore and Vietnam. Naderi & Mace (2003) found that, general education levels and job experience were tied to wages in Iran, representing a core idea of human capital theory. Over-education and under-education of manufacturing workers can lead to consequences, such as lower earnings and lower productivity, impacting national economic targets (Zakariya, 2014). According to Harvey (2000), educated workforce is a requirement as organizations evolve to be more flexible.

Urbanization doesn't always automatically fuel a boom in manufacturing jobs. Developing nations with abundant natural resources are experiencing "urbanization without industrialization" (Gollin, Jedwab & Vollrab, 2016). Urban centers are also growing into 'consumption cities' driven by service sector, rather than manufacturing sector. Following agglomeration economies, companies get benefits from clustering together, having a critical relationship with employment generation. Farahmand, Akbari & Abootalebi, (2012) found an inverse U-shaped effect of a diverse industrial mix, as it helps create jobs up to a point before becoming detrimental. The negative impact of urbanization is cities becoming too crowded and expensive, and that leads to cancel out the benefits for businesses (Moomaw, 1988). According to Kolko (2010), service sector has become the main employers in big cities, and the way they expand and cluster together is different from those of manufacturing sector in developed countries. Scott (1986) found that, the way the manufacturing sector organize themselves is a key factor of industrial employment.

According to Acemoglu & Restrepo (2020), when labor force becomes scarce, industries move to automation in the United States. Another study found that, when labor is replaced by robots, there is a decrease in the share of low-skilled workers (Graetz & Michaels, 2018). That means, when robots replace labor, there is a decline in labor force participation, as well as employment. Studies show that, the Great Recession in 2008 caused higher unemployment and lower labor force participation (Yagan, 2019). According to Autor, Dorn & Hanson (2016), increasing imports from China made labor force participation rate depressed in the United States, and employment has fallen in the industries. We can see that, labor force participation has a clear relationship with employment, also for the industry sector.

Existing literature focused on a single country, or based on developed or developing nations, which doesn't count for important regional dynamics. A gap exists in research that simultaneously investigates the combined influence of foreign investment, trade openness, capital formation, education, labor force participation rate, and urbanization on industrial employment in developing Asian countries. Asia is a global hub of developing economies, but there is a contradiction in findings while studying single countries. Therefore, a comprehensive panel data analysis is needed. Our research tries to fill this gap. A panel data approach is employed, taking nine developing countries from different parts of Asia. A balanced dataset is collected from the year 1995 to 2019. This study will show a clear understanding of the factors that influence industrial employment in developing countries of Asia.

Methodology of the Study:

Type of Research and Study Area

This research is based on quantitative analysis, following panel data estimation methods. Data is collected from nine developing Asian countries. Bangladesh, India, and Pakistan are from South Asia. Indonesia, Malaysia, Thailand, and Vietnam are from Southeast Asia. Kazakhstan is from Central Asia, and Jordan is from the Western Asia. Other countries hasn't been selected due to limited data availability. This panel is selected to enhance validity and generalizability of the findings. This panel has economic and geographic diversity, but ensures the "developing" status for all the countries. This diversity can strengthen the applicability of the findings. The analysis covers the period from 1995 to 2019, a timeframe selected to assess long-term trends, while excluding the anomalous economic shocks of the COVID-19 pandemic.

Dependent and Explanatory Variables

The dependent variable is employment in industrial sector as a share of total employment. The explanatory variables are foreign direct investment (net inflows), trade as a share of total GDP, gross capital formation, average years of schooling, urban population as a share of total population, and labor force participation rate.

Table 1: Dependent and Explanatory Variables

Variable	Definition	Data Source
lnIndusEmploy	Natural log of employment in industrial sector as a share of total employment	ILO Modelled Estimates database, International Labour Organization (ILO)
lnFDI	Natural log of foreign direct investment, net inflows (BoP, current US\$)	Balance of Payments database, International Monetary Fund (IMF)
lnTradeOpen	Natural log of trade as a share of total GDP	World Bank National Accounts Data (WB)
lnGCF	Natural log of gross capital formation (current US\$)	Organisation for Economic Co-operation and Development (OECD)
lnAYS	Natural log of average years of schooling	United Nations Development Programme (UNDP)
lnURB	Natural log of urban population as a share of total population	United Nations Population Division (UN)
lnLFPR	Natural log of labor force participation rate	International Labour Organization (ILO)

Estimation Method

The panel data estimation method is used for empirical analysis. The multicollinearity test shows that, there is moderate level of multicollinearity according to the VIF test. Then both fixed effect model and random effect model are used for panel regressions on the natural logarithms of each variables. Log transformation of the variables mitigates skewness and permits easy interpretation using percentages as unit. Then the Hausman test shows that the fixed effect model is appropriate in this case. Then some diagnostic tests are used. The endogeneity test with fixed effect model shows that, trade openness, gross capital formation, and urbanization are endogenous. To deal with endogeneity, we conduct a fixed effects two-stage least squares (FE-2SLS) estimation that includes three instrumental variables. Then we run the Pesaran CD test for checking cross-sectional dependence. Then the Modified Wald test is used for checking group wise heteroskedasticity. Then the bias-corrected Born and Breitung Q(p)-test is used for checking autocorrelation. We found that, there is no cross sectional dependence, but heteroskedasticity and autocorrelation is present. So, a fixed effects (IV) two-stage least squares estimation with cluster-robust standard errors is used. This FE-2SLS (IV) regression with cluster-robust standard errors is generally used to deal with instrumental variables, heteroskedasticity, and autocorrelation.

The final estimated model:

$$\ln IndusEmploy_{it} = \alpha_i + \beta_1 \ln FDI_{it} + \beta_2 \ln TradeOpen_{it} + \beta_3 \ln GCF_{it} + \beta_4 \ln AYS_{it} + \beta_5 \ln URB_{it} + \beta_6 \ln LFPR_{it} + \varepsilon_{it}$$

Here, i denotes country and t denotes time. The endogenous variables, $\ln TradeOpen$, $\ln GCF$, and $\ln URB$ were instrumented with their one period lags, $L.\ln TradeOpen$, $L.\ln GCF$, and $L.\ln URB$, within the fixed effects two-stage least squares framework.

Results and Interpretations:

Summary Statistics

Table 2 shows the summary statistics for the variables used in the study. This table includes within, between, and overall statistics for all the variables, providing initial insights into the sample and the relationships between variables before formal econometric analysis.

Table 2: Summary Statistics

Variable		Mean	Standard Deviation	Observations
Employment in Industry Sector (%)	Overall	19.93053	5.53	N=225 n=9 T=25
	Between		4.95	
	Within		2.95	
Foreign Direct Investment (\$)	Overall	7970000000	10700000000	N=225 n=9 T=25
	Between		7550000000	
	Within		8040000000	
Trade (% of GDP)	Overall	85.8902	50.54	N=225 n=9 T=25
	Between		50.46	
	Within		16.74	
Gross Capital Formation (\$)	Overall	96300000000	164000000000	N=225 n=9 T=25
	Between		136000000000	
	Within		102000000000	
Average Years of Schooling	Overall	7.045364	2.33	N=225 n=9 T=25
	Between		2.19	
	Within		1.06	
Urban Population (% of total population)	Overall	44.31529	19.60	N=225 n=9 T=25
	Between		20.20	
	Within		4.44	
Labor Force Participation Rate	Overall	64.46533	12.57	N=225 n=9 T=25
	Between		13.20	
	Within		1.52	

Source: Authors' Calculation

Table 2 shows the summary statistics for the dataset. The panel includes total 225 observations, which consists of 9 countries as cross-sectional units, and 25 time periods. The table represents overall variations, between variations for cross-sectional units, and within variations for time series. The overall mean for industrial employment is 19.93%,

with a standard deviation of 5.53% overall, 4.95% between entities, and 2.95% within them over time. The overall mean for FDI is \$7.97 billion, with a standard deviation of \$10.7 billion overall, \$7.55 billion between entities, and \$8.04 billion within them over time. The overall mean for trade as a percentage of GDP is 85.89%, with a standard deviation of 50.54% overall, 50.46% between entities, and 16.74% within them over time. The overall mean for gross capital formation is \$9.63 billion, with a standard deviation of \$16.4 billion overall, \$13.6 billion between entities, and \$10.2 billion within them over time. The overall mean for average years of schooling is 7.04 years, with a standard deviation of 2.33 years overall, 2.19 years between entities, and 1.06 years within them over time. The overall mean for urban population as a percentage of total population is 44.31%, with a standard deviation of 19.60% overall, 20.20% between entities, and 4.44% within them over time. The overall mean for labor force participation rate is 64.46%, with a standard deviation of 12.57% overall, 13.20% between entities, and 1.52% within them over time.

Diagnostic Tests

Multicollinearity is measured using the Variance Inflation Factor (VIF). VIFs for variables were between 2.54 and 6.67. So, there is moderate level of multicollinearity, and it's not a problem. Then we run both fixed effect model and random effect model. For choosing one between these two models, Hausman test is used. Here, the p-value is 0.0105, which is less than 0.05. We conclude that fixed effect model is appropriate for this study. According to Torres-Reyna (2007), the fixed effect model is used when there might be unobserved, time-invariant individual characteristics that could influence or bias any of the variables, and when to control for these characteristics is needed. Since the fixed effect model solves this problem, there is no need to use country dummy.

For checking endogeneity, Durbin-Wu-Hausman test is used after running instrumental variable (IV) regressions, for all independent variables. If the p-value is less than 0.05, the variable is endogenous. The p-value for foreign direct investment is 0.2770, so it's exogenous. The p-value for trade openness is 0.0350, so it's endogenous. The p-value for gross capital formation is 0.0087, so it's endogenous. The p-value for average years of schooling is 0.1674, so it's exogenous. The p-value for urbanization is 0.0457, so it's endogenous. The p-value for labor force participation rate is 0.5636, so it's exogenous.

Pesaran's test is used for checking cross sectional dependence in residuals. The p-value is 0.1223, which is more than 0.05. So, cross sectional dependence is not present. This means that observations across different countries aren't correlated, and what happens to one country doesn't influence the outcomes of others. Then we used the Modified Wald test for checking heteroskedasticity. Here, the p-value is 0.0000. As the p-value is very small, we conclude that heteroskedasticity is present in the model. That means the error terms in the model do not have a constant variance across observations, which can make standard errors unreliable and lead to biased statistical inference if not corrected. The presence of autocorrelation is tested through the Bias-corrected Born and Breitung Q(p)-test. The p-value is 0.000, which is less than 0.05. Thus, there is autocorrelation which can make standard errors biased and inferences unreliable if not corrected.

FE-2SLS (IV) Estimation with Cluster-Robust Standard Errors:

A fixed effects two-stage least squares estimation with cluster-robust standard errors is used. Here, the endogenous variables, $\ln\text{TradeOpen}$, $\ln\text{GCF}$, and $\ln\text{URB}$ were instrumented with their one period lags, $L.\ln\text{TradeOpen}$, $L.\ln\text{GCF}$, and $L.\ln\text{URB}$. The reason for using this method is, it can deal with instrumental variables, heteroskedasticity, and autocorrelation. This method solves endogeneity and ensures that the estimated coefficients are consistent and the inference is reliable. Findings are represented in the following table:

Table 3: FE-2SLS (IV) Estimation with Cluster-Robust Standard Errors

Number of clusters (country1) = 9		Number of observations = 216	
		F (6,8) = 27.63	
		Prob > F = 0.0001	
Total (centered) SS = 5.794673086		Centered R ² = 0.7132	
Total (uncentered) SS = 5.794673086		Uncentered R ² = 0.7132	
Residual SS = 1.661652183		Root MSE = 0.0896	
Variables	Coefficients	Robust Standard Errors	P-value
lnTradeOpen	0.377102	0.1375708	0.006
lnGCF	0.1468808	0.0325394	0.000
lnURB	0.5047291	0.3314193	0.128
lnFDI	-0.0018487	0.0195502	0.925
lnAYS	-0.3311973	0.1116247	0.003
lnLFPR	0.0870058	0.4199871	0.836
P-value for Kleibergen-Paap rk LM statistic: 0.0065			
Kleibergen-Paap rk Wald F statistic: 92.108			

Source: Authors' Calculation

Findings show that, if trade as a share of GDP increases by 1% on average, industrial employment increases by about 0.377102%, which is highly significant (p-value = 0.006), indicating a positive relationship. Trade openness has the highest positive and significant impact on industrial employment in our selected sample. If gross capital formation increases by 1% on average, industrial employment increases by about 0.1468808%, which is highly significant (p-value = 0.000). If urban population increases by 1% on average, industrial employment increases by about 0.5047291%, which is insignificant (p-value =

0.128). If foreign direct investment increases by 1% on average, industrial employment decreases by about 0.0018487%, which is highly insignificant (p -value = 0.925). If average years of schooling increases by 1% on average, industrial employment decreases by about 0.3311973%, which is highly significant (p -value = 0.003). This result is notable as it suggests a negative relationship, contrary to many literatures. If labor force participation rate increases by 1% on average, industrial employment increases by about 0.0870058%, but it is highly insignificant (p -value = 0.836). The p -value for Kleibergen-Paap rk LM statistic is 0.0065, which is less than 0.05, meaning instruments are relevant. The Kleibergen-Paap rk Wald F statistic is 92.108, which is more than 10, meaning instruments are strong.

Discussion:

The impact of various factors on industrial employment in developing Asian countries is not simple, and sometimes counter-intuitive. Surprisingly, foreign direct investment is insignificant while influencing industrial employment. Jenkins (2006) observed a trend in Vietnam, FDI is becoming capital-intensive, prioritizing automation and technological efficiency over labor. So, policymakers can't assume that attracting foreign capital will increase industrial employment. Malik (2019) found similar story in India, where foreign investment had minimal impact on employment creation. Another counter-intuitive and significant finding is that, increasing average years of schooling decreases industrial employment. This phenomenon indicates structural transformation in the job sector. According to Buera et al. (2022), the growing service sector in finance, business services, and information technology attracts the educated workforce more than manufacturing sector. Aizenman et al. (2018) suggests a skill gap is created, since general educational progress is growing more than vocational training and technical skills required by modern manufacturing sector. Urbanization is insignificant while influencing industrial employment. This phenomenon aligns with some of our previously mentioned literature. Gollin, Jedwab & Vollrab (2016) found that, some developing nations are experiencing urbanization without industrialization. Kolko (2010) found that, service sector is the main source of employment in large cities. A study on Turkey found a positive relationship between increased female labor force participation rate and the growing service sector (Kubota, 2020). So we can say that, labor force participation rate has a positive influence on employment, but it doesn't mean the workers will go to the industrial sector. Like urbanization and average years of schooling, increased labor force participation might be ended up with higher employment share in another sector.

Conclusion and Recommendations:

This study across nine developing Asian countries from the year 1995 to 2019 shows a complex picture on the share of manufacturing jobs in total employment. Results show that, trade openness is the most potent engine for industrial employment in our context. Along with this, gross capital formation is a significant and positive contributor to the share of manufacturing jobs. This study also represents that foreign direct investment, urbanization, and labor force participation rate are insignificant while influencing industrial employment. Surprisingly, higher levels of education had a significant and

negative impact on the share of manufacturing jobs. This phenomenon signals a structural economic shift, where educated people are going to the service sector.

The focus of policymakers should shift from attracting FDI to targeting high-quality investments that create linkages with local industries to maximize benefits (Narula & Dunning, 2010). A stable environment for domestic investment must be created. Education system should focus on two things, modern vocational training system for advanced manufacturing sector, and higher education for the service sector. Urbanization should be managed properly through integrated planning and sustainable infrastructure development.

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Appendix:

Table A.1: Multicollinearity Test

Variable	VIF
lnURB	6.67
lnAYS	5.52
lnFDI	3.63
lnGCF	3.49
lnLFPR	3.14
lnTradeOpen	2.54
Decision: Moderate level of multicollinearity	

Table A.2: Hausman Test

Test	Chi-square value	Chi-square df	Probability
Hausman test	16.70	6	0.0105
Decision: Fixed effect model is appropriate			

Table A.3: Endogeneity Test

Variable	χ^2 P-value
lnFDI	0.2770
lnTradeOpen	0.0350
lnGCF	0.0087
lnAYS	0.1674
lnURB	0.0457
lnLFPR	0.5636
Decision: lnTradeOpen, lnGCF, and lnURB are endogenous.	

Table A.4: FE-2SLS (IV) Estimation

Variables	Coefficients	Standard Errors	P-value
lnTradeOpen	0.377102	0.0491834	0.000
lnGCF	0.1468808	0.020948	0.000
lnURB	0.5047291	0.1084981	0.000
lnFDI	-0.0018487	0.0100004	0.853
lnAYS	-0.3311973	0.1064564	0.002
lnLFPR	0.0870058	0.298614	0.771

Table A.5: Cross-Sectional Dependency Test

Test	Statistic	Probability
Pesaran's test	1.545	0.1223
Decision: No cross-sectional inter-dependence		

Table A.6: Heteroskedasticity Test

Test	Chi-square value	df	Probability
Modified Wald test	1805.35	9	0.000
Decision: Heteroskedasticity is present			

Table A.7: Autocorrelation Test

Test	Q(p) Statistic	P-value
Bias-corrected Born and Breitung Q(p)-test	40.82	0.000
Decision: Autocorrelation is present		