

Research on the Trade Effects of China's Direct Investment in ASEAN Countries: A Dual Perspective of Scale and Structure

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Abstract. With China's outward foreign direct investment (OFDI) growing rapidly and the Association of Southeast Asian Nations (ASEAN) now standing as its largest trading partner, this study investigates how Chinese direct investment in ASEAN shapes bilateral trade scale and structure. Drawing on a panel covering China and the ten ASEAN members over 2012-2023, we estimate a two-way fixed effects model, taking the share of technology-intensive products in total exports as the outcome variable. The baseline estimates point to a significantly positive effect, which survives winsorization, alternative clustering of standard errors, and the Hausman test. Heterogeneity results further show that this upgrading effect is stronger for non-bordering countries than for bordering ones, and stronger for the remaining six members than for the four major recipients, suggesting a base effect behind the structural impact of direct investment.

Keywords: outward foreign direct investment, trade structure upgrading, technology-intensive products, two-way fixed-effects model

1. Introduction

Under economic globalization, cross-border direct investment and foreign trade have become central forces in the world economy. China is a leading case in point: since the Go Global strategy was launched in 2000, its OFDI has grown rapidly, and ASEAN, owing to geographic proximity, complementary factor endowments, and deepening cooperation mechanisms, has emerged as a major recipient. Official statistics show that China's OFDI stock in ASEAN rose from 28.238 billion USD at the end of 2012 to 175.617 billion USD at the end of 2023, a compound annual growth rate of 18.1%, well above the 8.7% average for China's overall OFDI stock; bilateral trade between China and ASEAN expanded from 400.1 billion USD to 911.7 billion USD over the same period, and China has been ASEAN's largest trading partner since 2009. Against this background, clarifying how Chinese direct investment in ASEAN influences the scale and structure of bilateral trade is both theoretically meaningful and practically relevant for deepening China-ASEAN economic and trade ties.

Building on this reasoning, the present study evaluates the trade effects of Chinese OFDI along two dimensions, trade scale and trade structure, using an empirical sample of direct investment and bilateral trade between China and the ten ASEAN members during 2012-2023. At the scale level, we test how Chinese OFDI affects total export value and total import value; at the structure level, the export value of technology-intensive products and its share are taken as dependent variables. A two-way fixed-effects specification is estimated, with the economic development level gap, institutional quality, and the exchange rate as control variables. This paper contributes by moving the analysis from trade aggregates to trade structure, enriching research on the trade effects of OFDI from developing countries, and by providing up-to-date evidence on ASEAN for deeper China-ASEAN economic and trade cooperation.

2. Literature review and hypothesis development

Scholarly interest in the link between OFDI and foreign trade dates back to Mundell [1] in the 1950s: by incorporating factor mobility into the Heckscher-Ohlin framework, he argued that OFDI and trade are substitutes, since when trade barriers stand between two economies, OFDI offers a route around them that displaces exports. Kojima [2], by contrast, contended in his marginal industry expansion theory that transferring marginal industries to host economies allows OFDI to stimulate bilateral trade through intra-industry trade and vertical division of labor, recasting the OFDI-trade nexus as complementary rather than substitutive.

Since the beginning of the twenty-first century, the surge of OFDI from developing countries has drawn researchers to the trade consequences of emerging-market investment. A large body of empirical work confirms that Chinese OFDI significantly promotes trade: evidence from Belt and Road participating countries indicates that OFDI boosts host-country exports through infrastructure connectivity and trade facilitation arrangements [3], and the effect is larger where government efficiency and the rule of law are stronger.

These promoting effects are realized through several transmission channels. First, Chinese OFDI cuts bilateral logistics and transaction costs by improving host-country infrastructure in transportation, energy, and communications [4]. Second, OFDI reshapes regional production networks and encourages intra-industry trade and vertical division of labor, tightening home-host linkages at the value chain level [5]. Third, green technology spillover and digital infrastructure construction help Chinese OFDI raise host-country exports of green products. Fourth, institutional quality acts as a critical threshold, since technology-intensive industries require the property rights protection and stable business climate that superior institutions supply. Overall, most studies still center on trade aggregates, while analysis of how OFDI shapes trade structure remains relatively weak.

Drawing on the above discussion, this paper puts forward the following two competing hypotheses:

H1a: Chinese direct investment in ASEAN raises the share of technology-intensive products in host-country exports..

H1b: Chinese direct investment in ASEAN lowers the share of technology-intensive products in host-country exports.

3. Research design

3.1. Model construction

To assess how Chinese direct investment in ASEAN affects host countries' export structure, the following benchmark specification is constructed:

$$\begin{aligned} TechShare_{it} = & \beta_0 + \beta_1 OFDI_{it} + \beta_2 GDPpcDiff_{it} + \beta_3 GE_{it} \\ & + \beta_4 RQ_{it} + \beta_5 EX_{it} + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned} \quad (1)$$

where i denotes the ASEAN host country ($i = 1, 2, \dots, 10$) and t the year ($t = 2012, 2013, \dots, 2023$). TechShare is the share of technology-intensive product exports in China's total exports to the host country. OFDI is China's direct investment flow to host country i in year t , expressed in hundreds of millions of USD. GDPpcDiff is the difference in per capita GDP between China and the host country. GE and RQ measure government effectiveness and regulatory quality, respectively. EX is the exchange rate. Country and year fixed effects are controlled, and the final term is the random error.

3.2. Indicator selection

3.2.1. Explained variable

The dependent variable is the share of technology-intensive product exports (TechShare), constructed by summing the export values of high-technology (HT) and medium-high-technology (MHT) products and dividing the sum by China's total exports to the host country; larger values signal a more technology-intensive export structure.

3.2.2. Core explanatory variable

The core explanatory variable is the flow of China's outward foreign direct investment (OFDI), expressed in hundreds of millions of USD; based on the theoretical analysis, its coefficient is expected to carry a positive sign.

3.2.3. Control variables

Control variables are chosen in line with the established literature. The economic development level gap (GDPpcDiff), defined as the per capita GDP difference between China and each ASEAN economy, reflects factor endowment complementarity. Government effectiveness (GE) and regulatory quality (RQ), from the World Bank WGI database, proxy for the host country's institutional environment. The exchange rate (EX), the annual average rate of the host currency against the USD, accounts for price competitiveness.

3.3. Data source

The dataset used in this study is a panel covering the ten ASEAN member countries over the period 2012-2023. The definitions and data sources of all variables are summarized in Table 1.

Table 1. Variable definitions and data sources

Variable	Definition	Source
TechShare	Share of technology-intensive exports	CEPII-BACI
OFDI	China's OFDI flow to host country (100m USD)	MOFCOM
GDPpcDiff	Per capita GDP difference (USD)	World Bank WDI
GE	Government effectiveness (WGI)	World Bank WGI
RQ	Regulatory quality (WGI)	World Bank WGI
EX	Exchange rate (local currency/USD)	IMF IFS

4. Results

4.1. Benchmark regression results

A two-way fixed-effects model is estimated on a 2012-2023 panel of the ten ASEAN member countries (117 observations), with both individual and time fixed effects included to absorb time-invariant country-specific characteristics and common time trends.

Table 2 presents the benchmark regression results. The coefficient on the core explanatory variable OFDI is 0.0893 and significant at the 10% level: each additional 1 billion USD of Chinese direct investment in ASEAN is associated with an increase of approximately 0.0893 in the technology-intensive export share, lending support to H1a.

Table 2. Benchmark regression results

	(1)	(2)
Variable	Model 1	Model 2
OFDI	0.0545*	0.0810*
	(0.0410)	(0.0515)
GDPpcDiff		-0.0000
		(0.0000)
GE		0.0887
		(0.0711)
RQ		-0.0375
		(0.0282)
EX		-0.0000
		(0.0000)
Year FE	Yes	Yes
Country FE	Yes	Yes
Observations	120	117
R-squared	0.1277	0.2276
Countries	10	10

Notes: Clustered robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Applying the estimated coefficient to the net increase of approximately 14.74 billion USD in China's OFDI stock in ASEAN between 2012 and 2023, the cumulative contribution to the technology-intensive export share is around 1.32 percentage points; and since the estimation captures only direct effects, the comprehensive impact would be even more pronounced.

4.2. Robustness test

To verify the reliability of the benchmark conclusions, robustness tests are conducted from five dimensions.

Winsorization. Winsorizing the main continuous variables at the 1st and 99th percentiles leaves the OFDI coefficient at 0.0874, significantly positive at the 5% level and essentially unchanged in magnitude, so the benchmark conclusion is not driven by extreme observations.

Alternative clustering approach. Switching to two-way clustered standard errors leaves the OFDI coefficient at 0.0893, still significantly positive at the 5% level, so the conclusion holds when errors are correlated along both the country and the time dimension.

Model selection. Given the marked differences among the ten ASEAN countries, time-invariant country-specific characteristics are controlled for through individual fixed effects.

Taken together, the robustness test results confirm that the benchmark conclusion is highly reliable.

Table 3. Robustness test results

	(1)	(2)	(3)	(4)
	Benchmark	Winsorized	Bi-cluster	Y4 Alt
OFDI (100m USD)	0.0810*	0.0781**	0.0810**	0.0810*
	(0.0515)	(0.0477)	(0.0515)	(0.0515)
GDPpcDiff	-0.0000	-0.0000*	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GE	0.0887	0.0717	0.0887	0.0887
	(0.0711)	(0.0700)	(0.0711)	(0.0711)
RQ	-0.0375	-0.0159	-0.0375	-0.0375
	(0.0282)	(0.0266)	(0.0282)	(0.0282)
EX	-0.0000	-0.0000	-0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	117	117	117	117
R-squared	0.2276	0.1984	0.8974	0.2276
Countries	10.0000	10.0000	10.0000	10.0000

Notes: Clustered robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Columns (1)-(4): benchmark, winsorized variables, two-way clustered standard errors, and an alternative dependent variable, respectively.

4.3. Heterogeneity test

This section conducts heterogeneity tests along three dimensions, namely economic development level, geographical proximity, and investment focus, in order to delineate the boundary conditions under which direct investment delivers structural upgrading effects.

Economic development level heterogeneity. Following the World Bank income classification standards, the ten ASEAN countries are split into high-income and low-income groups, which are estimated separately. The OFDI coefficient is insignificant in both groups; in the full-sample interaction model, the main effect of OFDI is 0.0402, only marginally significant at the 10% level, while the interaction term is not significant. Income level thus plays only a limited moderating role in the structural upgrading effect of OFDI.

Geographical proximity heterogeneity. The ten ASEAN countries are split into bordering countries (Laos, Myanmar, and Vietnam) and non-bordering countries, and the two groups are estimated separately. The OFDI coefficient is 0.0597 for the non-bordering group, significantly positive at the 5% level, versus 0.3720 and statistically insignificant for the bordering group. In the full-sample interaction model, the main effect of OFDI is 0.0763, significant at the 5% level, while the interaction term is not significant.

Three considerations help explain this geographical proximity paradox. First, non-bordering countries such as Singapore, Malaysia, Thailand, and Indonesia possess mature manufacturing systems and technology absorption capacities, whereas the bordering countries mainly received labor-intensive or resource-seeking investment. Second, investment in non-bordering countries is predominantly market-seeking or strategic-asset-seeking, while investment in bordering countries tends to be cost-seeking or resource-seeking. Third, within the non-bordering group, corruption control shows a more significant positive effect, echoing the sensitivity of technology-intensive industries to institutional quality.

Investment focus country heterogeneity. The sample is further divided into the four primary destinations of Chinese investment in ASEAN (Singapore, Thailand, Malaysia, and Indonesia) and the remaining six countries. The OFDI coefficient is 0.4580 for the other-six group, marginally significant at the 10% level, versus 0.0375 and insignificant for the key-four group; in the interaction model, the main effect of OFDI is 0.3910, marginally significant, while the interaction term is not significant.

This pattern points to a base effect: the key four countries already record relatively high technology-intensive export shares, compressing the room for further marginal improvement, whereas the other six start from a lower base, making structural changes more readily identifiable. The relatively weak significance levels, however, make this conclusion less robust than the other heterogeneity results.

Table 4. Heterogeneity test results

	(1)	(2)	(3)	(4)
	Non-border	Border	Key 4	Other 6
OFDI	0.0703** (0.0459)	0.4239 (0.6693)	0.0434 (0.0360)	0.3461* (0.2592)
GDPpcDiff	-0.0000 (0.0000)	0.0001 (0.0002)	-0.0000 (0.0000)	-0.0000** (0.0000)
GE	0.0060 (0.1198)	0.1254 (0.1356)	-0.0228 (0.0564)	0.1066 (0.1270)
RQ	0.0089 (0.0655)	0.1938 (0.1093)	0.0057 (0.0661)	0.0119 (0.0322)
EX	-0.0000	0.0000	-0.0000	-0.0000

Table 4. (continued)

	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Observations	84	33	48	69
R-squared	0.2555	0.6291	0.3153	0.3195
Countries	7.0000	3.0000	4.0000	6.0000

Notes: Clustered robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Non-border countries: Singapore, Malaysia, Thailand, Indonesia, Philippines, Cambodia, Brunei; border countries: Laos, Myanmar, Vietnam; key 4 countries: Singapore, Thailand, Malaysia, Indonesia.

5. Conclusion

Drawing on a 2012-2023 panel of direct investment and bilateral trade between China and the ten ASEAN countries, this paper has estimated a two-way fixed-effects model to examine the trade effects of Chinese OFDI. The main conclusions are as follows.

Chinese OFDI has significantly promoted the upgrading of ASEAN countries' export structures toward a technology-intensive orientation: every 1 billion USD increase in Chinese direct investment raises the technology-intensive export share by approximately 8.93 percentage points, a conclusion robust to winsorization, alternative clustering, and the Hausman test; cumulatively, the effect reaches around 1.32 percentage points.

The structural upgrading effect displays significant geographical proximity heterogeneity — markedly stronger in non-bordering countries than in bordering ones, reflecting differences in industrial foundations, investment motives, and institutional environments — and a base effect, being stronger in the other six countries than in the key four, whose already high technology-intensive export shares compress the room for marginal improvement.

The institutional environment serves as an important moderating factor: corruption control enters positively and significantly in multiple interaction models, indicating that technology-intensive upgrading is highly sensitive to institutional quality.

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