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The impact of financial development on OFDI: Based on GMM estimates

Li Jingwen[1]
Soh Wei Ni[2*]
Zariyawati Mohd Ashhari[3]
Fakarudin Kamarudin[4]

[1,2,3,4]*School of Business and Economics, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.*
[1]*Email: 243923349@qq.com*
[2]*Email: sohweini@upm.edu.my*
[3]*Email: zariyawati@upm.edu.my*
[4]*Email: fakarudin@upm.edu.my*

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(Corresponding Author)*

Abstract

In this study, we use panel data from 2010 to 2019, covering a sample of 64 countries, including developing and developed economies. This study provides an in-depth exploration of the impact of financial development on foreign direct investment (OFDI) by applying four different estimation methods, namely hybrid ordinary least squares (OLS), fixed effects estimation, random effects estimation, and systematic generalized method of moments (GMM). Impact. Investors from the source country plan and conduct direct investments in foreign countries, representing the cross-border flow of direct investment (OFDI). We measure financial development through three indicators: economic growth scale, financial product structure composition, and financial development efficiency. Our results reveal a consistent positive relationship between all dimensions of financial development and OFDI. In addition, we introduce country-specific dummy variables to stratify the analysis between developing and developed countries. Our empirical results highlight the statistical significance of these dummy variables, indicating clear differences in OFDI patterns between the two categories of countries. On this basis, this article examines developing and developed countries, respectively, and draws different conclusions. This study reveals that the impact of financial development on OFDI is significantly different in developing and developed countries, and provides new evidence on the growth of OFDI in developing countries to support this theory. The findings of this study can better provide a reference for governments in developing countries to formulate policies.

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1. Introduction

OFDI, an acronym for "Outward Foreign Direct Investment," refers the cross-border deployment of a nation's international direct investment. Specifically, it entails investments orchestrated by investors directly organizing and overseeing business enterprises in foreign jurisdictions (Chen, Chen, & Tian, 2023; Christofi, Vrontis, & Makrides, 2022; Yang, 2021). Investors opt for OFDI as a strategic approach to establishing foreign subsidiaries, facilitating production, operational expansion, and profit maximization. Consequently, the capital deployed for OFDI is substantial (Fahad, Bai, Liu, & Dagar, 2022; Xu, 2020). OFDI represents a pivotal strategy for nations seeking to venture beyond their borders, leveraging dual resources and markets, bypassing international trade obstacles, assimilating advanced foreign technology and management expertise,

and staying abreast of external information (Guo, Yang, & Meng, 2020; Jia, 2015; Li & Che, 2021). "Home country" in the context of OFDI specifically refers to the country of the origin where the enterprise first incorporated and primarily operates.

Conversely, the "host country" designates the jurisdiction where the multinational corporation's business expansion activities are situated. OFDI manifests in two primary ways: firstly, through greenfield investments, wherein the parent company seeks total control of a subsidiary by establishing an independent office or branch. Secondly, it manifests through acquisitions or mergers conducted within the host country. Given the relative clarity and precision of the OFDI concept, this study posits a refined definition: OFDI embodies the direct investment activities in production or services undertaken by enterprises operating within a nation's jurisdiction into foreign countries and regions beyond the nation's borders.

While the intuitive perception of OFDI may suggest a depletion of capital resources within the home country, potentially impeding its economic growth, a nuanced examination reveals multifaceted implications. OFDI, as undertaken by multinational enterprises, serves as a conduit for enriching human capital and technological prowess. This enrichment is evident in the increase in productivity, which is achieved by improving individuals' knowledge, management capabilities, and technological competencies, as well as the broadening of international perspectives. Furthermore, domestic enterprises from the home country engaged in OFDI possess the capacity to steer the evolution of their industrial structure towards higher-end sectors. Such a strategic shift is conducive to securing stable reservoirs of natural resources and market opportunities, thereby ameliorating the domestic business landscape. Consequently, these indirect mechanisms not only facilitate an influx of foreign direct investment (FDI) but also contribute to the overall economic advancement of the home country (Bhasin & Paul, 2016).

The rapid growth of OFDI from home countries may contribute to higher levels of investment in their own countries. This effect originates from the practice of foreign-owned subsidiaries in host countries integrating home-country resources and inputs into their production processes (Desai, Foley, & Hines Jr, 2005; He, 2019; Yu & Yang, 2014). It is worth pointing out that multinational enterprises (MNEs) specialize in integrating domestic and foreign production operations as a way to increase cost efficiency. This increase in cost-effectiveness enhances the profitability of local production operations, which in turn promotes domestic investment (Herzer & Schrooten, 2008). In addition, the internationalization process can also stimulate domestic research and development (R&D) activities, especially in high-tech and low-tech areas. A panel data study of Taiwanese manufacturing firms highlights the positive impact of firms' international direct investment on domestic R&D expenditures (Chen, Chen, Liang, & Wang, 2013).

At the same time, there is growing evidence that OFDI can foster innovation and technological progress. OFDI can acquire knowledge and technology that do not exist in the domestic market (Amann & Virmani, 2015). These knowledge effects can benefit the outward-investing firms and domestic firms in the home economy (Mani, 2013). OFDI has the potential to instigate a reverse technology transfer dynamic, thereby catalyzing advancements in technological capabilities within the home country (Hao, Guo, Guo, Wu, & Ren, 2020; Li et al., 2017). Notably, Hong, Zhou, Wu, Wang, and Marinova (2019) employed the technology gap theory and discerned that OFDI activities substantially enhanced provincial innovation performance within China. Based on portfolio theory, Clegg, Lin, Voss, Yen, and Shih (2016) confirm that fast-growing OFDI patterns can generate reverse technology transfer and that firms' multinationality strategy significantly impacts the relationship between OFDI and performance. Nair, Demirbag, and Mellahi (2016) revealed the positive effect of absorptive capacity on reverse knowledge transfer through social learning theory. Piperopoulos, Wu, and Wang (2018) confirmed that OFDI positively impacts the innovation performance of Chinese subsidiaries, and this effect intensifies when it targets developed nations rather than emerging economies.

OFDI exhibits distinct characteristics, entailing substantial initial capital outlays and protracted capital return timelines. Consequently, countries embarking on foreign investments must grapple with financing constraints and potential losses stemming from investment risks. At this point, it's especially important to think about the importance of financial development, which is marked by a rise in the number of financial transactions and the steady improvement of the financial industry.

This refinement catalyzes sustained enhancements in financial efficiency, concretized through the eradication of financial repression and the evolution of financial structures. Innovations in financial instruments and the diversification of financial institutions characterise the latter, aligning them with the requirements of economic development (Behera, Tripathy, & Mishra, 2020; Yang, 2021). It is worth noting that the influence of financial development on economic growth is particularly pronounced in developing countries. This observation stems from the dual role financial development plays in these contexts. On the one hand, the improvement of the financial system holds equal significance to the expansion of the real economy. On the other hand, financial development serves as a catalyst for propelling the advancement of the real economy (Batool, Raza, Ali, & Abidin, 2022). In light of these considerations, this study defines financial development as the enhancement of financial efficiency resulting from the concurrent expansion of financial scale and the optimization of financial structure.

The current academic research on the relationship between financial development and OFDI has achieved some revealing results. However, there is still some disagreement on whether financial development promotes or inhibits OFDI, and most empirical methods have neglected the dynamic development between economic variables. Based on the triple perspective of financial scale, structure, and efficiency, this paper establishes a dynamic panel model to comprehensively examine the relationship between financial development and OFDI to make up for the shortcomings of the existing research to a certain extent. Financial development can affect OFDI in variety of ways. For example, firstly, expanding a country's financial scale (bank credit scale, stock market scale, and bond market scale) can provide OFDI with the required investment capital and alleviate financial constraints. The expansion of bank credit provides enterprises with more indirect financing opportunities, especially in many developing countries. The financing channels mainly rely on bank credit, so the bank credit scale plays a more significant role in easing the financing constraints in the OFDI process. In contrast, the expansion of the stock market and bond issuance scales provides enterprises with more direct financing opportunities. At the same time, the expansion of financial scale will reduce the financing costs in the process of OFDI, because the expansion of financial scale will bring about economies of scale and reduce the financing costs of enterprises.

Secondly, the enlargement of the financial scale plays a pivotal role in enhancing investment efficiency and mitigating the inherent risks associated with OFDI. As the financial development scale expands, the heightened competition among financial institutions drives improvements in their capacity to discern and assess project-related risks, resulting in reinforced risk oversight. This, in turn, mitigates the risks stemming from information asymmetry, thereby optimizing capital allocation. In the fiercely competitive landscape, it directs capital flows towards high-quality projects with moderate risks, ultimately elevating investment efficiency. Increased financial development levels and progress in developmental levels, especially the growth of insurance financial institutions, have led to a lot of new insurance and guarantee products that are better and stronger on the financial market: These products, in turn, furnish robust risk-mitigation mechanisms, serving to safeguard OFDI activities.

The optimization of financial structure improves the efficiency of OFDI. The external financing channels of enterprises mainly include direct financing methods mainly based on stocks and bonds, and indirect financing methods mainly based on bank credit. With the optimization of financial structure, the proportion of direct financing methods such as stocks and bonds will gradually increase. The bank credit method increases the financing cost due to the asymmetric information between the two sides, the inability to directly communicate the supply and demand of funds, and the investor's reliance on the bank's risk identification and supervisory abilities. The communication and supervision costs of direct financing methods such as stocks and bonds are lower than those of indirect financing methods, because the supply and demand of funds directly establish a relationship based on the information held by each other, and the financier needs to be supervised by the investor, thus prompting the investor to conduct a rigorous examination of the investment project, choose high-quality investment projects, and continuously innovate in the process of foreign investment to improve the efficiency of OFDI.

Improvements in financial efficiency have reduced the cost of indirect financing for enterprises. As the financial development increases, banks and other financial institutions expand their scale, lowering costs and improving their efficiency and converting savings into enterprise investment, thereby reducing the circulation of funds within the financial system and facilitating their entry into the real sector. The increase in the savings-to-loan ratio has therefore made it easier for enterprises to obtain credit financing on the one hand, and reduced the cost of loans to enterprises on the other, thereby promoting OFDI.

This paper's structure consists of five main sections:

The initial section serves as the introduction, followed by the literature review and hypothesis formulation in the second section. The third section details the research methodology used. Findings and discussions are presented in the fourth section, while the final section concludes with the study's limitations and recommendations.

2. Literature Review and Hypothesis Development

2.1. Literature Review

Kim (2021) uses two-system GMM estimators to look at how institutional quality, FDI, trade openness, and how these things affect the balance of financial development in 33 emerging economies from 2002 to 2019. The findings suggest that while inward FDI positively boosts financial development, trade openness tends to have a crowding-out effect. Conversely, Zhang, Li, and Sun (2022) explore the reverse technology spillover effect of China's outward FDI using inter-provincial panel data from 2003 to 2020, applying GMM estimations. Their analysis indicates that a positive reverse spillover effect is not evident at this stage. Building on these ideas, this study looks closely at what factors affect absorptive capacity and how they affect the reverse technology spillover effect. It discerns that domestic investment in R&D, the accumulation of human capital, the level of economic development, the degree of international openness, infrastructural development, and the magnitude of financial development all exhibit a positive propensity to facilitate the realization of the reverse technology spillover effect emanating from OFDI. Nevertheless, when subjected to subregional scrutiny, notable disparities emerge. Within the eastern region, domestic R&D investments, the

degree of international openness, infrastructure development, and the scale of financial development emerge as pivotal factors propelling the realization of OFDI reverse technology spillovers. In contrast, the central region's capacity to promote such reverse spillovers is more limited, primarily associated with the degree of international openness, infrastructural enhancements, and the scale of financial development. Notably, the western region exhibits a unique profile, primarily attributing positive reverse technology spillovers to the scale and the efficiency of financial development, which serve as distinctive enables in this context.

Dempere, Qamar, Allam, and Malik (2023) utilized the macro, regional, and industrial perspectives to study the financial development and technological innovation-related data for econometric analysis and found that financial development and technological innovation will indeed play a role in promoting OFDI. However, it is imperative to recognize that distinct dimensions of financial development yield varying effects on OFDI within the Chinese context. Specifically, financial expansion exerts a notable and positively facilitating impact on OFDI, while financial deepening demonstrates only a modest and weakly positive facilitative effect on OFDI. The prevailing challenges in China's financial system, predominantly characterized by the dominance of the state-owned banks, are the primary cause of this divergence in this effect. Research by Kergroach (2019) illuminates that the externalities stemming from FDI, commonly referred to as FDI spillovers, can assume diverse orientations, including positive, neutral, or negative outcomes. Several factors moderate these dynamics, including the host country's institutional absorptive capacity, the stock of R&D capital, and the state of its financial markets, among others. Empirical findings by He (2023) underscore that, at the present stage, OFDI has not exhibited a significant reverse technology spillover effect on China's technological advancement and innovation capacity. Nevertheless, it is noteworthy that the inclusion of financial markets can enhance China's absorptive capacity, augmenting the impact of OFDI on reverse technology spillovers to a certain extent. Syamala and Wadhwa (2019) conducted an inquiry into the impact of foreign institutional investors' (FIIs) trading activities on the enhancement of information dissemination within India's financial market. Notably, in recent years, the Indian market has emerged as the preferred investment destination for global investors across the spectrum of emerging markets. Employing an extensive dataset encompassing individual trades spanning the period from 2003 to 2016, and employing four distinct delay measures, this research undertakes an in-depth examination of the role played by FIIs in facilitating information dissemination within the Indian stock market. The outcomes of this investigation reveal that the correlation analysis unequivocally demonstrates a negative relationship between FII trading activities and the measured delays. We can attribute this observed phenomenon, at least in part, to the unique characteristics of individual firms operating within the market.

Fu, Buckley, and Fu (2020) discovered that the OFDI from developing nations promotes economic growth in their origin countries, though with observed delays and regional disparities. Their threshold test results also highlight that the level of financial development significantly influences this growth effect. In 2023, Dar and Nain (2023) did real world research on the threshold effects of financial development on the effects of international capital flows. They found that the size of the financial system has a clear effect on economic growth through its non-linear effects on OFDI. Xu and Zhou (2023) investigated the threshold effects of OFDI on total factor productivity (TFP) within their origin country, using China's inter-provincial panel data from 2003 to 2021. They constructed a panel threshold model using the financial development composite index as the threshold variable. Their findings indicate that OFDI has a pronounced double-threshold effect of OFDI on TFP, depending on financial development levels. Specifically, OFDI adversely affects TFP below the first threshold, this negative impact lessens between the two thresholds, and beyond the second threshold, OFDI markedly enhances TFP growth. The current level of China's overall financial development has not yet reached the level that prompts OFDI to generate positive productivity spillovers, and regions in China with a higher degree of coupling and coordination between OFDI and financial development during the sample period tend to have higher TFP. Li and Wang (2023) utilize China's inter-provincial data from 2007-2014, combined with the generalized least squares method, to study the impact of OFDI on TFP based on the theory of optimal financial structure theory to study the relationship among the three variables of OFDI, financial structure and total factor productivity. The findings indicate that: (1) the impact of reverse technology spillovers formed by OFDI in China on TFP is not significant overall, and the impact of OFDI on TFP is affected by financial structure, i.e., the financial structure can significantly improve the impact effect of OFDI on TFP; (2) the promotion of China's financial structure on TFP is significant. The financial structure in central and western China has a significant effect on TFP in each region, whereas it is not significant in the relatively economically developed eastern region. There are significant regional differences in the impact of financial structure on TFP; (3) China's adoption of the internationalization path of OFDI has effectively promoted the development of the domestic financial structure and catalyzed the transformation of the financial structure from "bank-led" to "market-led."

2.2. Hypothesis

This study defines financial scale growth, financial structure evolution, and financial efficiency improvement as measures of financial progress (Jiang, Luo, & Zhou, 2020). Jiang et al. (2020) conducted a panel analysis of data for 31 provinces in China over the period 2008 to 2016. The study finds that financial deepening plays a key role in OFDI and its spillover benefits. Another study by Zhong, Du, and Liu (2018)

explored how financial progress affects OFDI by analyzing panel data between Chinese provinces from 2007 to 2015. The findings indicate that financial progress significantly contributes to the growth of regional OFDI.

Progress in the financial sector is mainly reflected in the continued expansion and increased maturity of capital and credit markets. When financial development reaches a certain level, it contributes to the aggregation of capital, which facilitates large-scale production and the realization of economic economies of scale; to the efficient allocation and utilization of resources, which in turn enhances social and economic returns; and to the efficient allocation of credit resources between the public and private sectors, as well as to the creation of a more optimal economic structure. It also facilitates the optimal allocation of credit resources between the public and private sectors, thus creating a better economic system. Therefore, the level of financial development has a significant impact on OFDI. This study explores the core explanatory factors of financial development in OFDI through the three dimensions of financial scale, structure, and efficiency (Jiang et al., 2020).

Hypothesis 1: The financial development scale has a positive impact on OFDI.

Hypothesis 2: Financial development structure has a positive impact on OFDI.

Hypothesis 3: Financial development efficiency has a positive effect on OFDI.

3. Research Design

3.1. Model Setting

This study explores the role of financial development in OFDI through macroeconomic indicators. Considering the attributes of the data used, the study conducted a quantitative analysis based on secondary data. We choose panel data regression analysis as the primary tool because of its effectiveness in capturing the intertemporal dynamics inherent within the data set. This method gives you a basic way to deal with time-fixed variables, which can add missing or hidden variables or factors to the regression analysis if they are not taken into account. This cuts down on heterogeneity errors. These methodological advantages enhance the reliability of our findings, distinguishing them from analyses that rely only on static cross-sectional or time-series data. To examine this topic comprehensively, this study adopts a multivariate estimation approach. Specifically, for the static model version, we use aggregated ordinary least squares (OLS), fixed effects, and random affects estimation methods. The OLS model is a method of linear regression analysis widely used in statistics and econometrics and has the property of best linear unbiased estimation (BLUE) of the OLS estimator when certain assumptions are met (e.g., linearity, homoskedasticity, absence of autocorrelation, normality of the error term, etc.). A fixed effects model is a statistical model used to analyze panel data (i.e., data with observations on multiple individuals over a time series), and is particularly suited to studying the factors influencing changes in the dependent variable over time, taking into account inter-individual heterogeneity. Random effects models assume that unobservable heterogeneity among individuals is random and uncorrelated with the explanatory variables in the model. When we assume that inter-individual differences arise from a large aggregate and have the same distribution of effects for all individuals, this type of model is particularly appropriate.

To delve into the dynamic dimension of the analysis, we embrace the system generalized method of moments (GMM) estimation method. GMM is preferred due to its capacity to address potential concerns related to endogeneity and individual heterogeneity. Specifically, the GMM approach provides parameter estimates that exhibit consistency (Arellano & Bond, 1991). The research encompasses a total sample of 64 countries, comprising 53 developing nations and 11 developed ones. Consequently, to underscore the outcomes of developing countries, this study incorporates a country-specific dummy variable, differentiating between the two categories of countries.

Another reason to use different estimation methods in this case is that OLS estimates alone might not give accurate results, especially when it comes to issues with endogeneity and heterogeneity. While both fixed effects and random effects estimation methods offer the advantage of addressing heterogeneity issues, they do not fully resolve endogeneity concerns, especially in situations where the model incorporates lagged first-order OFDI. Hence, it is imperative to exercise prudence and scepticism when interpreting the findings emanating from these three estimation methodologies. When confronted with endogenity issues, their results may exhibit a degree of impression. The principal rationale behind the inclusion of these three estimation techniques is to employ them as comparative benchmarks, accentuating the resilience and accuracy of the system GMM approach.

A comprehensive series of diagnostic evaluations is necessary before the estimation process is initiated. Among these, the autocorrelation test serves as a key statistical analysis tool that helps identify the degree of correlation between observations at different points in time. Autocorrelation tests are widely used in many fields, such as finance, economics, and meteorology. Common autocorrelation tests cover null hypothesis tests, such as the Wooldridge test, which is used to determine whether autocorrelation exists in the data. Other important diagnostic tests involve heteroskedasticity, a concept that refers to the inconsistency of the variance of a random error term, in contrast to homoskedasticity. White's test is frequently used to verify a heteroskedasticity problem. Furthermore, multicollinearity, characterized by intricate correlations or high

interrelationships between explanatory variables within a linear regression model, can distort or impede accurate model estimation. Consequently, it is imperative to employ a series of econometric tests to identify and rectify such issues, ensuring the veracity and reliability of the study's results. In cases where econometric problems are detected within the sample, a robustness test becomes indispensable to validate the fairness and dependability of the study's findings.

3.2. Data Processing

This study utilizes quantitative analysis and selects secondary data from both developing and developed countries as research material. The reason for focusing on developing countries is that OFDI in these countries has grown significantly over the past decades. For example, in 1995, OFDI from developing countries accounted for only 15% of global OFDI flows. However, this figure has since risen significantly, reaching 34.6% in 2014 and rising further to 52.3% in 2020. This remarkable growth in cross-border investment activity touches a wide range of industries in developing countries and constitutes an important phenomenon that deserves further empirical analysis (Khan, 2012; Nayyar & Mukherjee, 2020). The study covers a period of ten years, from 2010 to 2019. Macroeconomic data from each country was carefully collected from authoritative organizations such as the World Bank and the United Nations Conference on Trade and Development. We rigorously screened the dataset to exclude outliers and missing data, ensuring its completeness and reliability.

3.3. Variable Description

3.3.1. Dependent Variables

In this study, the analysis of OFDI is the central topic, so the precise definition of the concept of OFDI is crucial to ensuring the reliability of the research results. We chose to use OFDI flow values as the key variable to ensure the analysis aligns with the long-term trend of the industry's structural evolution, while avoiding short-term fluctuations in the data. Further, a logarithmic transformation of OFDI values was adopted, which, according to Song (2020) helps to moderate the impact of extreme values in a given year on the analysis.

3.3.2. Independent Variables

The scale of financial development (FD) reflects the overall level of development. Financial development is, first and foremost, the deepening of monetization. The main internationally used indicator is the McIntosh indicator, which measures the degree of monetization of a country through the ratio of the money stock to GDP. It was first used by McKinnon to measure the level of financial development. The level of financial development of a country can be reflected in McIlroy's indicator. A country with a higher monetization rate indicator means a higher level of financial development. Therefore, the first basic indicator to measure financial development should be the monetization ratio. This paper employs the ratio of broad money M2 to GDP to gauge the extent of financial development (Qamruzzaman & Jianguo, 2020). Financial development structure (FDS) measures the trend of financial development and the direction of allocation of available resources. The private sector and the state sector divide the flow of financial resources into two main directions. An increase in the share of private sector credit reflects the increased marketization of the financial sector and is an indicator of the optimization of the FDS structure. Private sector credit excludes credit to the public sector, such as the government, and therefore reflects to some extent the efficiency of a country's financial system in the allocation of funds (Desbordes & Wei, 2017; Wang, 2018). We adopt a logarithmic form to eliminate the effect of market size. Financial development efficiency (FDE) measures the speed of financial development. In this paper, we consider the efficiency of financial institutions in converting deposits into loans. One of the most important functions of financial markets is to finance capital and accelerate capital flows. It also attracts savings and increases investment, so the ratio of deposits to loans can be a good measure of the allocation efficiency of funds (Dai, 2020; Jiang, 2014; Raifu, 2019; Zang, 2018). However, the shortcoming is that the indicator cannot reflect the efficiency of other ways of allocating funds in the financial market, such as through stocks and bonds. Although stock markets in developing countries are well developed, a large amount of idle capital still exists in the form of savings, and firms that want to obtain capital prefer to borrow from banks. Therefore, it is feasible to use the deposit-to-loan ratio indicator to reflect the efficiency of financial development. Because of the serious lack of data on deposit-to-loan ratios in some developing and developed countries, this paper uses the deposit-to-loan spread to measure the efficiency of financial development (Aizenman, Jinjarak, & Park, 2015; Raifu, 2019).

3.3.3. Control Variables

According to the theory of economic cycle development, a region or country's level of OFDI closely correlates with its level of economic growth. In measuring the level of economic growth (LGDP), this study uses GDP per capita as the assessment indicator, which is in line with the description of Qamruzzaman and Jianguo (2020). Labor-abundant (LAB) regions are usually endowed with large labour resources, which leads to relatively low labour costs. This advantage attracts the entry of foreign investors who wish to reduce their production expenditures. The entry of foreign capital not only takes up the market share of local firms, but

also pushes up local wages. As a result, to cut expenses and increase profitability, countries of origin may turn overseas through FDI to expand into new market spaces (Cieślik & Tran, 2019; Peng, 2021). The urbanization process, characterized by the continuous migration of rural residents to urban areas, closely correlates with the urbanization rate. This migration promotes the concentration of capital, labour and other factors of production in urban areas, attracting a large number of highly skilled people who, through their participation in economic activities, promote technological innovations adapted to the needs of local development, which in turn contributes to the level of FDI. This study selects the urban population ratio as a measurement indicator, which is consistent with the research methodology of Zhang (2021) and Song (2020).

3.4. Regression Modelling

First and foremost, my Research encompasses a diverse sample comprising both developing and developed nations. To facilitate empirical differentiation between these categories, a dummy variable has been incorporated into this Study. Specifically, designating a value of 1 to denote developing countries and 0 to signify developed countries.

$$D = \begin{cases} 1 - \text{Developing countries} \\ 0 - \text{Developed countries} \end{cases}$$

This study examines three independent variables: financial development scale, financial development structure, and financial development efficiency. As such, the analysis in this study is structured around three distinct models.

Model 1

$$OFDI_{it} = \beta_0 + \beta_1 OFDI_{it-1} + \beta_2 FD_{it} + \beta_3 LGDP_{it} + \beta_4 LAB_{it} + \beta_5 UP_{it} + \beta_6 D + \varepsilon_{it}$$

Model 2

$$OFDI_{it} = \beta_0 + \beta_1 OFDI_{it-1} + \beta_2 FDS_{it} + \beta_3 LGDP_{it} + \beta_4 LAB_{it} + \beta_5 UP_{it} + \beta_6 D + \varepsilon_{it}$$

Model 3

$$OFDI_{it} = \beta_0 + \beta_1 OFDI_{it-1} + \beta_2 FDE_{it} + \beta_3 LGDP_{it} + \beta_4 LAB_{it} + \beta_5 UP_{it} + \beta_6 D + \varepsilon_{it}$$

Where,

$OFDI_{it}$: OFDI stocks from country i in year t.
$OFDI_{it-1}$: The first-order lagged term of OFDI.
FD_{it}: The financial development scale of the country i in year t.
FDS_{it}: The financial development structure of country i in year t.
FDE_{it}: The financial development efficiency of country i in year t.
$LGDP_{it}$: The level of economic development of country i in year t.
LAB_{it}: Labour abundance in country i in year t.
UP_{it}: Urbanization percentage in country i in year t.
D: Dummy variables.
β_0: Constant term.
β_1, β_2, β_3, β_4, β_5, β_6 : Estimated coefficients.
ε_{it}: Error term for country i in year t.

4. Empirical Results and Discussion

4.1. Descriptive Analysis

Descriptive statistical analysis aims to provide a comprehensive statistical overview of the data set for all variables of interest, essentially summarizing a complex set of data through a few key indicators to facilitate the visual interpretation of changes in the data and to gain insight into the characteristics of the variables. Table 1 shows the results of the descriptive statistics for each variable. In the subset of data for developing countries, the average value of OFDI is recorded as 1.496. Furthermore, the average value of the financial development scale (FD) registers at 0.645, while the mean value of the financial development structure (FDS) is 0.521, and the mean value of financial development efficiency (FDE) equal 0.340. The level of economic development (LGDP) demonstrates an average value of 0.901, while the level of urbanization (UP) averages 0.589, and the labour force level (LAB) average 6.913. Notably, the standard deviations exhibit considerable dispersion around the mean values, signifying the elasticity of these variables in the cross-sectional dataset, indicating their capacity for variations.

In the context of developed countries, a distinct set of statistical parameters emerges. Specifically, the mean value of OFDI stands at 4.260. Additionally, the financial development scale (FD) records an average value of 1.079, while the financial development structure (FDS) exhibits an average value of 1.287, and the financial development efficiency (FDE) maintains a mean value of 0.415. Furthermore, the level of economic development (LGDP) presents an average value of 4.623, whereas the level of urbanization (UP) attains an average of 0.841, and the labour force level (LAB) achieves an average of 7.461. Notably, the scale of financial

development (FD), the structure of financial development (FDS), and the efficiency of financial development (FDE) all manifest notably higher values in developed countries in comparison to their counterparts in developing nations. This observation may be attributed to the intrinsic discrepancy in the level of financial development between developed and developing countries.

Table 1. Descriptive statistics.

	Developing countries		Developed countries		Total sample	
	Mean	Sd	Mean	Sd	Mean	Sd
Office	1.496	2.961	4.260	4.326	1.971	3.397
FD	0.645	0.411	1.079	0.457	0.721	0.450
FDS	0.521	0.327	1.287	0.317	0.653	0.435
FDE	0.340	0.113	0.415	0.141	0.353	0.121
LGDP	0.901	1.170	4.623	0.907	1.541	1.802
UP	0.589	0.215	0.841	0.043	0.633	0.218
LAB	6.913	1.607	7.461	1.268	7.007	1.567

4.2. Diagnostic Checking

Table 2 presents the results of the comprehensive diagnostic evaluation, covering the autocorrelation test, the heteroscedasticity test, and the multivariate covariance test. We implemented the basic assumptions of the Wooldridge test to identify potential autocorrelation problems, and the results show that autocorrelation problems affect all models. Similarly, the basic assumptions of White's test were applied to explore the heteroskedasticity problem, and it was found that all models exhibited heteroskedasticity. Furthermore, the variance inflation factor (VIF) analysis showed that most VIF values fell below the threshold of 5. Thus, this analysis reveals that no significant multivariate covariance problem was found in the studied dataset.

Table 2. Diagnostic checking report.

Model	Wooldridge test	White test	VIF
Model 1	22.614 (0.0000)***	89.45 (0.0000)***	1.22 - 2.14
Model 2	26.880 (0.0000)***	92.68 (0.0000)***	1.57 - 2.23
Model 3	23.784 (0.0000)***	98.15 (0.0000)***	1.06 - 2.08

Note: The wooldridge test is used to test the existence of an autocorrelation problem. The white test is used to identify the existence of a heteroskedasticity problem, and VIF is a diagnostic of collinearity.
***Significant at 0.01 confidence level.

4.3. Result

The results of using different econometric methods are shown in Tables 3 through 6. These include aggregated ordinary least square (OLS), fixed effects random effects model, and systematic generalized method of moments (GMM) estimations. Specifically, Table 3 details outcomes from the OLS method, revealing that the size (FD), structure (FDS), and efficiency (FDE) of financial development significantly and positively influence OFDI. Across all models, the economic growth level (LGDP), urbanization (UP), and labor abundance (LAB), are found to have significant positive impacts on OFDI.

Table 3. Regression results using the pooled OLS estimation.

Variables	Model 1	Model 2	Model 3
FD	0.850*** (5.21)		
FDS		1.456*** (5.55)	
FDE			2.663*** (3.28)
LGDP	0.519*** (5.26)	0.457*** (4.76)	0.528*** (5.42)
UP	4.757*** (8.38)	4.700*** (8.27)	5.012*** (8.43)
LAB	1.090*** (18.27)	1.060*** (18.32)	1.127*** (18.56)
Countriesdum	1.329*** (3.00)	1.815*** (3.75)	1.279*** (2.84)
Constants	-11.189*** (-14.09)	-11.584*** (-13.93)	-11.909*** (-14.27)
R-squared	0.4231	0.4304	0.4214

Note: ***Significant at 0.01 confidence level.

Table 4 presents the analysis results obtained using the fixed effects model. The results indicate that the size (FD), structure (FDS), and efficiency (FDE) of financial development have a positive and statistically significant effect on OFDI at the 1% significance level. However, it is important to highlight that the level of economic growth (LGDP), the level of urbanization (UP), and the size of the labour force (LAB) show negative effects, which contrasts with existing research findings. Numerous previous studies have concluded that these factors have a positive effect on OFDI (Sun & Liu, 2020; Tian, Song, & Yang, 2021; Wang, 2022).

Table 4. Regression results using the fixed effect estimation.

Variables	Model 1	Model 2	Model 3
FD	3.474***		
	(6.01)		
FDS		3.203***	
		(3.99)	
FDE			2.939***
			(3.33)
LGDP	-0.436	-0.481	-0.630
	(-1.23)	(-1.36)	(-1.72)
UP	-17.313**	-16.321**	-19.506**
	(-2.59)	(-2.53)	(-2.39)
LAB	-1.814**	-2.340***	-0.217
	(-2.62)	(-3.99)	(-0.27)
Constants	23.803***	27.343***	15.767**
	(4.03)	(4.91)	(2.88)
R-squared	0.029	0.033	0.029

Note: ***Significant at 0.01 confidence level, **Significant at 0.05 confidence level.

Table 5 presents the results of the random effects model analysis. These findings further support the initial observations in Table 3, particularly about the key role of different aspects of financial development-including size (FD), structure (FDS), and efficiency (FDE)-in contributing to the growth of OFDI's role. In addition, the study confirms that the level of economic growth (LGDP), the urbanization process (UP), and the wide availability of labour (LAB) have a significantly positive and statistically significant contribution to OFDI. Nonetheless, the country-level dummy variables exhibit insignificant effects. It is worth mentioning that the Hausman test indicates that a fixed effects model may be more appropriate than a random effects model for this analysis.

Table 5. Regression results using the random effect estimation.

Variables	Model 1	Model 2	Model 3
FD	0.992**		
	(2.26)		
FDS		1.626***	
		(3.08)	
FDE			2.691**
			(2.58)
LGDP	0.387**	0.340*	0.380**
	(2.10)	(1.89)	(2.05)
UP	4.610***	4.501***	4.977***
	(4.02)	(4.03)	(4.45)
LAB	1.027***	0.996***	1.071***
	(8.32)	(8.14)	(8.71)
Countriesdum	0.827	1.423*	0.690
	(1.04)	(1.72)	(0.87)
Constants	-10.141***	-10.621***	-10.788***
	(-6.73)	(-7.11)	(-6.90)
R-squared	0.4212	0.4289	0.4197

Note: ***Significant at 0.01 confidence level, **Significant at 0.05 confidence level, *Significant at 0.1 confidence level.

As delineated earlier, the three preceding estimation methods do not account for the potential endogeneity inherent in the regression variables. Therefore, one should exercise caution when interpreting these findings. To address this endogeneity concern, the study resorts to the system GMM approach. The results of the system GMM estimation are presented in Table 6. The system GMM estimation necessitates an initial validation of instrumental variables and the rationale of the estimation method. Usually, it is necessary to fulfil

two main conditions: first, the random error terms should not exhibit autocorrelation, which is usually verified by a p-value greater than 0.05 for the Arellano-Bond AR(2) test, implying that there is no second-order serial autocorrelation between the error terms; and, second, the instrumental variables need to be exogenous, which can be confirmed by a p-value greater than 0.05 for the Hansen test, which ensures the applicability of the selected instrumental variables. The Arellano and Bond (1991) tests were adopted in this study. The Arellano-Bond test meticulously examines whether the difference model residuals exhibit serial correlation. The systematic GMM model allowed for the presence of first-order autocorrelation between terms but not second-order autocorrelation. The Hansen test assessed the possibility of instrumental variables being over-identified, confirming their applicability. Table 6 presents the results of the three models. Significantly, models (1), (2), and (3) pass the Hansen test, validating their applicability. Meanwhile, the first-order autocorrelation is significant, while the second-order autocorrelation is not detected. Lagged first-order FDI showed significance at a 1% significance level, pointing to a significant positive effect of earlier FDI on the current level. This implies that a favourable investment climate in the past enhances the willingness to invest in the future, thus contributing to the growth of FDI in the present. Both size (FD) and structure (FDS) of financial development pass the test at a 1% significance level while efficiency of financial development (FDE) passes the test at a 5% significance level highlighting their significant positive effect on OFDI. The enhancement of financial development opens up a wider range of financing channels for firms, reduces the cost of financing, and reduces the risk of information asymmetry, which in turn incentivizes firms' OFDI behaviour (Li, 2021). The significant country-level dummy variable, which shows a significant difference in OFDI patterns between developed and developing countries, is particularly noteworthy.

Table 6. Regression results using the system GMM estimation.

Variables	Dependent variable : OFDI		
	GMM		
	Model 1	**Model 2**	**Model 3**
$OFDI_{it-1}$	0.399***	0.392***	0.402***
	(5.02)	(4.91)	(5.10)
FD	0.528***		
	(2.76)		
FDS		0.957***	
		(3.23)	
FDE			1.805**
			(2.11)
LGDP	0.299***	0.264***	0.306***
	(2.75)	(2.65)	(3.06)
UP	2.946***	2.924***	3.071***
	(4.12)	(4.20)	(4.10)
LAB	0.654***	0.642***	0.674***
	(6.55)	(6.55)	(6.42)
Countriesdum	0.833*	1.172**	0.816*
	(1.73)	(2.11)	(1.87)
Constants	-6.800***	-7.152***	-7.276***
	(-6.23)	(-6.25)	(-6.50)
Hansen test	0.339	0.222	0.412
	(57.75)	(61.62)	(55.67)
AR (1)	0.000***	0.000***	0.000***
	(-4.52)	(-.4.50)	(-4.51)
AR (2)	0.776	0.792	0.819
	(0.28)	(0.26)	(0.23)

Note: ***Significant at 0.01 confidence level, **Significant at 0.05 confidence level, *Significant at 0.1 confidence level.

In summary, our research outcomes affirm the constructive influence of financial development on OFDI. This affirmation is robustly supported by the amalgamated findings from the pool OLS, random effects, fixed effects, and system GMM estimations. It is noteworthy that while the combined OLS, Random effects, and fixed effects estimations may overlook the endogeneity concern, their congruence with the results derived from the system GMM methodology lends additional credence to this conclusion, in line with the work of Muhammad et al. (2015).

There are big differences in OFDI between developed and developing countries, as shown by the importance of country-specific variables in systematic generalized moment estimation (GMM) analysis. To delve deeper into the differences in OFDI between these two groups of countries, this study utilizes an independent two-sample t-test to compare whether there is a significant difference in the mean values of OFDI

between the two groups of countries. The results of the independent two-sample t-test are presented in Table 7, where the p-value of 0.000 indicates that the null hypothesis that the OFDI means of the two groups are equal is strongly rejected, confirming the significant difference between developing and developed countries in terms of OFDI. Further, this study differentiated the sample by developing and developed countries and analyzed each group of data separately. Table 8 shows the results of GMM analysis for developing and developed countries separately.

Table 7. Two-sample t-test results for OFDI in developing and developed countries.

Group	Obs.	Mean	Std. err
0	110	4.260	0.412
1	530	1.496	0.129
Combined	640	1.971	0.134
Diff		2.763	0.339
t=8.1529 P=0.0000			

Table 8. The summary of GMM estimation on the impact of impact of financial development on OFDI from 2010 to 2019 for developing and developed countries.

	Dependent variable： OFDI					
	Developing countries			Developed countries		
Variables	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
$OFDI_{it-1}$	0.311* (1.71)	0.307* (1.78)	0.290* (1.65)	0.265** (2.28)	0.254** (2.01)	0.222* (1.84)
FD	0.900** (2.41)			-0.843 (-0.55)		
FDS		1.341*** (3.51)			-1.148 (-1.00)	
FDE			2.534 (1.44)			7.493*** (4.51)
LGDP	1.591 (1.38)	1.364** (1.98)	2.028 (1.59)	-0.535 (-1.28)	-0.325 (-1.22)	-0.267 (-1.01)
UP	-0.543 (-0.22)	-0.007 (-0.01)	-1.516 (-0.55)	9.268 (0.60)	4.900 (0.86)	12.350* (1.94)
LAB	0.854*** (2.90)	0.812*** (3.67)	0.950*** (3.11)	1.250** (2.59)	1.205*** (2.61)	1.154*** (3.38)
Constants	-6.567*** (-3.68)	-6.495*** (-4.39)	-7.299*** (-3.91)	-10.727 (-0.82)	-7.033 (-1.15)	-17.624*** (-2.78)
Hansen test	0.697 (15.39)	0.594 (35.32)	0.339 (17.74)	0.609 (3.60)	0.445 (4.77)	0.259 (6.51)
AR(1)	0.000*** (-4.19)	0.002*** (-3.09)	0.000*** (-3.67)	0.008*** (-2.64)	0.011** (-2.55)	0.011** (-2.56)
AR(2)	0.105 (1.62)	0.170 (1.37)	0.266 (1.11)	0.578 (-0.56)	0.558 (-0.59)	0.482 (-0.70)

Note: Significant at the 0.1 (*), 0.05 (**), and 0.01 (***) levels, the t-values are in parentheses.

For both developing and developed countries, the lagged first order of OFDI is significant and positive. This suggests that the OFDI situation in the previous period contributes to OFDI in the current period. In both developing and developed countries, OFDI is a continuous and dynamic process.

In the case of developing countries, both the size and structure of the financial system show a significant positive effect on OFDI, while financial efficiency, although it has a positive effect on OFDI, does not reach the level of significance. In developed countries, the size and structure of the financial system tend to harm OFDI, but its significance is insufficient. In contrast, in developed countries, financial efficiency has a significant positive impact on OFDI. The financial system in developing countries is in its early stages of development, and its size continues to grow, which expands a wider range of financing options for firms and reduces the cost of capital (Travkina, Fiapshev, Belova, & Dubova, 2023). In contrast, in developed countries, the financial system has matured and its size has largely stabilized, making it difficult for further expansion to bring significant gains. This study chooses the ratio of private credit as a measure of financial structure development, taking into account the unique circumstances of developing countries. The stock and debt markets in these countries are still undergoing gradual improvement and face a series of challenges. The funds needed by enterprises for OFDI are still provided by bank credit, so the optimization of the financial development structure will have a significant impact on developing countries. Developed countries' stock and

bond markets are more perfect, and enterprises' financing is more inclined to stock and bond markets (Kumar, 2022), so the role of bank credit in OFDI is not significant.

The improvement of financial efficiency focuses on the effective allocation of financial resources and the proper utilization of idle capital. However, in developing countries, the financial system is still in its formative stage, its size continues to expand, and its financial structure has not yet reached an ideal state, which hinders the efficient allocation of financial resources (Appiah-Otoo, Chen, & Ampah, 2023). Therefore, in these countries, the primary focus of financial development in OFDI is on enhancing its scale and structure. In developed countries, the scale expansion and structural optimization of the financial system have relatively limited promotional effects on OFDI. However, such improvements in scale and structure have contributed to the increased efficiency, specialization, and transparency of the financial system, which is mainly reflected in enhanced financial efficiency. Thus, improved financial efficiency will help to promote increased OFDI.

5. Conclusion and Policy Recommendations

This study constructs a comprehensive dataset of 64 countries, including 53 countries defined as developing countries and 11 countries identified as developed countries. Covering the ten years from 2010 to 2019, the study explores the role of financial development on OFDI through the use of dynamic panel modelling. The empirical analysis consistently shows that several aspects of financial development, including its size, structure, and efficiency, exhibit a statistically significant positive effect in promoting OFDI, in line with the study's initial preconceived hypothesis. In the analysis of control variables, factors such as economic growth, labour resources, and urbanization process exhibit positive effects on OFDI. This study successfully distinguishes between developing and developed countries by using dummy variables that are specific to each country. The statistical significance of these categorical variables makes the differences in OFDI patterns between the two groups of countries even clearer. This study analyzes developing and developed countries separately in detail and finds that in developing countries, the scale and structure of financial development have a clear positive impact on OFDI, while in developed countries, the efficiency of financial development shows a significant positive contribution to OFDI.

Although this study can provide evidence for developing countries and compare them with developed countries, it also faces several limitations and restrictions. The outbreak of COVID-19 in 2020 caused a massive change in the world economy. The original purpose of this study was to create dummy variables to distinguish COVID-19 and compare the trends of OFDI before and after COVID-19. However, since certain information, such as the stock of OFDI in 2021 and the export value in 2021, is not yet revealed in the current database, especially for some developing countries, the missing data are more serious. The study timeline is too short to include the post COVID-19 impact. This paper suggests that subsequent studies incorporate the effects of COVID-19.

The study focuses on the country's investment-trade relationship at the macro level. It cannot analyze it at the microlevel of TNCs, which may affect the overall understanding of the investment-trade relationship. We can divide financial development into two aspects: financial institution development and financial market development. Simultaneously, many developing countries have too many missing indicators at the financial market level, and there is no way to verify whether the missing data is due to the non-existence of stock and bond markets in the country. The sample size will be severely compressed if the study uses financial market indicators for empirical analysis. As a result, the empirical analysis in this paper does not include financial development indicators at the financial market level. This paper suggests that subsequent research could examine the impact of financial development on firms' OFDI from a microperspective.

This paper has four recommendations. First, the implementation of different financial development strategies based on the differences in national financial development, the governments of each country, depending on the actual situation of their development, to formulate financial development strategies suitable for their own countries. Grasp the low level of financial development of the region, focus on promoting the financial development of the low level of financial development of the city to promote the overall level of financial development of the whole country to improve, and better solve the problem of unbalanced development. Developing countries, in particular, should not blindly follow the developed countries, but should adapt to their development situation and formulate reasonable financial development policies.

Furthermore, the increase in financial development's scale is poised to foster the advancement of OFDI. However, it's essential to acknowledge that the scale of financial development in developing countries presently stands at a moderate level. Therefore, there exists a compelling necessity to persist in expanding the ambit of financial development. This endeavour could encompass initiatives to incentivize residents to channel their idle funds into savings and amplify the capacity of financial institutions, including banks, to accumulate savings. We envision such measures to enhance the liquidity of the financial market and optimize its role as a conduit for financing. Concurrently, it becomes imperative to elevate support for market enterprises, stimulating both corporate entities and residents to explore opportunities for securing loans. A persistent strategy of expanding tax incentives and reducing fees should be pursued to alleviate the fiscal burdens on enterprises. The continued implementation of a prudent monetary policy, marked by judicious reductions in interest rates, would serve to augment the accessibility of loans for enterprises. Furthermore, we should extend robust backing to meet the financial needs of enterprises engaged in R&D. Encouraging enterprises to

embark on R&D initiatives via loan mechanisms could, in turn, catalyze technological advancements, bolster profitability, and act as a motivating catalyst for OFDI.

Thirdly, the direct financing market in developing countries is still imperfectly developed, and there is still a substantial difference between the direct financing market and that of developed countries. To improve the structure of the financial market, it is necessary not only to improve the indirect financing market, but also to better develop the direct financing market. We should formulate corresponding policies to promote the benign development of the direct financing market, establish a sound system for listing enterprise financing, and allow more enterprises to raise funds in the stock and bond markets. The expansion of the bond market, the reform of the stock market, and the improvement of equity trading can be adopted to promote the development of the direct financing market and provide enterprises with more and more flexible direct financing channels.

Furthermore, heightened efficiency within the sphere of financial development stands as a potent catalyst for the advancement of OFDI. Regrettably, the contemporary landscape of financial efficiency in developing countries remains characterized by notable deficiencies and instability. The enhancement of financial development efficiency holds the promise of further reducing the operational costs of financial markets, thereby fostering a symbiotic relationship between banks, other financial institutions, and enterprises. This pursuit of augmented financial development efficiency holds profound implications for the deepening of market-oriented financial reforms, fortifying the financial system, refining resource allocation efficiency, directing capital flow towards the real economy, and ensuring the provision of substantial credit support and financing mechanisms for enterprises engaged in OFDI endeavours. Consequently, it becomes imperative to proactively facilitate the enhancement of financial development efficiency. Encouraging the transformation of funds from deposits into loans assumes paramount significance in this endeavour. Such an approach maximizes the judicious use of dormant funds within society, thereby invigorating market dynamics and increasing enterprise vitality to its fullest extent.

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