The nexus between outward foreign direct investment and exports: evidence from developing countries[1]

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Abstract

This research analyses how outward foreign direct investment (OFDI) by emerging nations affects the investing countries' exports, examining the diversity in this relationship by categorizing developing nations by income (low-income, lower-middle-income and upper-middle-income) and by region (Africa, Asia and the Pacific and Latin America and the Caribbean). The research uses fixed and random effects on unbalanced data from 64 developing nations between 1990 and 2019. The results show that export performance in developing countries is significantly enhanced by OFDI. There is a supplementary impact of OFDI on exports from the middle-income and upper-middle-income classes of emerging nations. Results at the regional level show that this additional impact is greater in Asia and the Pacific than in other developing regions. In Latin America and the Caribbean, conversely, OFDI substitutes for domestic exports, and the region's contribution to total global OFDI is smaller and more variable than that of other regions.

Keywords

Foreign direct investment, investments, exports, emerging markets, developing countries, economic development, macroeconomics, econometric models, Latin America

JEL classification

F41, E24, F21, D22

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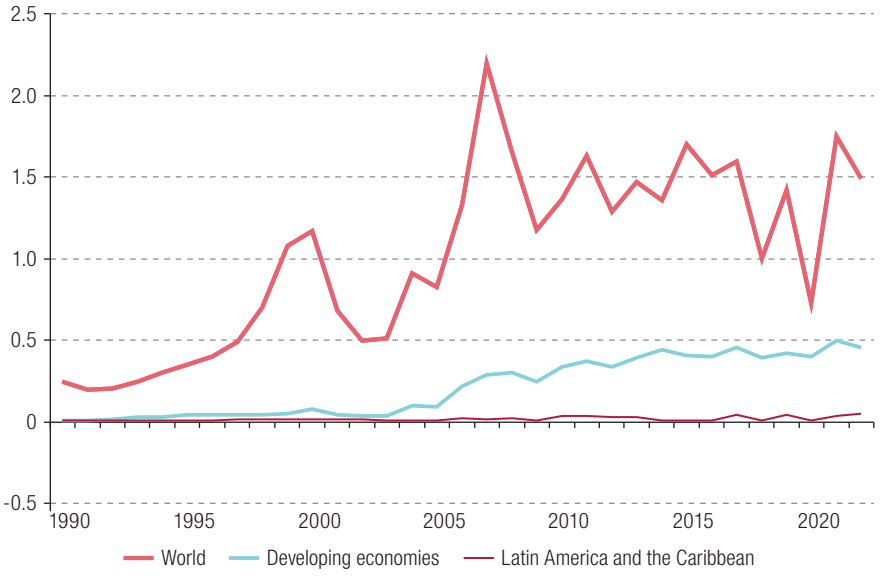
I. Introduction

Foreign direct investment (FDI) refers to investment coming into a country from outside, whereas FDI by the country abroad is called outward foreign direct investment (OFDI). Foreign investment has consequences for both the home and host nations. Historically, rich nations have been portrayed as the exclusive sources of FDI, particularly for emerging markets. This implies that the domestic economies of industrialized nations are also affected by direct investment in developing countries. The impact of OFDI on the home nation is now seen as a more crucial phenomenon than formerly. In 1995, OFDI remained associated with the developed countries of the world, with developing countries only supplying 4% of the total, but developing nations subsequently invested more abroad, accounting for 27% of total world OFDI in 2014 (UNCTAD, 2015). The 2023 figures for FDI show a boom for developing countries, and for the Latin American and Caribbean region specifically, with increases to 51% and 4% of the global total, respectively, in the wake of the economic stresses caused by coronavirus disease (COVID-19) there as in other regions around the globe (UNCTAD, 2023).

Figure 1 shows the volume of OFDI from developing countries and from Latin America and the Caribbean specifically. OFDI has a variety of effects on emerging nations' domestic economies. First, when the effect of capital outflows on the local job market is considered, it is clear that locating part of the production structure abroad means fewer jobs at home (Crescenzi, Ganau and Storper, 2022). However, Slaughter (2000) argues that domestic employment benefits from OFDI owing to supervisory obligations stemming from foreign investment. OFDI also affects productivity. To reduce costs and boost output, businesses throughout the world are increasingly pooling resources from many nations (Desai, Foley and Hines, 2005). Lastly, OFDI has an impact on the home nation's technology. When a nation begins investing abroad, it often learns new technologies that it then introduces at home (Liu and others, 2016). While OFDI has a variety of consequences for domestic performance, the impact on exports is particularly noteworthy, given the centrality of exports to emerging countries.

Figure 1
World, developing economies and Latin America and the Caribbean: outward foreign direct investment, 1990–2020
(Billions of dollars)



Source: United Nations Conference on Trade and Development (UNCTAD), *World Investment Report 2022, International Tax Reforms and Sustainable Investment*, Geneva, 2022.

How OFDI affects exports from the home nation varies greatly from country to country, depending on factors that include the nature of the local economy and the underlying motivations of investing companies. For instance, the impact of a capital outflow will be different in nations with plentiful natural resources and those with scarce ones. The effects of OFDI entailing the relocation of manufacturing to other countries are extremely contextual. Previous research identifies three primary motivations for OFDI: exploring new markets, improving operational efficiency and acquiring strategic assets (Dunning, 1993).

When motivated by a desire to maximize output per unit of input costs, home country companies outsource manufacturing to countries with lower production costs as a supplement to trade. OFDI increases domestic investment by boosting the export of capital and intermediate products from the home nation to the foreign country (Hejazi and Pauly, 2003). There is no initial impact on domestic output.

Market-seeking OFDI, meanwhile, is designed to serve the host country's home market and nearby markets. Such investments are intended to improve access to foreign markets and thence boost sales of goods and services in these markets. When OFDI replaces exports from the home economy or when a local company relocates its manufacturing facilities to another country, the result is less investment in the home country. While OFDI may reduce the volume of exports of finished products, it can increase the volume of exports of intermediate items by the parent company in the home nation to the firm's subsidiaries abroad. The overall effect is unclear.

The third motivation, the acquisition of strategic assets, reflects a need to acquire resources and assets that are not readily accessible in the home market but are crucial to the success of the company's long-term plans. Access to cutting-edge information and tools may help domestic businesses increase output and branch out into uncharted territory, which might have a favourable effect on investment levels.

Although a number of studies have looked at how OFDI affects exports for both individual companies and whole industries, most of them have concentrated on more industrialized nations rather than developing ones. Furthermore, the overall effect of OFDI on home nation export performance is not conclusively shown by the available information. Depending on the type of relationship between OFDI and domestic exports, the empirical literature suggests that OFDI may be either complementary (Head and Ries, 2001; Mullen and Williams, 2011; Padilla Pérez and Gomes Nogueira, 2016; Ahmad, Draz and Yang, 2016) or substitutional (Bojnec and Fertő, 2014; Bhasin and Paul, 2016). Most of these studies only include industrialized nations or very specific categories of nations. When it comes to emerging nations, there is a dearth of data in the empirical literature. Even if developing nations' proportion of global OFDI is growing, they still rely heavily on exports to bring in cash. To fill this knowledge vacuum, then, the present study looks at how OFDI affects exports from developing countries. An unbalanced sample of 64 developing nations covering the period from 1990 to 2019 was taken and divided into three categories based on income: low-income (20 countries), lower-middle-income (30 countries) and upper-middle-income (14 countries). We have also examined the link in nations spanning three continents (Africa, Asia and the Pacific and Latin America and the Caribbean).

The study results will make it easier to understand the behaviour of OFDI and its influence on the domestic exports of developing nations, which will be of use to policy reviewers, academics and contributors to the empirical literature. The developing nations most affected by international investment will also be highlighted in this study. Policymakers in developing nations will be equipped to make better judgements about investment prospects abroad, and accessible capital structures will be identified so that valuable investment flows may be attracted. As a result of this study, it will be clearer which locations and income brackets might benefit from exploring OFDI as a means of increasing exports.

There are five distinct parts to this analysis. A comprehensive literature review will be found in section II. The OFDI profile of developing countries is discussed in section III. Section IV sets out the econometric data and methodology. Section V includes the discussions and empirical results. Section VI offers some policy suggestions and concludes.

II. Literature review

Opponents of OFDI argue that it is harmful to local economies because it sends employment and productive capital abroad. The evidence, however, reveals that OFDI has both positive and negative impacts on domestic economies. For several decades, the effects of OFDI on exports have been the subject of a large body of theoretical and empirical research. The complementary impacts of OFDI on exports are distinguished from substitution-type effects in the theoretical literature. Both Mundell (1957) and Buckley and Casson (1981) postulated scenarios in which OFDI served as a replacement for exports from the home nation. Because these models place a high premium on exports of finished commodities, they assume that foreign investment can stand in for exports. When intermediate items are included in these models, the outcomes vary. The new trade theory views OFDI and exports as supplementary rather than competing. Svensson (1996) claims that growth in both OFDI and exports of intermediate products occur simultaneously. Vertical FDI, according to the latest theories, should create complementary trade flows of final goods from foreign affiliates to the parent business and of intermediate products within the firm, in headquarters operations for example, as replacements for exports from the home country to the partner countries.

The effects of FDI on a country's exports have been studied empirically at the company, sector and country levels, with various schools of thought emerging. One consequence that is clear from the data is that OFDI can help domestic exporters. Different studies have shown either that OFDI has no impact or that it increases exports from the home nation. Kim and Rang (1997) used cross-sectional data to analyse the connection between OFDI and exports from Japan and the Republic of Korea, finding in both cases that exports were unaffected by OFDI. Similar conclusions were reached by Cantwell and Narula (2001), who found no correlation between OFDI and domestic exports from Malaysia in their research. However, inward foreign direct investment (IFDI) was found to have a great impact on trade. Head and Ries (2001) used panel data on around 932 Japanese production companies over 25 years to analyse the influence of direct investment into different nations on product exports. OFDI and domestic exports were found to be complementary across the whole sample of businesses.

Lim and Moon (2001) analysed data collected from Korean enterprises to investigate the link between Korean OFDI and exports. They used ordinary least squares (OLS) estimates to explore the positive correlation between OFDI and exports from the home nation. Canadian and United States foreign investment and exports, in particular to China and India, were studied by Ghosh and Wang (2011) using cross-country time series data from 1989 to 2001. Increased investment in another nation was cited as a cause of growth in exports to it. Research by Bojnec and Fertő (2014) showed that OFDI had a substitution impact on exports from the home nation. They used the gravity model to study the OFDI and bilateral exports of European member countries of the Organisation for Economic Co-operation and Development (OECD) at the country level and conducted a panel study covering the years 2004–2008 using four distinct econometric methods. According to their findings, OFDI dampens growth in bilateral merchandise exports.

Similarly, Bhasin and Paul (2016) looked at 11 Asia-Pacific nations from 1991 to 2012 to see how OFDI affected domestic exports. Exports and OFDI were shown to be substitutes by means of a panel cointegration and causality test. However, Liu and others (2016) found home nation exports to be heavily reliant on the growth of OFDI. They reached this conclusion by analysing subsets of data from the two primary export and OFDI data sets, using a group of exports from the United States, the OECD nations and China. Their analysis of these two-panel data sets led them to the conclusion that exports rose most rapidly in the early phases of OFDI, with export growth lagging behind OFDI growth as OFDI developed into its mature stage. Ahmed, Draz and Yang (2016), for their part, used

data from 1981 to 2013 for four Association of Southeast Asian Nations (ASEAN) countries to examine the effects of OFDI on those countries' exports, employing an OLS regression model. They determined that in the ASEAN area, the impacts of OFDI on home country exports were mostly of the complementary kind. The effects of OFDI on Costa Rica's domestic economy were studied by Padilla Pérez and Gomes Nogueira (2016), who looked at the specific circumstances of Costa Rican companies with outside operations and identified a favourable correlation notwithstanding the very small size of the country.

Microdata from 552 Chinese manufacturing firms that had invested abroad for various reasons allowed Jia and others (2019) to analyse the impact of OFDI on domestic employment. They applied the difference-in-differences technique to compare two groups of indicators: absolute employment levels and relative employment levels. Overall, they found that OFDI boosted employment whatever its destination. Kapoor and Arora (2022), after disaggregating their data at the country, industry, company and product levels, found that the correlation between OFDI and exports varied. Analyses at the national and business sector levels identified complementary correlations, whereas product-level analyses lent credence to the conventional wisdom.

Overall, the aforementioned research demonstrates three distinct impacts of OFDI on home nation exports. The results of this research are contradictory, with evidence in the literature that OFDI may either boost or reduce domestic exports. The majority of studies cover just one country or a limited number of developing and industrialized nations. Since the proportion of OFDI originating from developing countries has been growing over time, it is crucial to examine OFDI and exports for a large sample of these. Examining whether the correlation between the OFDI and the exports of developing nations changes with a region's development level is equally crucial.

III. Developing countries and outward foreign direct investment

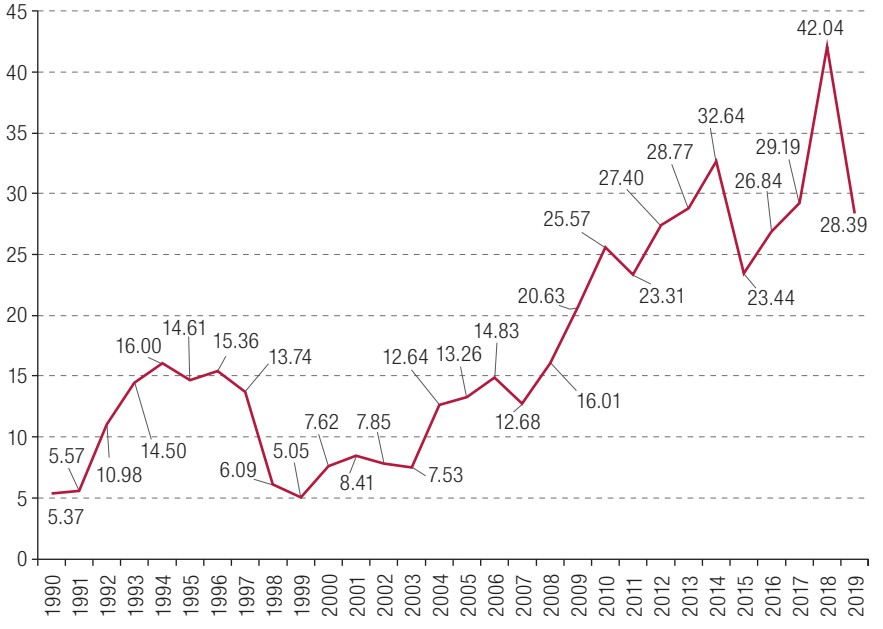
More and more underdeveloped nations are engaging in OFDI, which contributes to the acceleration of globalization. A global total of US$ 1.45 trillion was invested abroad in 2016. In 2017, FDI came in at a record amount of about US$ 1.6 trillion. Revenues from foreign investments were directly affected by the rise in commodity prices. After the Second World War, the industrialized nations of the globe were the main sources of OFDI. The effects of OFDI on the home nations also began to be discussed. Since the 1980s, however, a number of emerging nations have been making significant foreign investments. The uptick in OFDI from such countries meant there was a need for deeper knowledge of the domestic variables behind it. Factors driving investment from developing nations, according to the literature, include the host country's macroeconomic stability, political stability, openness and level of investment in research and technology.

Das (2013) argues that domestic corruption, low per capita incomes and slow economic development are major factors in encouraging OFDI from small developing nations. Natural resources, the accessibility of major markets and the size of the host country's market are other drivers of developing country OFDI (Buckley and others, 2007; Kolstad and Wiig, 2012). According to the *World Investment Report 1995* (UNCTAD, 1995), the percentage of global investment coming from emerging nations more than doubled between 1980–1984 and 1990–1994, from 5% to 10%. In 1995, developing nations were responsible for 15% of all OFDI. Such investment boosts a country's economy because it stimulates the competitiveness of local companies and has other positive effects. However, capital

outflows may also have negative consequences for economies, and although this is recognized, few developing nations have implemented aggressive policies to deal with OFDI. Many of the drivers of greater OFDI from developing nations were summed up in the *World Investment Report 2006* (UNCTAD, 2006). They include a rise in the home country's production costs, improved market and trading conditions and a shift in macroeconomic policy. By 2014, developing nations had increased their foreign investment by 23% to a total of US$ 468 billion, as detailed in the *World Investment Report 2014* (UNCTAD, 2014). The FDI share of this investment rose to 32% in 2014, up from 13% in 2007.

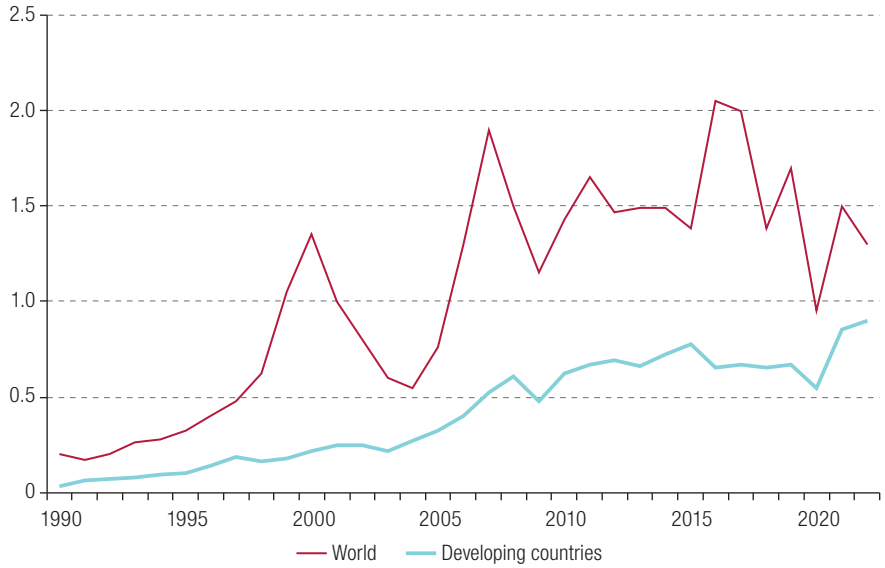
The share of global OFDI from developing countries has been on the rise. Figures 2 and 3 show that they have come to account for a significant portion of overall FDI outflows around the globe, alongside wealthy nations. Greenfield investments have enabled them to increase their share of global output (UNCTAD, 2014). As shown in figure 2, developing nations' proportion of global OFDI has risen steadily from 5.37% in 1990 to 25.57% in 2010 and a record 42% in 2018. However, the percentage of OFDI originating from the low-income category of emerging nations has been lower, owing to severe political and economic upheavals in those countries. Transnational corporations are common in many lower-middle-income and upper-middle-income countries, which are major sources of FDI in many other countries. Owing to massive greenfield projects in areas like steel, electronics and petrochemicals, FDI flows into the manufacturing sector have been on the rise of late (UNCTAD, 2015). Nations in the lower-middle-income and upper-middle-income brackets are increasingly looking to low-cost Asia-Pacific nations as bases for their industrial activity and providing large amounts of FDI.

Figure 2
Share of total world foreign direct investment originating in developing countries, 1990–2019
(Percentages)



Source: United Nations Conference on Trade and Development (UNCTAD), "Investment statistics and trends" [online] www.unctad.org/fdistatistics.

Figure 3
Foreign direct investment originating in developing countries, 1990–2020
(Billions of dollars)



Source: United Nations Conference on Trade and Development (UNCTAD), "Investment statistics and trends" [online] www.unctad.org/fdistatistics.

Table 1 shows the changing pattern of FDI originating in developing nations and regions over time. OFDI has risen most dramatically in Asia and the Pacific. In 2005, the outflow of FDI from the region was a then record US$ 79 billion (see table 1). While services were a primary focus of Asia-Pacific OFDI, a larger proportion of the region's capital outflows went to investments in natural resources and industry. The rapid expansion of the global economy, surging oil consumption and a promising investment climate were the driving forces behind this trend. Although there were fewer worries about geopolitical instability in certain parts of Asia and the Pacific in 2006 than formerly, the trend of increasing OFDI from the region continued. All the major economies and subregions in Asia and the Pacific saw growth. Outflows from the region were mostly driven by China. With the rise of Asia-Pacific transnational corporations, FDI soared to US$ 253 billion in 2007, marking a new high for developing countries. African nations likewise, by expanding their operations both inside and outside the region, increased OFDI to US$ 6 billion in the same year, with South Africa, Egypt, Morocco, Angola and Libya as the leading five countries, with investments in the extraction of raw materials and the expansion of service industries. South Africa played the leading role among these countries.

Brazil and Mexico, the two largest economies in Latin America and the Caribbean, continued to compete with each other for control of gas and oil, steel, mining, cement, food and beverages and other industries that attracted investment from Latin America and the Caribbean. However, a drop in Brazilian outflows led to a reduction in FDI from the region to US$ 52 billion in 2007. According to King Mantilla (2022), research has shown that the net effect of FDI on the balance of payments is influenced by intra-company loans, which are a major driver of FDI proceeds in those economies. Several nations in the region have launched an array of initiatives to foster FDI. The Brazilian State oil corporation, Petrobras, for instance, has expanded its operations to the African continent and the ominican Republic. Extractive sectors were initially the focus of these programmes, but they have now expanded into key areas including agriculture and transportation.

Table 1
Selected regions and economies: outward foreign direct investment
(Billions of dollars)

OFDI	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
World	881	1 323	1 997	1 929	1 101	1 451.4	1 694.4	1 284	1 306	1 354	1 594	1 452	1 601	986	1 314
Developed countries	749	1 087	1 692	1 572	821	989.6	1 237.5	873	834	823	1 173	1 044	1 095	534	917
Developing countries	118	212	253	296	229	400.1	383.8	357	381	468	389	383	467	415	373
Africa	2	8	6	10	5	7	3.5	12	16	13	18	18	12	8	5
Asia and the Pacific	79	141	195	204	210.9	273	280.5	299	335	432	339	363	417	407	328
Latin America and the Caribbean	36	63	52	82	47	119.9	99.7	44	28	23	31	1	38	0.1	42

Source: United Nations Conference on Trade and Development (INCTAD), *World Investment Report*, several issues.

Developed countries' OFDI slowed in 2008. After flows peaked in 2007, the financial crisis and subsequent economic slump in many developed nations impaired and ultimately checked transnational corporations' capacity and willingness to invest in countries outside their own in 2008 and 2009. While FDI flows from emerging countries increased by 3% in mid-2008, they began to dip at the beginning of 2009 as part of a drastic worldwide drop in FDI flows that year. African outbound investment fell by half in 2009 to US$ 5 billion. Asia-Pacific OFDI kept rising in 2009, however. The expansion of China's non-financial FDI abroad was driven by the country's incessant need to replenish its mineral base and by rising OFDI worldwide.

OFDI from China, the Republic of Korea, Singapore and Taiwan Province of China rebounded in 2010. Although the rise in OFDI from developing nations was gradual and modest, it reached a record high of US$ 400.1 billion in 2010, with most of the money being invested within the same area. Global OFDI rose by 17% from 2010 to 2011. Developing country OFDI was US$ 383.8 billion in 2011, down marginally from the previous year. The decline was caused by a combination of factors, including a slowdown in foreign investment growth in emerging Asia and the Pacific and a reduction in capital outflows from Latin America and the Caribbean. Nonetheless, OFDI from emerging and transition economies attained its second-highest level ever.

OFDI from emerging and developing markets increased further in 2014, and vertically integrated businesses headquartered in developing nations spread internationally. A decline in outflows from Latin America and the Caribbean and from Africa was offset by a surge in foreign investment in developing nations by Asia-Pacific multinational corporations. Nearly a third of all FDI came from these multinationals, making them the world's largest foreign investors. Nine of the 20 nations receiving the most FDI were either emerging or transitioning economies. Multinational corporations based in developing countries spent US$ 468 billion on operations abroad in 2014, up 23% from 2013. In 2014, multinational corporations headquartered in emerging Asia and the Pacific increased their foreign investment to US$ 432 billion. This growth was quite extensive, affecting almost every major economy in Asia and the Pacific and adjoining States. That same year, Chinese multinationals invested US$ 143 billion in the East Asia subregion, with this meteoric rise causing the country to become the world's second-biggest investor.

China's outbound investment growth outpaced its inbound investment growth at this time. Nonetheless, OFDI from developing nations as a whole dipped in 2015, with the total amount invested abroad by multinational corporations from developing nations falling by 17% to US$ 389 billion. OFDI from the Asia-Pacific region, which had been the largest investing group in 2014, decreased in 2015. Weak aggregate demand, falling commodity prices and currency depreciation all played a role. OFDI from emerging nations was especially vulnerable owing, among other things, to the slow pace at which new foreign affiliates were opened and acquired. OFDI did increase in a small number of developing nations in 2015, despite the general decline in outflows that year. As an example, China maintained its position as the world's second-largest investor, behind only the United States. China became a major investor in several industrialized countries, chiefly via cross-border ventures. The Latin America and Caribbean region's OFDI increased by 5% as a result of changes in intra-company lending. The global economic slowdown, persistently low aggregate demand and falling earnings for multinational enterprises were all major factors during the 2015 downturn.

OFDI from developing nations fell by 1% in 2016 to US$ 383 billion, after a steeper decline in 2015. This was despite a substantial outflow of FDI from China. However, OFDI from developing nations continued to be substantial, accounting for a major share of FDI from all countries. OFDI shifted its emphasis from maximizing efficiency to expanding into new markets or acquiring new assets. International investment agreements were largely responsible for the increase in OFDI from developing nations, with a wide variety of regional and bilateral agreements being reached.

OFDI from developing nations went into decline in 2017. Investment by Chinese multinationals fell for the second year in a row as a result of government restrictions on investment abroad and heightened scrutiny of inbound investment in the United States and Europe. Foreign investment by Latin American companies experienced its largest decline on record in 2018. Brazil's negative cash outflows and Chile's reduced investment significantly influenced this. As multinational firms continued to channel funds raised on foreign capital markets back to their home countries, the movement of money out of Brazil slowed.

Lower commodity prices, geopolitical concerns and a decline in OFDI from China all contributed to a 19% drop in Asia-Pacific capital outflows to US$ 328 billion in 2018. Because of a decrease in intraregional flows and negative outflows, OFDI from Latin America and the Caribbean totalled just US$ 42 billion.

In general, as a look at recent patterns in developing country OFDI shows, developing economies are continuing to increase their investment in other countries in an effort to integrate into the global economy. Increased market access and domestic competitiveness are two benefits of OFDI. A few nations in the developing world are largely responsible for the rising tide of OFDI, as governments take more active measures to encourage it and provide local enterprises with access to the advantages of investing abroad via measures such as expanding regional agreements. Nonetheless, certain emerging nations' record with outbound investment flows has been quite fragile. It is invariably a financial crisis that ends up undermining them.

Governments should work harder to foster OFDI in order to improve their economies, since this kind of investment boosts a country's competitiveness by strengthening ties between foreign subsidiaries and home businesses. Countries seeking to benefit from FDI and attract money, technology and skilled workers should update their policies with this in view.

IV. Methodology and data

1. Models

This section describes the framework used to investigate the link between OFDI and exports from the investing nation. Various considerations, including transportation costs, the relative size of countries and relative factor endowment, play a role in a firm's choice between exporting and setting up a foreign affiliate, as theorized by Brainard (1997). We concentrate on the model specification that makes exports the dependent variable, OFDI the independent variable and the remaining control factors the explanatory variables. A comprehensive examination of the theoretical and empirical literature underpins our choice of control variables for explaining exports.

To begin, we transform all the numbers into their natural logarithms. Many advantages arise from working with variables expressed in natural logarithm form. Slope parameters of regressors can be easily interpreted in this framework. In relation to a change of 1 percentage point in the regressors, the coefficients of the logged regressors represent partial elasticities of the dependent variable. Putting the variable into logarithmic form may help with the outlier issue.

The following is the equation of the regression model:

$$ln(EPXO)_{it} = \alpha_0 + \alpha_1 ln(OFDI)_{it} + \alpha_2 ln(IFDI)_{it} + \alpha_3\, ln(TOP)_{it} + \alpha_4 ln(EX)_{it} + \alpha_5 ln(RGDP)_{it} + \alpha_6 ln(RGDP_{RW})_{it} + \pi_i + \eta_t + \epsilon_{it} \quad (i = 1, \ldots N);\ (t = 1, \ldots T) \tag{1}$$

where $EXPO$ denotes exports of goods and services, $OFDI$ outward FDI flows, $IFDI$ inward FDI flows, TOP trade openness, EX the official exchange rate, $RGDP$ real gross domestic product and $RGDP_{RW}$ real gross domestic product in the rest of the world, while ε_{it} is the error term, cross-section-specific effects are represented by τ_i, and η_t represents period-specific effects.

This model is estimated in several steps: first for the full sample of developing countries, then for three subsamples based on development level (low-income, lower-middle-income and upper-middle-income countries) and lastly for the full sample of countries by region (Africa, Asia and the Pacific and Latin America and the Caribbean).

Estimating the effect of OFDI on exports using the model formulated in equation (1) ignores economy size. The effect of OFDI on exports as a percentage of GDP is a more useful metric, since it captures the impact of OFDI on the export sector as a proportion of the domestic economy. In addition to the level form, we thus also consider the following variant of the model:

$$ln(EPXO/RGDP)_{it} = \beta_0 + \beta_1 ln(OFDI/RGDP)_{it} + \beta_2 ln(IFDI/RGDP)_{it} + \beta_3 ln(TOP)_{it} + \beta_4 ln(EX)_{it} + \beta_5 ln(RGDP)_{it} + \beta_6 ln(RGDP_{RW})_{it} + \pi_i + \eta_t + \epsilon_{it} \quad (i = 1, \dots N); (t = 1, \dots T) \tag{2}$$

where $(EXPO/RGDP)$ denotes exports of goods and services relative to real GDP, $(OFDI/RGDP)$ outward FDI flows relative to real GDP and $(IFDI/RGDP)$ inward FDI flows relative to real GDP.

2. Definition of variables

The primary goal of this research is to examine how domestic exports are affected by OFDI. At the same time, the analysis incorporates additional factors that affect domestic exports, including trade openness, the exchange rate, real GDP and other countries' real GDP. Similar factors have been considered in most earlier research, including that by Bojnec and Fertő (2014) and Ahmed, Draz and Yang (2016). Table 2 provides the abbreviations and definitions for all the variables used in the study.

Table 2
Definition of variables

Variable	Abbreviation	Definition
Exports	*EXPO*	Exports of goods and services (current dollars)
Outward foreign direct investment	*OFDI*	Foreign direct investment outflows (current account balance in current dollars)
Inward foreign direct investment	*IFDI*	Foreign direct investment inflows (current account balance in current dollars)
Trade openness	*TOP*	Trade as a percentage of real gross domestic product (GDP)
Exchange rate	*EX*	Official exchange rate (local currency units per dollar, period average)
Real gross domestic product	*RGDP*	Real GDP (constant dollars)
Real gross domestic product (rest of world)	$RGDP_{RW}$	Real world GDP (constant dollars) less home country GDP (constant dollars)

Source: World Bank, "World Development Indicators" [online] https://databank.worldbank.org/source/world-development-indicators.

3. Estimation methodology

Owing to the panel nature of the data, we shall be concentrating on two methods for estimating the panel regression model. Both fixed and random effects models fall within this category. Using these methods, we can regulate the unobserved factors that create the observed individual heterogeneity in the panel data.

The findings may be skewed if panel data are analysed using pooled OLS regression, since this disregards the possibility of bias introduced by the panel data set's inherent individual variability. Independence of the error term ε_{it} is another assumption of OLS. However, owing to subject-level variability, the panel data do not follow this OLS prediction. Therefore, a random or fixed effects approach to estimating the panel regression model should be considered.

The fixed effects method is a well-known way of estimating data panels in the academic literature. The unique qualities of each cross-sectional unit set it apart from all others of the same kind. Models exhibiting these features remain stable over time, and the term i provides an explanation for this in the fixed effects model. This model provides a way of considering how unobserved individual effects could influence the dependent variable. The basic concept is that numerous factors may go unnoticed over the course of the data collection process, and fixed effects account for these overlooked factors. The fixed effects model is useful for minimizing the impact of selection bias owing to missing data by investigating the impact of time and country variables on the results. As defined by Wooldridge (2010), variables that do not appear in the dataset but always influence the dependent variable are omitted variables.

Estimating panel regression models with a random effect is another common method. The random effects model assumes that individual effects (heterogeneity) are independent of all regressors and examines error variance in respect of cross-sections and time frames. The regressor's intercepts and slopes are stable across both people and time periods. It is the precise faults made by each person that differ among people (or time periods) (Park, 2011). If variables are omitted in the data, or if the regressors in the regression and the omitted variables are not associated, the random effects model may provide a way to mitigate the impact of the missing information. It will provide the least biased and most accurate possible estimations of the coefficients.

The fixed effects approach accounts for the connection between regression regressors and unique individual effects, while the random effects approach ignores this connection. A test for choosing between fixed and random effects strategies was proposed by Hausman (1978). The random effects approach is assumed to be beneficial to the model under the null hypothesis in this test, whereas the alternative suggests that the fixed effects approach is beneficial to the model. This test helped us decide between the fixed and random effects models.

4. Data and sources

The following empirical research will use an unbalanced panel data set based on 64 developing nations for which data are available to analyse the effects of OFDI on home country exports from 1990 to 2019. The research uses the World Bank's yearly categorization of developing nations from 1990 to 2019 and additionally categorizes them into three groups based on per capita income: low-income, lower-middle-income and upper-middle-income countries (the World Bank divides countries chiefly by GDP). This research will also attempt to investigate regional variations in this connection by grouping developing nations into three regions: Africa, Asia and the Pacific and Latin America and the Caribbean.

The variables utilized in this study and their definitions are listed in table 2. Exports are what are being measured. Data for the dependent variables and six independent variables (OFDI, IFDI, trade openness, the exchange rate, real GDP and real GDP in the rest of the world) are drawn from the World Development Indicators (WDI) database.

V. Results and interpretations

Equation (1) estimates a model for the impact of OFDI on home country export performance. This analysis is conducted for the full sample of developing countries and for subsamples categorized by development level and geographical location. A transformation was also applied to the level form model

in both the fixed effects and random effects variants, converting it into a form where the variables were relative to real GDP (equation (2)). This allowed us to evaluate the impact of OFDI on exports in a way that took economy size into account across the entire sample of developing nations. The Hausman (1978) specification evaluation was applied to choose the best model from the available static and random effects models. The Hausman test suggests that fixed effects models are more appropriate for estimating overall development, degree of development and regional model classifications in developing nations, whether in level form or relative to real GDP. This implies acceptance of the alternative hypothesis that the fixed effects model is accurate. Tables 3, 4 and 5 present the results of the fixed effects model, illustrating the influence of OFDI on home country exports in developing nations. The tables give the results for emerging economies at both the aggregate level and for subgroupings based on current development status (low-income, lower-middle-income and upper-middle-income countries) and geographical area (Africa, Asia and the Pacific and Latin America and the Caribbean).

Table 3
Selected developing countries (whole sample): fixed effects estimates for the impact of outward foreign direct investment on domestic exports

Independent variable	Dependent variable	
	Exports *(Current dollars)*	Exports *(Percentages of real GDP)*
ln*OFDI*	0.006***	0.008***
ln*IFDI*	-0.0031	-0.0071***
ln*TOP*	0.7712***	0.7123***
ln*EX*	0.0631***	0.0612***
ln*RGDP*	0.0613***	-0.9631***
ln$RGDP_{RW}$	1.4801***	1.4014***
Constant	-22.9618***	-17.9620***
Adjusted R^2	0.9823	0.9736
F-statistic	1 012.13	24 670.50
	(0.0000)	(0.0000)

Source: Prepared by the authors.
Note: ln*OFDI* denotes the logarithm of outward FDI flows, ln*IFDI* of inward FDI flows, ln*TOP* of trade openness, ln*EX* of the official exchange rate, ln*RGDP* of real gross domestic product and ln$RGDP_{RW}$ of real gross domestic product in the rest of the world. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 4
Selected developing countries, by income subgroup: fixed effects estimates for the impact of outward foreign direct investment on domestic exports

Independent variable	Dependent variable					
	Exports *(Current dollars)*			Exports *(Percentages of real GDP)*		
	Low-income	Lower-middle-income	Upper-middle-income	Low-income	Lower-middle-income	Upper-middle-income
ln*OFDI*	0.0021	0.0063***	0.0004	0.0020	0.0079***	0.0124***
ln*IFDI*	-0.0020	-0.059**	0.0069	-0.0068	-0.025***	-0.023**
ln*TOP*	1.0753***	0.8315***	1.0761***	1.0746***	0.5783***	1.0847***
ln*EX*	0.9867***	0.0392	-0.0901	0.9685***	0.0202***	-0.0030
ln*RGDP*	-0.0613***	0.0619***	0.8621***	-1.0316***	-0.774***	-0.0641***
ln$RGDP_{RW}$	-0.0577	1.293***	0.0827***	-0.0642	1.437***	0.0715**
Constant	-4.572***	-25.729***	-7.355***	1.885***	-26.571***	-1.423***
Adjusted R^2	0.9862	0.9988	0.9974	0.9877	0.9570	0.9920
F-statistic	3 561.90	587.83	7 652.19	9 834.32	20 765.15	1 462.09
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Source: Prepared by the authors.
Note: ln*OFDI* denotes the logarithm of outward FDI flows, ln*IFDI* of inward FDI flows, ln*TOP* of trade openness, ln*EX* of the official exchange rate, ln*RGDP* of real gross domestic product and ln$RGDP_{RW}$ of real gross domestic product in the rest of the world. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Table 5
Selected developing regions: fixed effects estimates for the impact of outward foreign direct investment on domestic exports

Independent variable	Dependent variable					
	Exports *(Current dollars)*			Exports *(Percentages of real GDP)*		
	Africa	Asia and the Pacific	Latin America and the Caribbean	Africa	Asia and the Pacific	Latin America and the Caribbean
ln*OFDI*	0.0061***	0.0004	0.0003	0.0069***	0.0080***	-0.0030
ln*IFDI*	-0.0020	0.0097**	-0.0090***	-0.0079**	0.0154***	-0.0017***
ln*TOP*	0.702***	0.901***	0.976***	0.6950***	0.9012***	0.8921***
ln*EX*	0.5103***	-0.0079	0.0176*	0.5011***	-0.0091	0.0201**
ln*RGDP*	0.0634***	0.307***	0.451***	-0.862***	-0.719***	-0.7281***
ln$RGDP_{RW}$	0.129***	1.728***	0.805***	0.917***	1.398***	0.875***
Constant	-13.571***	-26.478***	-18.124***	-8.945***	-17.982***	-14.124***
Adjusted R^2	0.971	0.993	0.997	0.989	0.986	0.987
F-statistic	498.87	1 836.02	12 986.6	11 443.57	50 143.23	59 984.20
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Source: Prepared by the authors.
Note: ln*OFDI* denotes the logarithm of outward FDI flows, ln*IFDI* of inward FDI flows, ln*TOP* of trade openness, ln*EX* of the official exchange rate, ln*RGDP* of real gross domestic product and ln$RGDP_{RW}$ of real gross domestic product in the rest of the world. *, ** and *** denote significance at the 10%, 5% and 1% level, respectively.

Considering first how FDI flows out of a country and how it can affect domestic exports, findings for different subgroups of developing nations corroborate the observation for the total sample that the OFDI variable has a considerable positive influence in explaining exports from the home country. Likewise, when the model variables are taken as a percentage of real GDP, the effect is positive and statistically significant for both the lower-middle-income and upper-middle-income groups of developing countries, indicating that OFDI is positively associated with economic growth. This positive and statistically significant impact indicates that the OFDI of a nation boosts domestic exports by way of vertical integration. According to Desai, Foley and Hines (2005), vertically integrated FDI boosts exports of intermediate products from the home nation to the host market, which might account for these complementarities. Companies in the lower-middle-income and upper-middle-income ranges of emerging nations have the financial wherewithal to set up operations abroad, where they may take advantage of cheaper labour and materials. The positive but inconsequential impact of OFDI in the low-income nations group may be attributed to the fact that low-income countries' OFDI is concentrated in the service sector and is thus not likely to have a major impact on exports.

In addition, when developing nations are compared by region, we discover that OFDI has a positive and significant influence on African exports, but when we turn to the model in which the variables are expressed as a percentage of real GDP, we find that it has a positive and significant effect on exports in both Africa and Asia and the Pacific. This is more pronounced in Asia and the Pacific, perhaps because of its higher rate of OFDI in other regions. To obtain more accurate findings and a more transparent view of the different economies, we converted the level form model into a percentage of GDP model in this research. The high volatility of OFDI from Latin America and the Caribbean suggests that the negatively insignificant impact of FDI on home country exports there is due to the fact that the vast bulk of the region's OFDI is simply horizontal or market-seeking FDI to overcome customs obstacles by producing abroad as an alternative to exporting (Dunning, 1993).

Our results hold up well in comparison to those of other investigations, including those by Chen, Hsu and Wang (2012), Qiang (2013), Bojnec and Fertő (2014) and Bhasin and Paul (2016).

The income analysis reveals that, in both the level form model and the model specified in terms of GDP, IFDI into emerging economies proves to be a quite significant negative variable for domestic exports in both the lower-middle-income and upper-middle-income groups. The regional analysis reveals

that Africa and Latin America and the Caribbean are the only emerging world regions where the IFDI coefficient is negatively significant. This negative impact suggests that IFDI leads to the introduction of harsh competition in the reporting economy, which in turn drives out prospective but extremely weak exporters, i.e. that IFDI is flooding the local market and displacing local producers. The low IFDI ratio in low-income developing countries has a negligible impact on domestic exports because of the weak infrastructure and political instability in these nations. Large amounts of IFDI into the extractive sectors of the Asia-Pacific region are having a profoundly favourable impact on the region's export growth. Similar results were found by Tufa and Tashu (2015) and Zhang (2005).

In both the whole sample and its income and geographical subgroups, domestic export volumes are positively correlated with the degree to which an economy is open to trade. This impact shows that the benefits of increased export demand are a direct result of trade liberalization. According to the Santos-Paulino (2002) synopsis, exports expand at a higher rate in more liberal countries. The United States International Trade Commission (USITC, 2003) and Abbas (2014) corroborate the favourable correlation between economic openness and exports.

The exchange rate is a crucial positive factor affecting exports from developing countries. This impact is strongest for emerging nations with low and moderate per capita incomes. In Africa and Latin America and the Caribbean, the exchange rate has the same beneficial impact on exports. A rise in exports is associated with a positive coefficient, suggesting that currency depreciation boosts exports. For emerging nations in the upper-middle-income class and in Asia and the Pacific, the impact of the exchange rate is minimal.

Both the overall and subgroup effects of real GDP are substantial, although it has a positive influence only in the level form model, with the exception of low-income nations, where it inversely affects exports. However, in the relative form model, the higher negative impact of real GDP is realized at the general level and it is all subgroupings of developing nations. Increased economic activity equals greater aggregate domestic demand and thus fewer resources available for export. Dodaro (1993), Anwer and Sampath (1997) and Sohn (2005) all find similar associations.

Lastly, rest of the world GDP has a very substantial positive influence on exports for all countries in the sample and the income and geographical subgroupings. The reason this variable is good for domestic exports is that demand for exports rises whenever it does. The connection is supported by Bojnec and Fertő (2014). The high adjusted R^2 values suggest that the model estimates have considerable predictive ability. Even when the model is converted into GDP terms, R^2 values remain quite strong. F-statistic p-values suggest that the data support a good fit with the model.

VI. Conclusions and policy implications

Exports have been shown to be positively correlated with OFDI in both absolute terms and as a percentage of real GDP. The findings of the relative form model, however, demonstrate a complementary effect of OFDI on home country exports in the aggregate for developing nations, and are therefore more relevant for understanding the impact of OFDI on home country exports. Low-income nations experience little effect from OFDI, but lower-middle-income and upper-middle-income emerging economies see a positive correlation between OFDI and exports. This synergy might be the result of vertically integrated investment that boosts exports of local intermediate inputs to the market of the host nation. Firms in developing nations with lower-middle to upper-middle levels of income can afford to set up operations abroad, where they can take advantage of the cheaper labour and materials on offer. When looking at the effect of OFDI on exports from developing countries, we find it to have a positive effect on exports from both Africa and Asia and the Pacific, although more complementarity is found in Asia and the Pacific

when the real GDP form model is considered. This is because a significant portion of overall FDI outflows from poor nations originate there, and the region is reaping the rewards in the form of higher exports from the home countries. There are important policy consequences from this research. Our findings will help countries with local enterprises that have both domestic and foreign operations make decisions about OFDI and its influence on exports. A proactive approach to OFDI is necessary for policymakers in developing nations owing to the enormous influence that OFDI has on the performance of exports from those countries' domestic markets. For developing nations to reap the benefits of OFDI in the form of exports, governments must remove obstacles to local enterprises investing abroad.

Policymakers in developing nations will be able to better assess whether or not their country should invest abroad if they compare the impact of OFDI on home country exports across developing countries by their degree of development. Regional enterprises may use this research to determine whether they would benefit more from engaging in vertical FDI, horizontal FDI or technology-sourcing FDI while providing manufacturing services abroad. This study will contribute to the understanding and framing of OFDI policies to enhance developing nations' export performance.

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Annex A1

Developing countries included in the research

Table A1.1
Full sample of countries

1. Algeria	33. Jamaica
2. Angola	34. Jordan
3. Argentina	35. Kenya
4. Bangladesh	36. Lao People's Democratic Republic
5. Benin	37. Libya
6. Bolivia (Plurinational State of)	38. Madagascar
7. Botswana	39. Malawi
8. Brazil	40. Malaysia
9. Bulgaria	41. Mali
10. Burkina Faso	42. Mauritius
11. Burundi	43. Mexico
12. Cabo Verde	44. Morocco
13. Cambodia	45. Namibia
14. Cameroon	46. Niger
15. China	47. Nigeria
16. Colombia	48. Pakistan
17. Congo	49. Panama
18. Costa Rica	50. Papua New Guinea
19. Dominican Republic	51. Paraguay
20. Egypt	52. Peru
21. El Salvador	53. Philippines
22. Eswatini	54. Republic of Moldova
23. Fiji	55. Romania
24. Gabon	56. Russian Federation
25. Ghana	57. Senegal
26. Guatemala	58. Sierra Leone
27. Guinea	59. South Africa
28. Guinea-Bissau	60. Sri Lanka
29. Guyana	61. Thailand
30. Honduras	62. Togo
31. India	63. Türkiye
32. Iran (Islamic Republic of)	64. Venezuela (Bolivarian Republic of)

Source: Prepared by the authors.

Table A1.2
Countries by income level

Low-income countries	Lower-middle-income countries	Upper-middle-income countries
Bangladesh	Algeria	Argentina
Benin	Angola	Botswana
Burkina Faso	Bolivia (Plurinational State of)	Brazil
Burundi	Bulgaria	Costa Rica
Cambodia	Cabo Verde	Gabon
Ghana	Cameroon	Libya
Guinea	China	Malaysia
Guinea-Bissau	Colombia	Mauritius
India	Congo	Mexico
Kenya	Dominican Republic	Panama
Lao People's Democratic Republic	Egypt	Russian Federation
Madagascar	El Salvador	South Africa
Malawi	Eswatini	Türkiye
Mali	Fiji	Venezuela (Bolivarian Republic of)
Niger	Guatemala	
Nigeria	Guyana	
Pakistan	Honduras	
Senegal	Iran (Islamic Republic of)	
Sierra Leone	Jamaica	
Togo	Jordan	
	Morocco	
	Namibia	
	Papua New Guinea	
	Paraguay	
	Peru	
	Philippines	
	Republic of Moldova	
	Romania	
	Sri Lanka	
	Thailand	

Source: Prepared by the authors.

Table A1.3
Countries by region

Africa	Asia and the Pacific	Latin America and the Caribbean
Algeria	Bangladesh	Argentina
Angola	Bulgaria	Bolivia (Plurinational State of)
Benin	Cambodia	Brazil
Botswana	China	Colombia
Burkina Faso	Fiji	Costa Rica
Burundi	India	Dominican Republic
Cabo Verde	Iran (Islamic Republic of)	El Salvador
Cameroon	Jordan	Guatemala
Congo	Lao People's Democratic Republic	Guyana
Egypt	Malaysia	Honduras
Eswatini	Pakistan	Jamaica
Gabon	Papua New Guinea	Mexico
Ghana	Philippines	Panama
Guinea	Republic of Moldova	Paraguay
Guinea-Bissau	Romania	Peru
Kenya	Russian Federation	Venezuela (Bolivarian Republic of)
Libya	Sri Lanka	
Madagascar	Thailand	
Malawi	Türkiye	
Mali		
Mauritius		
Morocco		
Namibia		
Niger		
Nigeria		
Senegal		
Sierra Leone		
South Africa		
Togo		

Source: Prepared by the authors.

Annex A2

Hausman test results

Table A2.1
Hausman test results for the full sample of countries

Dependent variable	Exports *(Current dollars)*	Exports *(Percentage of real GDP)*
Chi-statistic	314.789	234.987
Probability	(0.0000)	(0.0000)

Source: Prepared by the authors.

Table A2.2
Hausman test results by countries' development level

Dependent variable	Exports *(Current dollars)*			Exports *(Percentages of real GDP)*		
	Low-income	Lower-middle-income	Upper-middle-income	Low-income	Lower-middle-income	Upper-middle-income
Chi-statistic	22.76	83.98	29.27	49.68	51.4397	29.64
Probability	(0.0135)	(0.0000)	(0.0000)	(0.0924)	(0.0000)	(0.0000)

Source: Prepared by the authors.

Table A2.3
Hausman test results by region

Dependent variable	Exports *(Current dollars)*			Exports *(Percentages of real GDP)*		
	Africa	Asia and the Pacific	Latin America and the Caribbean	Africa	Asia and the Pacific	Latin America and the Caribbean
Chi-statistic	123.81	179.76	119.32	109.87	139.65	141.65
Probability	(0.0000)	(0.0000)	(0.0000)	(0.0190)	(0.0000)	(0.0000)

Source: Prepared by the authors.