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Can outward FDI promote export diversification for emerging economies? Firm-level evidence from China

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ABSTRACT

Recent studies have highlighted the importance of export diversification in facilitating emerging economies' structural change and economic development. This study aims at investigating whether outward foreign direct investment (OFDI) can promote export diversification. Using a firm-product-level dataset, this study investigates empirically the impact of China's OFDI conducted by exporting firms on their export diversification both at product-level and destination-level. By employing propensity score matching (PSM) techniques and differences-in-differences (DID) analysis, this study finds that China's OFDI has a positive and statistically significant impact on promoting China's diversification of export basket, and the promotion effects vary upon different motivations of OFDI. A dynamic effect test shows that the promotion effects of OFDI are significant for several consecutive years after outward investment was made. In addition, this study also finds that the promotion effects mainly come from optimised organisational structure and improved business performance of the OFDI firms.

1. Introduction

Export diversification, i.e., the export of new products, is now considered as the most relevant marker of emerging economies' productive transformation (IMF, 2014, 2017; Lectard and Rougier, 2018; Mania and Rieber, 2019). However, unlike the exports of developed countries, which are concentrated in capital- and technology-intensive products, exports from emerging markets[1] are mainly made up of resource products or low value-added manufactures. From a development point of view, the process of structural change in an emerging economy is always accompanied by the diversification of its export composition (Parteka and Tamberi, 2013). Many empirical studies also directly test the relationship between export diversification and economic growth in the context of emerging economies. They show unanimously, from various samples of countries, that export diversification contributes to economic growth (Mau, 2016; Mania and Rieber, 2019; Lee and Zhang, 2022).

Apart from facilitating structural change and economic development, export diversification also exerts positive effects on firms by reducing the risks in the face of various volatilities. Just as the popular saying goes, "do not put all eggs into one basket". Export concentration increases firm's or country's exposure to product-specific or sector-specific shocks, focusing on several regions as trade partners may also be vulnerable to external risks (Caselli et al., 2020). By diversifying their export, firms and countries reduce the risks of extreme price and volume fluctuations in specific goods (Balavac and Pugh, 2016), and selling to more regions can stabilize the export if the destinations are not perfectly correlated (Vannoorenberghe et al., 2016). Moreover, evidences also show that multi-product enterprises perform better than single-product ones (Schoar, 2002; Villalonga, 2004; Bernard et al., 2010).

Emerging economies need to move away from traditional products and to diversify their economies, promoting their productive transformation and structural change (Hausmann and Rodrik, 2003; IMF, 2014, 2017). But this is not easy to do. As Rodrik (2007) puts it, the problem is one of "self-discovery". A typical emerging country is more abundant in labour than in capital. Export diversification means the country needs to move away from its comparative advantage, producing products with the country's less abundant endowment, say, capital. However, this process would not happen automatically. First, the relative price of labour and capital will discourage the production of new manufactures which use the country's less abundant factor. Second, even though building a new production line or exploring a new market

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[1] In this paper, emerging economy, emerging market and emerging country are synonymous.

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overseas can be profitable, entrepreneurs may be reluctant to do so because the gains of their efforts may be undercut by the inevitable imitation that will follow their success, while they have to bear the additional sunk costs.

How can emerging countries promote export diversification and thus economic structural upgrading? This study provides insights into multinational enterprises (MNEs). Existing literature examines the country-specific factors that affect export diversification (Agosin et al., 2012; Parteka and Tamberi, 2013; Cieślik and Parteka, 2021), as well as firm-level determinants of exports diversification (Cirera et al., 2015). However, there is still a research gap in exploring the causal relationship between a firm's international activities and its export diversification. In this study, we intend to uncover the potential mechanisms by which outward foreign direct investment (OFDI) of emerging market multinational enterprises (EMEs) affect their export diversification, and provide empirical evidence using firm-level data from China.

The current wave of globalization has witnessed a dramatic growth of MNEs from emerging markets, and the overseas investment conducted by these active participants has become increasingly noteworthy and prevalent (Dunning et al., 2007; Luo et al., 2010; Li et al., 2017). Chinese MNEs, one of the most active global investors, have experienced a new round of rapid OFDI growth due to the initiation of the national "go globally" strategy (1999) and the accession to the WTO (2001). Researchers regard 2000s as the second stage of China's internationalization.[2] The changes of China's OFDI activities are reflected in the following aspects: (1) national public policies started to transform from manufacturer to innovator, Chinese MNEs also took aggressive actions to acquire advanced technology; (2) Chinese government transformed its role from the regulator to supporter of OFDI, by simplifying its approval processes, offering preferential treatment on funding, tax collection and foreign exchange, and providing official guidance on overseas investment (Luo et al., 2010); (3) the ownership structure of Chinese MNEs has been transformed from state ownership to multiple ownership, with a number of private companies surging, and (4) Chinese MNEs targeted into a more diverse destination—from Asia and North America to Europe, Australia, and Africa (Chen and Young, 2010). As a result, China's OFDI flow increased from US$0.9 billion in 2000, a year before joining the WTO, to US$145.7 billion in 2015, surpassing FDI inflow into China. China's OFDI stock reached US$2.75 trillion at the end of 2022, ranking the third in the world next only to the United States and Netherlands (MOFCOM, 2023).

The main purpose of this study is to shed light on the impact of OFDI on EME's export diversification. This study makes several contributions to the existing literature. First, many factors have long been studied and considered as drivers of export diversification, whereas this study adds OFDI into the framework, which to our knowledge is the first research to investigate how OFDI can affect export diversification of home economies. Second, as there may be a reverse causality relationship between OFDI and export diversification, this study adopts a combined PSM-DID methodology to solve the potential endogeneity problem and to obtain more accurate empirical estimates. Third, by using a comprehensive merging dataset which comes from three separate databases, this study enables us to do the heterogeneity test as well as mechanism analysis. The study identifies four types of OFDI motivations as heterogeneous factors and two channels through which OFDI affects export diversification.

The rest of this study is organized as follows. Section 2 discusses the roles of export diversification on economic development in emerging economies, analyses how OFDI promotes export diversification, and presents a literature review. Section 3 introduces the data and methodology employed in this study. Section 4 reports the empirical regressions and conducts multiple robustness checks. Section 5 provides conclusion and policy implications.

2. Export diversification and outward foreign direct investment: theories and literature

2.1. Why export diversification matters?

Early studies have reached a consensus that export diversification increases non-linearly with economic growth (Imbs & Wacziarg, 2003; Cadot et al., 2011; Cadot et al., 2013): low-income countries generally have very low-level export diversification, focusing their export on a few low value-added products, such as agricultural products, raw materials and a few unsophisticated manufactured goods; developing countries diversify their export products due to their increasing ability to producing various manufactured products as industrial upgrading and economic development; after a higher income level has been reached, developed countries reconcentrate their export to a few high value-added manufactured products, i.e., their export diversification decrease.

The non-linearly pattern of export diversification can reflect the structural change of a country's development path, and, to some extent, is consistent with the law of comparative advantage and factor endowment theory, which suggest poor countries export labour-intensive products and rich countries export capital-intensive products. Comparative advantage theory offers important insights into the benefits and direction of trade, but it alone is insufficient to explain the specific goods different nations export (Rodrik, 2007), neither does it interpret the dynamic changes of a country's export. If developing countries dogmatically follow the principle of comparative advantage, which emphasize the export of labour-intensive products, they will be condemned to the production and export of the same commodities forever. Therefore, the idea of comparative advantages was challenged by Prebisch (1950) and Singer (1950) (known as the Prebisch–Singer hypothesis), who argue that the principle of specialization in developing countries may not necessarily lead to sustainable growth, because primary goods, especially food, suffer from a lower income elasticity and lower price elasticity of demand than manufactured goods. As a result, these export patterns would face the volatility of export earnings and price fluctuations, and be vulnerable in international trade. It can be argued that the principle of comparative advantage inevitably leads developing countries to an "immiserating" growth, and is not very useful in the early stage of development for a country, which is in need of rapid structural change and is as much concerned with long-term development as with short-term efficiency (Thirlwall, 2011).

In the seminal work of Imbs & Wacziarg (2003), they identified an inverted U-shaped relationship between export diversification and development, and find that the turnaround point occurs quite late in the development process and at a robust level of income per capita.[3] This study focuses on the earlier part of the inverted U-shaped relationship: i.e., exports diversify as the economy develops, which is a typical characteristic of emerging economies. China's economic development, for example, has been accompanied by impressive diversification of export, with China's export structure shifting dramatically from agriculture and textile sectors to high-tech manufactured products, and permeating all areas of world trade (Jarreau and Poncet, 2012; Zhang and Chen, 2020). Empirical evidence shows that, during the first decade of the 21st century, China's export diversification of both products and markets has increased (Parteka and Tamberi, 2013; Fu et al., 2019). Several studies

[2] The first stage of China's internationalization refers to the opening up policy in the late 1970s.

[3] In their original paper, Imbs & Wacziarg (2003) note that sectoral concentration follows a U-shaped pattern in relation to per capita income, and that the turnaround point on average occurs when countries reach a level of per capita income roughly equal to $9,000 in 1985 constant U.S. dollars. Even today (the year of 2023) most emerging economies do not reach this point, which means they are still diversifying their export composition.

note that emerging economies have made great economic achievements through defying their comparative advantages and diversifying their export structure (Lectard and Rougier, 2018; Mania and Rieber, 2019). Apart from these studies, recent literature also provides evidence that export diversification brings benefits to countries in terms of output stability (Koren and Tenreyro, 2007; Malik and Temple, 2009) and trade performance (Vannoorenberghe et al., 2016; Abreha et al., 2020).

From a micro point of view, existing literature has paid attention to the behaviour and patterns of multi-product enterprises (e.g., Baldwin and Ottaviano, 2001; Bernard et al., 2009; Chatterjee et al., 2013). They find that the large share of a country's export is contributed by a small number of multi-product enterprises. For example, only 30 percent of U. S. enterprises export more than 5 products at 10-digit HS code in 2000, but they contributed 97 percent of U.S. total exports (Bernard et al., 2009). The multi-product enterprises export more than single-product enterprises not only in terms of export value and export categories, but also in terms of the number of destinations (Bernard et al., 2011). Moreover, there is evidence that multi-product exporting enterprises are more productive than single ones (Bernard et al., 2010).

In the case of China, Table 1 describes the relationship between export diversification of Chinese enterprises and their performance. It can be seen that enterprises having fewer export products are relatively small in size and low in efficiency, while the enterprises that export more products are larger and more efficient. 19.46 percent of the enterprises exported only one product, and its total export accounted for only 7.44 percent. The share of export for single-product enterprises is lower than the share of enterprises number. Moreover, the number of enterprises exporting more than 10 products accounted for 21.06 percent but the share of exports was 46.79 percent. The calculation is basically consistent with that of Yang and Wu (2019) in the case of China. Table 1 indicates that China's export is dominated by multi-product enterprises. Table 1 also reveals that firms export more products tend to have higher export value, TFP, export intensity, and larger size than firms export fewer products. This implies that export diversification is positively related with firm's performance (Schoar, 2002; Villalonga, 2004).

2.2. *Outward foreign direct investment from emerging markets: motivations, operating strategies, and potential outcomes*

The general motivations of OFDI have been widely discussed and are roughly divided into four categories, namely market-seeking, efficiency-seeking, natural resource-seeking and strategic asset-seeking OFDI (Dunning and Lundan, 2008). In addition to traditional principles, EMEs' overseas investment has some unique characteristics of its own. As latecomers, EMEs may not conduct OFDI with the purpose of exploiting firm-specific ownership advantages as Dunning (1977, 2001) proposed in the "OLI" framework, but they use outward investments as a "springboard" to augment their assets and gain competitive strength to enhance their performance (Luo et al., 2010; Li et al., 2017; Zhang et al., 2022b). OFDI also allows EMEs to alleviate latecomer deficiencies in areas such as consumer base and brand recognition (Luo and Tung, 2007), and to overcome domestic institutional constraints. Because OFDI activities from EMEs are triggered by distinct objectives, we propose four operational strategies of OFDI based on the unique characteristics of EMEs and the datasets structure of this study.

The first strategy is production promotion. The ability to produce and meet overseas orders is crucial for EMEs, therefore they are keen to boost productivity to prevail over fierce competition in oversea markets. This strategy is also supported by home countries' governments, with the purpose of raising the competitiveness of their economies (Dunning et al., 2007; Luo et al., 2010; Zhu et al., 2022). On the one hand, vertical OFDI conducted in this strategy helps firms to produce overseas at a lower real cost by transferring the labour-intensive stage of production abroad, and upgrading their domestic industrial structure (Zhang and Chen, 2020). On the other hand, faced with more foreign demands, EMEs are able to reinvest themselves and realize economies of scale. Empirical evidence suggests that OFDI has a positive effect on EME's productivity (Herzer, 2011; Cozza et al., 2015; Zhang et al., 2022b).

The second is information gathering. Under the condition of demand uncertainty from overseas markets, OFDI allows firms to penetrate more deeply into local markets, making it easier to gather information regarding local culture, institutions, consumer tastes and needs. This strategy often occurs in EME's first investment in a specific field or region. When the information spills over back to headquarters, it would guide firms to develop new products (Huang and Zhang, 2017). Despite the alleviation of information asymmetry, OFDI also enables firms to gather management expertise and organisational skills (Dunning and Lundan, 2008), which is vital for firms to operate internationally and expand their export baskets (Buckley et al., 2007).

The third is for trade and sales, which is typically adopted by horizontal OFDI (Damijan et al., 2007). In order to sell products overseas and gain a larger market share, firms need to operate locally and be closer to local distribution networks (Buckley et al., 2007; Herzer, 2011; Chen, 2015). To achieve this goal, EMEs can establish overseas outlets and offices to get in touch with local and adjacent regional markets, and build local distribution networks. Moreover, OFDI helps firms to get a "physical presence" in foreign markets, which is crucial for developing a well-known brand name and discovering foreign demand (Dunning and Lundan, 2008).

The fourth is acquiring technology. One of the most important strategies for EMEs to go abroad is to acquire advanced or proprietary technology, especially for those with high technology intensity, so that they could compensate for their competitive disadvantages and weaknesses against their global rivals (Gaffney et al., 2013; De Beule et al.,

Table 1
Distribution of characteristics of Chinese exporting firms

No. of HS6 products	1	2	3	4	5	6	7	8	9	10+
Share of Firms (percent)	19.46	15.03	11.96	8.93	7.08	5.40	4.30	3.79	3.00	21.06
Share of Exports (percent)	7.44	9.28	7.11	6.67	6.72	4.46	3.57	3.67	4.30	46.79
ln(export)		8.92				10.02				10.81
TFP		3.08				3.17				3.34
ln(assets)		5.98				6.10				6.28
Export Intensity		0.48				0.58				0.68

Data source: Calculated by authors using the matched data of product-level Chinese customs data and China Annual Survey of Industrial Firms in 2006.
Notes: TFP refers to total factor productivity, which is estimated by the LP method (Levinsohn and Petrin, 2003), Export Intensity equals export values divided by total sales.

2014). Though firms could access some of this technology through exporting or the spillover effect of inward FDI (Zhang et al., 2022b), the core technology is often non-traded. The potential way to obtain this is to establish R&D centres to use local knowledge resources (Siddharthan and Nollen, 2004; Huang and Zhang, 2017). Many studies have confirmed that EMEs like Chinese firms are active seekers of technology around the world (Deng, 2009; Ramasamy et al., 2012; Li et al., 2016).

2.3. Outward foreign direct investment and export diversification

Export diversification refers to the export commodities or export destinations that are not concentrated on a small range. In other words, a firm can diversify its export through two methods, that is, to produce and export new products to the existing market, or to explore new markets for its products. OFDI may affect firm's export diversification in both ways. However, the relationship between firm's OFDI and its export diversification is far less discussed. From a theoretical point of view, OFDI mainly affects EMEs' export diversification through two channels.

The first channel is related to the firm's organisational structure. The overseas operation of EMEs will change their organizational structure gradually, thus making them more competitive in the international markets. After setting up subsidiaries overseas, two main features will emerge in the organizational structure of EMEs. The first obvious change is that the firms' size will expand, which creates favourable conditions for the diversification of export. On the one hand, larger firms are more easily to achieve economies of scale, and produce diversified products at lower costs to meet different customer demands. On the other hand, large enterprises tend to be more profitable, thus accumulating more funds for reproduction, technological innovation and staff training, which is conducive to the production of new products. Moreover, large enterprises have the ability to explore new markets, which improves the market diversification (Castellani et al., 2017).

The other new feature regarding the organisational structure is that the firm's management competency will be strengthened. Management competency is important for EMEs in the internationalization process (Pradhan, 2004), especially for those with huge size (Tang et al., 2020), diversified export products and multiple target markets. When exporting to different regions, firms are always faced with distinct demands, cultures, standards and laws, and all of these need advanced operation capacities. As discussed above, information gathering OFDI helps firms to gather management expertise, making it easier to receive invaluable training at first-hand (Cai, 1999). The technology acquiring OFDI could also act as an important vehicle in the transfer process of managerial know-how to the host country, as it directly obtains these organisational skills from advanced companies (Herzer, 2011; Cozza et al., 2015; Zhang and Chen, 2020; Zhu et al., 2022). The raise of management competency not only helps EMEs to organize with efficiency in producing different products and managing their employees, but also provides expertise to deal with different situations in diversified markets. Thus, the smooth process of diverse production and operation is guaranteed.

The second channel is associated with the improvement of firm's business performance. Empirical studies have examined how OFDI could promote EMEs' performance, such as their overall performance (Edamura et al., 2014; Tang et al., 2020), sales and profit (Baiardi et al., 2021), productivity (Cozza et al., 2015; Huang and Zhang, 2017; Zhang et al., 2022b) and innovation capability (Pradhan and Singh, 2008; Piperopoulos et al., 2018). These effects could be largely explained by "reverse technology spillover" mechanism (Kimura and Kiyota, 2006; Yang et al., 2017). The improvement of these capabilities could also lead to export diversification, which is referred to the aforementioned strategies of production promotion and technology acquiring OFDI. First, the product-cycle theory initiated by Vernon (1966) indicates that innovation allows firm to gain competitive advantages so that it could compete in overseas markets. Following Vernon, many studies have found that innovation translates into firm's export behaviour (Wakelin, 1998; Bleaney and Wakelin, 2002; Caldera, 2010; Cassiman and Golovko, 2011).[4] From this perspective, firms getting better performance through OFDI could diversify their export as well. Second, establishing affiliates overseas enables firms to access novel knowledge and information, then they could create new products for export (Cirera et al., 2015; Castellani et al., 2017), or improve the quality of their products for export, thus expanding their export basket. Third, higher productivity means lower production costs, which allows the firm to export higher-quality goods at the same price. This can improve consumers' recognition and loyalty to the company, which makes the company more easily explore new markets and consumers more easily enjoy new products of the company. Therefore, higher productivity enables the firm to develop new products, thus enriching the variety of export products.

3. Data and methodology

3.1. Data description and processing

To test the impact of OFDI on export diversification, three databases are employed in this study. One is the Chinese Customs Trade Statistics (CCTS) which is compiled and maintained by the General Administration of Customs of China. CCTS is a transaction-level trade database recording every transaction (monthly) of China's international trade at 8-digit HS (Harmonised Commodity Description and Coding System) code category, containing every firm's basic information, as well as customs code, exports values, quantity of commodities, ownerships, customs regimes, origin and destination of each transaction. First, we collapse the original data into 6-digit HS code from 8-digit as well as yearly frequency from monthly.[5] Then the processed data will be used to calculate a series of indicators representing export diversification of each firm. However, the information of other firm characteristics such as operation and performance variables are not included in the database, thus we need to add more firm information from the National Bureau of Statistics of China (NBS) to link with CCTS.

The other database is the Chinese Annual Survey of Industrial Firms (CASIF) which was conducted by NBS. This is the most comprehensive firm-level database in China, covering all State-Owned Enterprises (SOEs) and non-SOEs with annual sales exceeding RMB 5 million (about US$0.8 million). The firms in the database generate more than 90% of China's total industrial output value and 98% of industrial exports. Every firm's basic information and necessary operation and performance variables are included in the database. Since CASIF was conducted separately every year, to clean the data, we employ a sequential recognition method to encode the firms (Brandt et al., 2012), thus an unbalanced panel data set is generated. For the noisy observations, we adopt some data cleaning processes. First, observations with missing or negative values of key variables (for example, the firm's identification number, total assets, gross industrial output, sales, fixed assets, and founded year) are deleted. Second, observations with number of employees less than 8 are eliminated because they are under a different

[4] For instance, both Wakelin (1998) and Bleaney and Wakelin (2002) find that the number of innovations will increase the probability of innovative firm to export.

[5] There are two main reasons for using 6-digit HS data. Firstly, 6-digit HS code data is employed in many export diversification literature (e.g., Vannoorenberghe et al., 2016; Lectard and Rougier, 2018; Mania and Rieber, 2019), since it is the most disaggregated trade data which can be obtained from UN Comtrade. We use 6-digit HS data to make our study consistent with previous studies. Secondly, the HS nomenclature was revised both in 2002 and 2007 during our sample period. We thus converted all the HS code to HS1996 version using the correspondence tables from UN TRADE STATISTICS at https://unstats.un.org/unsd/trade/classifications/correspondence-tables.asp. The tables only offer 6-digit HS code nomenclature.

legal regime (Brandt et al., 2012; Zhang et al., 2022b). In addition, observations obviously incompatible with facts or the *Generally Accepted Accounting Principles* are removed, such as total assets less than fixed assets, total assets less than liquid assets, founded year greater than the current year (Feenstra et al., 2014).

We match the two datasets (2000-2009) following the method of Dai et al. (2016), and all the nominal variables are deflated into 2000 constant prices using the appropriate deflators.[6] The merged CASIF-CCTS dataset thus has both the trade information and characteristics of each firm, and is widely used in the literature concerning international economics (e.g., Dai et al., 2016; Vannoorenberghe et al., 2016; Yang and Tsou, 2018). However, the merged dataset still cannot serve the purpose of this study because it lacks the OFDI information. Finally, we add OFDI information from the Ministry of Commerce of China (MOFCOM) to the dataset.

The last database is called *Directory of Foreign Investment Enterprises*, which is released by MOFCOM. As every China's OFDI activity needs to be registered at MOFCOM, in principle, the *Directory* covers every non-financial OFDI case since 1980. It includes information of firm names, the certificated number, host countries, overseas affiliates, the main business scopes as well as approval date. This study mainly investigates the firms conducting OFDI from 2002 to 2007, so we match these data to the 2000-2009 merged CASIF-CCTS dataset to ensure that there is a time period for comparative analysis before and after firms' conducting OFDI. Using a comprehensive link approach (Huang and Zhang, 2017; Zhang et al., 2022b), we generated the appropriate dataset for this study, of which the OFDI firms are the treatment group and the non-OFDI firms are the potential control group. In order to ensure the rationality of the conclusion of this study, we keep the firms which have observations for at least three consecutive years. In the robustness check analysis, we will use a balanced panel data of which the firms exist ten consecutive years in the sample period.

3.2. Measuring export diversification and addressing endogeneity issues

Firm-level export diversification is of primary interest in this research. There are two types of firm-level export diversification commonly used in the literature. One is at the product level, focusing on the scope of products the firm produces and exports. The other is at the market level, which pays more attention to the destinations of international trade. We classify them as export product diversification (Lopresti, 2016) and export market diversification (Vannoorenberghe et al., 2016), respectively. This study employs the following variables to proxy export diversification.

Export values. No matter what kind of export diversification, the expansion of export scope (extensive margin of exporting) is usually accompanied with the increase of export values. In order to reflect the systematic effect of OFDI on the firms' export diversification, this study first uses the export value (logarithm) of each firm as a rough proxy variable of export diversification.

Number of export products (*N_prod*). The number of products exported by a firm can directly reflect the product diversification degree of export (Bernard et al., 2010, 2011). We use the number of 6-digit HS code products the firm exported as one of the proxy variables for export product diversification.

Export product diversification index (*Div_prod*). Taking account of weight of each product and the distribution of firm sales across products, we construct a Herfindahl–Hirschman-style index following Lopresti (2016) as a comprehensive index of export product diversification.

$$Div\_prod_{it} = 1 - \sum_{p\in\Omega_{it}} \left(\frac{Sales_{ipt}}{\sum_{p\in\Omega_{it}} Sales_{ipt}} \right)^2 \quad (1)$$

Where *Div_prod* denotes the product-level export diversification; i and t denote firm and time respectively; Ω represents firm i's product set at time t, where each product is a 6-digit HS category denoted by p. $Sales_{ipt}$ is firm i's export values of product p in year t. It can be noted that the higher the value of *Div_prod*, the higher the diversification degree of products exported by firm i, and the more the export product sales are scattered among various export products; conversely, the lower the value of *Div_prod*, the more the export product sales are concentrated in a few products.

Similarly, we use **Number of export destinations (*N_mark*)** and **Export market diversification index (*Div_mark*)** to proxy export market diversification. All the specification of *Div_mark* is similar to that of *Div_prod* except that $Sales_{ict}$ in Equation (2) represents firm i's export values to country c in year t.

$$Div\_mark_{it} = 1 - \sum_{c\in\Omega_{it}} \left(\frac{Sales_{ict}}{\sum_{c\in\Omega_{it}} Sales_{ict}} \right)^2 \quad (2)$$

There could be an endogeneity problem with OFDI and firm export diversification due to the self-selection bias. On the one hand, as the new-new trade theory indicates, firms conducting OFDI are more productive than those do not. The most productive firms engage in OFDI, medium productive firms engage in export, and the least productive firms usually operate in domestic market and they neither export nor invest abroad (Head and Ries, 2003; Helpman et al., 2004). On the other hand, firm diversification behaviour directly affects firm performance and productivity levels (Schoar, 2002; Villalonga, 2004). It may be that the high export diversification leads to the engagement of OFDI, not the other way around. If the reverse causality exists, the simple least squares estimation is invalid. In order to address the endogeneity issue, we employ propensity score matching (PSM) technique combined with difference-in-difference (DID) method to assess the causal effect of OFDI on firms' export diversification (Girma et al., 2004; Heyman et al., 2007; Zhang et al., 2022b).

3.3. Empirical model specification

Since firms' OFDI flows are not included in our dataset, we assess the impact of OFDI on export diversification through treatment effect methodology. The key is to select the appropriate control group enterprises to test the effect of OFDI on diversification. High export diversification firms may self-select to conduct OFDI, that is, OFDI firms have higher export diversification than non-OFDI firms before investment overseas. If we use all the non-OFDI firms as control group, the conclusions are unreliable, as it is impossible to distinguish between the "self-selection effect" before investment overseas and the "promotion effect" after investment overseas. Therefore, we employ PSM technique (Heckman et al., 1997) to select the non-OFDI firms most similar to the OFDI firms as the control group, and then use the control group to compare with the treatment group.

The idea of PSM is to find a corresponding non-OFDI firm for each OFDI firm before treatment, to make sure that the control group and treatment group are most similar before conducting OFDI. The first step of PSM is to estimate the propensity score, i.e., the probability of conducting OFDI, using Logit (or Probit) model. In this study, we perform a Logit model to acquire the propensity score of each firm, algebraically:

$$\Pr(OFDI_{it} = 1) = \Phi(h(X_{i\text{-}t-1})) \quad (3)$$

Where $OFDI_{it}$ represents a dummy whether firm i starts to conduct OFDI in year t. $X_{i\text{-}t-1}$ refers to firm i's characteristics prior to the year

[6] Since the CCTS begins in 2000 and the CASIF lacks key variables in 2010, we employ both datasets from 2000 to 2009. For more detailed information about the matching method, please see Appendix A of Dai et.al. (2016). Industrial value-added is deflated by the provincial-level ex-factory price index of industrial products, and the net value of fixed assets is deflated by the provincial-level price index of investment in fixed assets.

Table 2
Descriptive statistics of main variables

Variable	Obs	Mean	Std. Dev.	Min	Max
OFDI	24,885	0.057	0.232	0	1
ln(export)	24,885	10.303	2.034	-2.084	18.094
ln(N_prod)	24,885	1.636	1.059	0	6.515
Div_prod	24,885	0.344	0.286	0	0.985
ln(N_mark)	24,885	2.180	1.115	0	5.193
Div_mark	24,885	0.538	0.300	0	0.975
ln(sales)	24,885	6.998	1.516	1.702	14.109
export intensity	24,885	0.569	0.441	0	10.066
firm age	24,885	2.012	0.792	0	4.956
ln(new product)	24,885	1.430	2.859	0	13.280
SOE	24,885	0.100	0.300	0	1
FOE	24,885	0.249	0.433	0	1
ln(assets)	24,885	6.858	1.643	1.895	14.334
ln(admin expense)	24,846	3.878	1.559	-3.801	12.315
ln(unit value)	24,878	2.363	2.677	-6.821	18.661

Source: Authors' calculation.

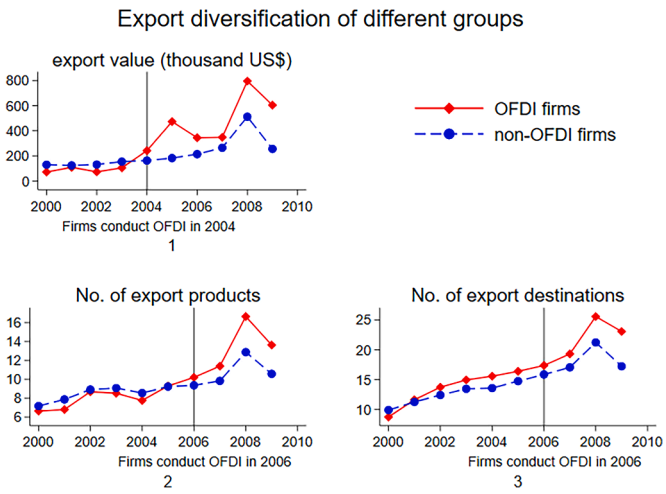

Fig. 1. Time trends before and after the occurrence of outward foreign direct investment in selected years

conducting OFDI to predict firm *i*'s OFDI behaviour. We include firm size, firm age, export value, number of destinations, labour productivity[7], SOE dummy, and dummy variables for year, industry and region as independent variables to calculate the propensity score.

After obtaining the propensity score of each firm, we employ the one-to-eight nearest neighbour matching strategy to find the non-OFDI firm for each OFDI firm as its counterpart in the control group. Finally, 654 firms of treated group are matched with 3,500 control firms in our sample. We also deploy other nearest neighbour matching to check the robustness of the results.[8] Table 2 presents descriptive statistics of the main variables of the samples in this study.

After obtaining the new control group, we pool all years of treated group and control group together, constructing an unbalanced panel data. Next, we employ DID approach to test the impact of OFDI on firms' export diversification (*ED*).

$$Treatment\ effect = E\left(\Delta ED_i^1 \middle| OFDI_{it} = 1\right) - E\left(\Delta ED_i^0 \middle| OFDI_{it} = 1\right) \quad (4)$$

Where ΔED_i^1 denotes the variation of *ED* between pre and after-OFDI for those OFDI firms, and ΔED_i^0 denotes the variation of *ED* for those non-OFDI firms. However, $E(\Delta ED_i^0 | OFDI_{it} = 1)$ is unobservable, because once the firms conduct OFDI, we never know the status if they don't. We use the matched control group to represent the counterfactual treated group, as they are very similar to each other through PSM process, changing Equation (4) to the following Equation:

$$Treatment\ effect = E\left(\Delta ED_i^1 \middle| OFDI_{it} = 1\right) - E\left(\Delta ED_i^0 \middle| OFDI_{it} = 0\right) \quad (5)$$

Finally, we perform the following DID specification using our newly constructed sample.

$$ED_{itjr} = \alpha + \delta ofdipost_{it} + \boldsymbol{\beta Control_{it}} + Year_t + IND_j + RE_r + u_i + \varepsilon_{itjr} \quad (6)$$

Where subscript *i, t, j and r* represent firm fixed effect, time fixed effect, industry fixed effect and region fixed effect respectively; $ofdipost_{it}$ denotes firm *i* conducting OFDI in year *t*; $\boldsymbol{Control_{it}}$ are a number of time-varying variables that are expected to have impacts on firms' export diversification, including *total sales, export intensity, firm age, innovative capability* and dummies representing whether the firm is State-Owned Enterprise (*SOE*) or Foreign-Owned Enterprise (*FOE*). Specifically, *total sales* are the value of sales (in logs), *export intensity* is the share of export value to total sales, and *innovative capability* is proxied by the firm's output value of new products (in logs).

In order to check the dynamic effect of firms' OFDI behaviour on export diversification, Equation (6) can be extended to Equation (7):

$$ED_{itjr} = \alpha + \delta_v \sum_{v=1}^{4} ofdi_{it} \times postv + \boldsymbol{\beta Control_{it}} + Year_t + IND_j + RE_r + u_i + \varepsilon_{itjr} \quad (7)$$

Where $ofdi_{it} \times postv$ in Equation (7) are the DID terms, indicating that the observation is *v* years after the enterprise invests overseas. The coefficients of δ_v reflect the real effect of enterprises in the *v* years after conducting OFDI. Considering the time interval of the data employed, this study investigates the dynamic effect of enterprises in 4 years after FDI to ensure the effectiveness of dynamic analysis.

Before turning to the empirical analysis, the validity of DID methodology must be considered. The validity of DID estimator hinges upon the assumption that the treatment and control groups are comparable before the treatment occurs, i.e., the parallel trend assumption must hold. Fig. 1 plots the time trends between the treatment and control groups before and after the occurrence of OFDI, where export diversification are the average values by groups and years. More specifically, Fig. 1-1) illustrates the change trends of export value of treatment group and control group, with the treatment group being the firms who conduct OFDI in 2004; Fig. 1-((2) and Fig. 1-(3) illustrate the trends of *N_prod* and *N_mark* respectively, with the treatment group being the firms who conduct OFDI in 2006.

Four features can be draw from all the three sub-figures in Fig. 1. First, before investing overseas, there exist a common trend on the export diversification representing by various proxies, indicating the validity of the PSM matching procedure, which lays a foundation for the reliability of the following DID estimation. Second, in the sample period of this study, China's export diversification generally increased in both groups, leading to a more diversified export structure of the country. Third, OFDI has a significant promoting effect on export diversification and the positive impact of OFDI on export diversification materializes very quickly. When conducting OFDI, the export value and number of export products increase immediately for the OFDI firms relative to non-OFDI firms. Fourth, OFDI plays a long and lasting role in promoting the

[7] TFP (Total Factor Productivity) is a better proxy representing firms' productivity. However, because the CASIF lacks the variables of intermediate inputs and industrial added value after 2007, we cannot calculate the OP and LP type TFP in our database. We use labour productivity as an alternative variable of firms' productivity, which is applied as the main indicator of productivity in many studies (e.g., Helpman et al., 2004; Tomiura, 2007). In this study, labour productivity is calculated as the total industrial output value relative to total employees of a firm.

[8] The results of robustness checks are available from the authors upon request.

Table 3
The impact of OFDI on firm's export diversification

	(1) Export	(2) N_prod	(3) Div_prod	(4) N_mark	(5) Div_mark
ofdipost	0.148***	0.084***	0.018**	0.121***	0.024***
	(2.833)	(2.757)	(2.141)	(4.009)	(2.620)
ln(Sales)	0.931***	0.226***	0.016***	0.371***	0.047***
	(37.219)	(19.027)	(4.775)	(28.325)	(12.784)
Exp Intensity	0.620***	0.160***	0.009*	0.234***	0.033***
	(13.394)	(9.101)	(1.914)	(10.773)	(5.921)
ln(Firm age)	0.195***	0.082***	0.016***	0.151***	0.038***
	(7.890)	(6.439)	(4.419)	(10.583)	(8.906)
ln(R&D)	0.005	0.008***	0.003***	0.009***	0.001
	(0.818)	(2.621)	(3.237)	(2.922)	(0.795)
SOE	0.290	0.228**	0.043*	0.223**	0.041
	(1.628)	(2.435)	(1.908)	(2.134)	(1.588)
FOE	0.404***	0.122	0.013	0.131*	-0.005
	(2.873)	(1.509)	(0.732)	(1.721)	(-0.223)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	3.570***	-0.107	0.142***	-0.464***	0.187***
	(16.596)	(-0.967)	(4.808)	(-3.900)	(5.463)
N	24885	24885	24885	24885	24885

Notes: Export, N_prod and N_mark are in natural logarithm; t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.
Source: Authors' estimation.

diversification of enterprises' exports. The promoting effect of OFDI can last for several years after outward investment was made for the period under study.[9]

However, since there are other factors which may affect firm's export diversification, Fig. 1 cannot fully reflect the real effect of OFDI on export diversification. Therefore, in the following section we will employ DID method to investigate empirically the promoting effect of OFDI on firm's export diversification.

4. Empirical results and discussion

4.1. Baseline results and the dynamic effects of OFDI on export diversification

Table 3 presents the baseline results of the PSM-DID regression based on Equation (6). Column (1) suggests that OFDI has a positive impact on promoting firm's export, implying a complementary relationship between China's OFDI and its export from a firm-level perspective. This finding is in line with most of the earlier empirical studies using country-level data (e.g., Liu et al., 2015; Zhang et al., 2022a). However, promoting effect on export value can be materialised through both intensive margin and extensive margin of export. In columns (2)-(5), we further test the impact of OFDI on export diversification, the extensive margin of export, at the product level and market level. The coefficients of *ofdipost* in columns (2)-(3) are positive and statistically significant at 5 percent level, indicating that firms conducting OFDI tend to increase the number of 6-digit HS products they export as well as the export product diversification index. The positive effect of OFDI still holds when the dependent variables change to export diversification in terms of destinations as showed in columns (4)-(5). The results of these three dimensions in Table 3 together confirm the existence of promoting effect on export diversification through OFDI.

For the control variables, the coefficients are mostly consistent with expectations. Firms with large sales and long-established firms tend to have a more diversified export basket, since they are more likely to achieve economies of scale and have higher productivity. This is in line with the conclusion of Qiu and Zhou (2013), who assume that the addition of new product scope requires firm to pay a fixed cost. Higher export intensity means that the firm is more export-oriented than domestic-oriented. The positive coefficients of export intensity in all the columns in Table 3 imply that export-oriented firms tend to diversify their exports (Dhingra, 2013). The coefficients of innovation, proxied by *ln(new products)*, are not significant. This may be because the new products are sold at domestic market before being exported, thus having litter impact on export diversification. SOEs' export behaviour is mostly affected by the factors of domestic policies, and dependent on the relationship between governments of trade partners, so they seldom consider the market risks of host countries than non-SOEs (Morck et al., 2008; Zhang et al., 2022b). The coefficients of SOE in Table 3 indicate that SOEs have a higher export market diversification. The FOE dummy has a positive but not statistically significant effect on various export diversification variables.

Table 4
The dynamic impact of OFDI on firm's export diversification

	(1) Export	(2) N_prod	(3) Div_prod	(4) N_mark	(5) Div_mark
ofdipost1	0.470***	0.138***	0.023**	0.257***	0.038***
	(7.083)	(3.639)	(2.438)	(6.925)	(3.563)
ofdipost2	0.500***	0.140***	0.034***	0.244***	0.046***
	(5.826)	(3.034)	(2.863)	(5.141)	(3.412)
ofdipost3	0.607***	0.119*	0.029*	0.290***	0.043***
	(5.917)	(1.831)	(1.848)	(4.383)	(2.584)
ofdipost4	0.316**	0.127	0.041*	0.175**	0.025
	(2.110)	(1.462)	(1.769)	(2.047)	(0.949)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	9.429***	1.400***	0.263***	2.031***	0.531***
	(56.761)	(14.352)	(11.967)	(20.342)	(19.408)
N	24885	24885	24885	24885	24885

Notes: Export, N_prod and N_mark are in natural logarithm; t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.
Source: Authors' estimation.

The above regression results show the average promotion effect of OFDI on export diversification.[10] In order to identify the dynamic effects of OFDI on firm's export diversification, Table 4 reports the empirical results based on Equation (7). The results in Table 4 imply that OFDI has a positive effect on export diversification of all measures in the consecutive four years after outward investment. Compared with the results in Table 3, the promotion effects of the first year is higher than the average effect over the years after outward investment. The significant coefficients in the first year indicate that the promotion effects materialize very quickly right after the firm conducted overseas investment. The coefficients of *N_ prod, Div_prod* and *Div_mark* reach their maximum in the second year after OFDI, while the other coefficients reach their maximum in the third year. The coefficients in Table 4 show the promotion effect of OFDI approximately follow an inverted U shape. It takes time for the firms to produce new products and discover new destinations. Once a new pattern is formed, it can last for a long time. However, due to data limitation we could not examine the lagged effect for more than four years. Nevertheless, the results do imply that the export promotion effects of OFDI can be maintained with sequential outward investment conducted by firms.

[9] Data are only available up to 2009.

[10] Several robustness checks are conducted in subsection 4.4, suggesting the results are robust.

4.2. OFDI operating strategy and export diversification

As we discussed in Section 2, the specific operating strategies of OFDI might have different effects on export diversification. To test how different types of OFDI firms diversify their exports, we categorize the OFDI firms into different groups. As the main business scopes of every OFDI case are included in the *Directory of Foreign Investment Enterprises*, we can test the effect of heterogeneity operating strategy OFDI on export diversification. In this study, we identify four types of the aforementioned OFDI operating strategies: a. production (PROD); b. information gathering (INFOR); c. trade & sales (TRADE); d. technology acquiring (TECH).

Since the empirical results in subsection 4.1 indicate that promotion effects of OFDI are robust among different proxies for export diversification, we focus on *Div_prod* and *Div_mark* to represent export diversification in this subsection and the following subsections. Table 5 reports the regression results, which indicate that the effects of OFDI on export diversification vary upon different OFDI operating strategies. The coefficients of *ofdipost* in columns (1)-(4) of Table 5 imply that OFDI for production and information gathering have positive effect on firms' export product diversification and export market diversification. The result of columns (5) and (6) reveal that OFDI for trade has positive and statistically significant effect on export product diversification while the positive effect on export market diversification is insignificant. The results of columns (7) and (8) indicate that technology acquiring OFDI has positive but not statistically significant effect on export diversification. This may be due to the fact that technology acquiring is a long-term process that cannot be quickly absorbed by the enterprise and reflected in export products.

4.3. Channels of diversification effect through OFDI

In this subsection, we will examine the potential mechanisms of how OFDI affects firm's export diversification through mediator variables. Based on the discussion in subsection 2.3, we will focus on two channels, namely improving organisational structure and business performance.

There are three steps to test a mediator (Baron and Kenny, 1986). The first is to run the regression of the dependent variable (*ED*) on the independent variable (*OFDI*), which we have already done in the previous subsections. The second is to run the regression of the mediator variables on the independent variable. The third is to run the regression of the dependent variable on both the mediator variables and the independent variable. In other words, we want to confirm that the independent variable is a significant predictor of the mediator variables, and that a mediator variable is a significant predictor of the dependent variable controlling for the independent variable (Yang et al., 2017).

4.3.1. Mechanism—through improving organisational structure

Firm's size reflects the concentration extent of labour, means of production and products within the firm. Large enterprises are easier to achieve economies of scale, because their division of labour is more specialized, which can effectively reduce production costs and set favourable conditions for the diversification of export. OFDI can expand the firm's size and market (Desai et al., 2009; Cozza et al., 2015; Li et al., 2017; Castellani et al., 2017), which could facilitate the firm's export diversification.

We can test the mechanism by using firm size as a mediator variable. Table 6 reveals this connection. Column (1) of Table 6 shows that investing overseas can enlarge the firm's size. The coefficients of firm size in columns (2)-(3) in Table 6 are positive and statistically significant, confirming the idea that large firms have a higher export diversification both at product-level and destination-level.

However, the expansion of firms may suffer from organizational problems since larger firms are more difficult to operate than smaller firms due to their complex organizational structure. This problem is particularly significant for OFDI firms, because a firm investing overseas will face new markets, environments, institutions as well as new cultural. Problems such as information gathered in local market, reverse spillovers of knowledge and technology from subsidiaries, and the communication between headquarter and subsidiaries must be well dealt with. Therefore, headquarter needs to make efforts to improve the firm's management experience and organizational structure. The process will make the OFDI firm more suitable to operate in international market, knowing what and where to export, thus improving the export diversification. We can verify this connection by investigating the causal effect of organisational structure change.

Table 6 employ management competency as a mediator variable to investigate the organisational structure change. This study uses administration expense as a proxy of management competency. We have shown that outward FDI brings more management expertise and organisational skills for the firm, and the raise of management competency enables the firm to produce and operate in a smoother way (Cai, 1999; Herzer, 2011; Cozza et al., 2015; Zhang and Chen, 2020; Zhu et al., 2022). Column (4) in Table 6 shows that investing overseas improves the firm's administration ability, which in turn increases the diversification of its export as shown in columns (5)-(6).

4.3.2. Mechanism—through improving business performance

In Section 2.3, we reviewed the relevant literature and found that OFDI promotes EME's overall performance, their production and innovation capability, and discussed how these performance improvements lead to export diversification. Therefore, we will use firm's performance variables as mediators to test this channel.

Table 7 reports the results of the estimations using firms' performance as mediator variables. Columns (1)-(3) use firm's sales as a

Table 5
OFDI operating strategy and firms' export diversification

	PROD		INFOR		TRADE		TECH	
	Div_prod (1)	Div_mark (2)	Div_prod (3)	Div_mark (4)	Div_prod (5)	Div_mark (6)	Div_prod (7)	Div_mark (8)
ofdipost	0.040**	0.065***	0.019*	0.024*	0.024**	0.014	0.026	0.014
	(2.067)	(3.384)	(1.590)	(1.855)	(2.394)	(1.275)	(0.902)	(0.402)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.169***	0.144***	0.167***	0.152***	0.136***	0.190***	0.160***	0.137***
	(5.359)	(3.848)	(5.543)	(4.193)	(4.731)	(5.723)	(4.996)	(3.720)
N	22093	21938	22811	22656	23965	23794	21610	21458

Source: Authors' estimation.
Notes: t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.

Table 6
Mediator effect: firm size and administration competency

	Mediator Variable: Firm Size			Mediator Variable: Admin cost		
	ln(Firm size) (1)	Div_prod (2)	Div_mark (3)	ln(Admin cost) (4)	Div_prod (5)	Div_mark (6)
ofdipost	0.274***	0.015*	0.023***	0.238***	0.014*	0.021**
	(12.220)	(1.825)	(2.580)	(8.926)	(1.728)	(2.369)
ln(Firm size)		0.025***	0.046***		0.018***	0.029***
		(6.550)	(10.854)		(4.343)	(6.304)
ln(Admin cost)					0.010***	0.027***
					(3.381)	(8.093)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	5.765***	0.091***	0.195***	3.276***	0.142***	0.171***
	(73.357)	(2.879)	(5.398)	(31.579)	(4.306)	(4.618)
N	24885	24885	24885	24846	24846	24846

Notes: t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.
Source: Authors' estimation.

mediator. Higher sales represent higher profitability and positive cash flow on the one hand. This enables the firm to develop and produce new products, thus increasing product diversification. On the other hand, higher sales refer to a larger market share, which contributes to the promotion of market diversification. The positive and statistically significant coefficient of *odfipost* in column (1) implies that firm's sales increase after conducting OFDI, while the positive and statistically significant coefficients of sales in columns (2)-(3) verify that larger sales can promote export diversification.

Columns (4)-(6) in Table 7 use unit value of the firm's products as a mediator variable. Unit value is defined as export value of the product divided by export quantity[11], denoting the quality of the export product. The coefficient of *ofdipost* in column (4) is positive and statistically significant, which implies that OFDI not only can increase the quantity of export but also can promote the quality of export from a firm level perspective. The positive and statistically significant coefficients of unit value in columns (5)-(6) indicate that firms exporting high quality products tend to have a higher export diversification. High-quality products are more competitive in the international market, so they have the capacity to gain more market share, thus increasing export diversification.

4.4. Robustness checks

In this sub-section, we will conduct a series of robustness checks to provide support for the validity of our PSM-DID estimations. Nowadays global economy is characterized by vertical fragmentation of production processes, with different stages of the production taking place in several disparate locations. Developing countries integrated into global value chain (GVC) no longer specialize in the production of specific goods, but in a specific stage of the production process. GVC integration enables developing countries to broaden their export composition, thus increasing the export diversification. However, the export diversification maybe overvalued and does not necessarily reflect the economy's structural transformation and economic development, because developing countries usually engage in low value-added activities such as production and assembly (Mania and Rieber, 2019). China's integration into the GVC is mainly due to its encouragement of processing trade[12]. From 2000 to 2006, processing trade accounted for an average of 55% of China's total trade (Dai et al., 2016). Some literatures consider that China's good export performance is due to its high share of processing trade (Van Assche and Gangnes, 2010). In this subsection, we will check the robustness of this study by deleting the processing trade transactions in CCTS. More specifically, when calculating firm's export diversification variables, we only use ordinary trade (non-processing trade) transactions. The results are reported in Table 8 and we find that the coefficients of *ofdipost* in all columns are positive and statistically significant. The results imply that OFDI can promote export diversification and structure change even taking GVC into consideration.

The samples in previous regressions are firms which have observations for at least three consecutive years, thus taking into account the new firm's entrances and old firm's exit. The production and export decision of newly established firms or firms who are about to exit may be influenced by non-market factors. The export of these firms may have large volatility. Firms existing and survival for a long time, whose production decisions tend to be consistent and coherent, are more suitable samples for empirical analysis. In the following, we will use a balanced panel data of which the firms exist ten consecutive years in the sample period. The results of robustness checks presented in Table 9 show similar patterns as in Table 3 and Table 8. All of the coefficients of *ofdipost* are positive and statistically significant no matter how long the business lasts.

5. Conclusion and policy implications

Emerging economies are experiencing industrial upgrading and structural changes in the process of development, and export plays a significant role in this process. Export-led strategy has contributed to economic growth and created growth miracles in the East Asian emerging economies. In the process of industrial upgrading, emerging economies not only increase the quantity of their export, but also the types of exported commodities and the number of destinations, i.e., their export diversified. Outward foreign direct investment, which is one of the ways to strengthen trade cooperation and avoid trade frictions and

[11] A firm's export unit value is calculated as the weighing average of unit value of all products it exported, with the weight being the share of each product sale in total export sales.

[12] Processing trade are characterized by imports for exports with favourable tariff treatment: firms import parts and other intermediate materials from abroad, with tariff exemption on the imported inputs and other tax preferences from local or central governments, and, after processing or assembling, export the final products abroad.

Table 7
Mediator effect: sales and unit value

	Mediator: sales performance			Mediator: export quality		
	ln(Sales) (1)	Div_prod (2)	Div_mark (3)	ln(unit value) (4)	Div_prod (5)	Div_mark (6)
ofdipost	0.259***	0.018**	0.024***	0.319***	0.017**	0.032***
	(9.170)	(2.142)	(2.619)	(4.852)	(2.062)	(3.589)
ln(Sales)		0.016***	0.047***			
		(4.800)	(12.776)			
ln(unit value)					0.016***	0.011***
					(12.863)	(7.886)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	5.770***	0.143***	0.187***	1.581***	0.210***	0.443***
	(75.053)	(4.856)	(5.467)	(9.991)	(9.842)	(17.087)
N	24885	24885	24885	24878	24878	24878

Notes: t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.
Source: Authors' estimation.

Table 8
Robustness check: samples using ordinary trade

	(1) Export	(2) N_prod	(3) Div_prod	(4) N_mark	(5) Div_mark
ofdipost	0.597***	0.133***	0.020**	0.267***	0.044***
	(8.433)	(4.256)	(2.321)	(7.994)	(4.701)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	9.011***	1.409***	0.286***	1.991***	0.500***
	(41.384)	(14.940)	(11.722)	(20.032)	(18.203)
N	23445	23445	23445	23445	23445

Notes: Export, N_prod and N_mark are in natural logarithm; t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.
Source: Authors' estimation.

Table 9
Robustness check: samples using 10-year balanced panel data

	(1) *Export*	(2) *N_prod*	(3) *Div_prod*	(4) *N_mark*	(5) *Div_mark*
ofdipost	0.613***	0.234***	0.044**	0.350***	0.064***
	(4.828)	(2.674)	(2.332)	(4.084)	(2.767)
Control Variables	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
Constant	10.709***	2.034***	0.438***	2.440***	0.587***
	(52.761)	(13.746)	(16.054)	(18.576)	(14.456)
N	6110	6110	6110	6110	6110

Source: Authors' estimation.
Notes: Export, N_prod and N_mark are in natural logarithm; t-statistics are in parentheses; *p<0.1; **p<0.05; ***p<0.01.

risks, is surging from emerging economies recently. Previous literature has confirmed that OFDI is beneficial to a country's exports. However, the relationship between OFDI and export diversification has been paid little attention. The main aim of this study is to shed light on the impact of OFDI on EME's export diversification. By using a firm-product-level panel dataset over the period 2000–2009, and applying the PSM-DID method, the study provides the following main findings.

First, OFDI has a positive and statistically significant impact on promoting Chinese firms' export product diversification and export market diversification, and the effect of OFDI in promoting export diversification in these two dimensions was significant for several consecutive years after outward investment was made. Second, after dividing the OFDI firms into four types according to their OFDI strategies (motivations), this study finds that production and information gathering OFDI significantly improve export diversification, while the positive effect of trade & sales and technology acquiring OFDI on export diversification are not significant. Third, the results of a further mechanism analysis reveal that OFDI can promote export diversification by improving firm's organisational structure and business performance.

The findings in this study have some policy implications for China as well as for emerging economies. First of all, in the face of industrial upgrading and structural changes, emerging economies need to diversify their export, from labour-intensive products to more capital-intensive products. This is not easy to do because a typical emerging economy is more abundant in labour than in capital. Export diversification means an emerging economy needs to move away from its comparative advantage, producing products with the country's less abundant endowment, say, capital. However, this process would not happen automatically in emerging economies due to the relative price of labour and capital and the "self-discovery" problem. Governments in emerging economies should thus adopt measures such as industrial policies to promote export diversification—and consequently transform domestic productive structures—by means of reducing the cost of capital, with the consequence that the export capital content will exceed the country's capital endowment (Lectard and Rougier, 2018). This study shows that this goal can be achieved by OFDI, providing an alternative way for emerging economies to promote export diversification.

In addition, recently emerging economies, notably China, have been facing fierce trade frictions. The rising frictions for emerging economies are due to their rapid economic development and the expansion of international trade. This is the result of their structural transformation and the evolution of international division of labour. Historically, Japan, South Korea and Taiwan have all experienced peaks of trade friction during their transition to advanced economies, and emerging economies are no exception. Export market diversification is one of the measures for emerging economies to alleviate trade frictions. Our findings send emerging economies a clear message that export market diversification can benefit from OFDI, thereby reducing trade frictions encountered by emerging economies in the process of structural transformation.

Finally, the rise of trade protectionism has brought more uncertainty to the trade of emerging economies such as extreme price and volume fluctuations, which has had a negative impact on their exports. The

results of this study indicate that conducting OFDI would increase the firms' export. This positive effect is not only reflected in the export volume, but also reflected in the export diversification. Therefore, encouraging domestic enterprises to invest overseas is an important way to upgrade their export. Governments in emerging economies should appropriately introduce preferential foreign direct investment policies to help export enterprises become more competitive, laying a solid foundation for the transformation and upgrading of export structure for the whole economy.

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CRediT authorship contribution statement

Song Zhang: Methodology, Investigation, Data curation, Formal analysis, Writing – original draft, Writing – review & editing. **Chunlai Chen:** Conceptualization, Writing – original draft, Writing – review & editing, Supervision. **Haoze Li:** Methodology, Investigation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

No conflict of interest exits in the submission of this manuscript, and the manuscript is approved by all authors for publication. The work described was original research that has not been published previously, and not under consideration for publication elsewhere, in whole or in part.

Data availability

The authors do not have permission to share data.

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