Journal of Asian Business and Economic Studies

Impact of pilot free trade zones on outward foreign direct investment: evidence from China

Markus Leibrecht
Faculty of Finance, City University of Macau, Macau, China
Christian Bellak
Department of Economics, Vienna University of Economics and Business, Vienna, Austria, and
Ming Chen and Zhoufu Yan
College of Economics and Management, Shanghai Ocean University, Shanghai, China

Received 19 December 2024
Revised 1 May 2025
18 June 2025
23 June 2025
Accepted 24 June 2025

Abstract

Purpose – This study investigates the causal impact of pilot free trade zones (PFTZs) on Chinese outward foreign direct investment (OFDI).

Design/methodology/approach – The study uses the concept of ownership advantage (OA) to derive the conceptual link between PFTZs and OFDI. Using Chinese provincial data from 2003 to 2022, the study employs various difference-in-difference estimators to estimate homogeneous and heterogeneous treatment effects.

Findings – Assuming a homogeneous treatment effect on the treated, implementing a PFTZ spurs OFDI. However, considering heterogeneity in treatment effects over cohorts and time diminishes the evidence for a positive impact. A positive causal effect on OFDI is established only for the Shanghai (China) PFTZ.

Practical implications – As China is a leading emerging economy with a state-driven development model, this study has significant implications for other developing and middle-income countries seeking to leverage PFTZs – or similar special economic zones – to stimulate OFDI.

Originality/value – This study conceptually links PFTZs to OFDI through the OA framework and explicitly models heterogeneity of effects across batches of PFTZs and over time. The latter is essential, as institutional differences across PFTZs may result in varying degrees of generation and overseas exploitation of OAs.

Keywords China pilot free trade zone, Outward foreign direct investment, Difference-in-differences, Heterogenous treatment effects, Policy evaluation

Paper type Research article

1. Introduction

Outward foreign direct investment (OFDI) can be paired with knowledge spillovers and technology acquisition and is frequently considered as a means of economic development. China promotes OFDI for financial reasons, increasing the competitiveness of domestic firms by granting access to scarce resources (Becker-Ritterspach *et al*., 2019), and for political reasons, such as extending and securing international influence and fostering energy security (Liu *et al*., 2023). Therefore, improving the institutional environment for FDI is among China's key policy objectives.

JEL Classification — F21, F23, O24

Funding: This work was supported by the National Natural Science Foundation of China (No: 72103134); MOE (Ministry of Education in China) Project of Humanities and Social Sciences (No: 21YJC790139).

Journal of Asian Business and Economic Studies
Vol. 32 No. 3, 2025
pp. 147-159
Emerald Publishing Limited
2515-964X
DOI 10.1108/JABES-12-2024-0557

Therefore, China's pilot free trade zones (PFTZs) are a crucial policy instrument. PFTZs aim at "stabilizing growth, transforming structure, and advancing reform" (UNCTAD, 2023, p. 3). Since 2013, China has established several PFTZs that enjoy greater regulatory flexibility and serve as testing grounds for system innovations (Wang *et al.*, 2022). PFTZs are an example of special economic zones (SEZs), which many emerging countries use to stimulate economic development. SEZs offer a liberalized business climate, characterized by reduced financial and administrative burdens, to foster a thriving business community (Moberg, 2015). In the context of FDI, PFTZs aim to reform the FDI management system by creating a more balanced and competitive business environment for domestic and foreign firms, eventually spurring both inward and outward FDI (see The Overall Plan of China [Shanghai] Pilot Free Trade Zone, 2013) [1]. PFTZs enhance the compatibility between Chinese and global trade rules and reduce or even eliminate trade and investment barriers, achieving trade and investment liberalization. Yao and Whalley (2016) noted that PFTZs significantly reduced foreign investment restrictions and enhanced the national treatment of foreign firms by compressing the negative list, which regulates market access. PFTZs gradually opened the financial sector, enhanced financial service functions, reformed the foreign exchange management system and improved cross-border investment and financing efficiency. These features of PFTZs should facilitate a more balanced competition between domestic and foreign firms, making PFTZs conducive to both inward and outward FDI.

Although several studies have shown that PFTZs are conducive to inward FDI, robust empirical evidence for a causal impact of PFTZs on OFDI needs to be established. As detailed in Section 4, to date, two studies (Bao *et al.*, 2023; Jing *et al.*, 2024) have investigated the association between PFTZs and OFDI. A notable feature of these studies is the assumption of a homogeneous impact of PFTZs on OFDI over cohorts and time. This study narrows a critical gap in the literature by recognizing that PFTZs and their effects on OFDI are heterogeneous. Given China's geographically dispersed PFTZs with substantial institutional variations (as highlighted in the Report on the 10th Anniversary of China's Pilot Free Trade Zone [2013–2023], 2023) [2], impact heterogeneity is plausible *a priori*: Institutional differences across PFTZs may result in differences in the generation and the possibilities to exploit given ownership advantages (OAs). The latter are preconditions for OFDI (Dunning, 1988; Hymer, 1960). From an economic policy perspective, accounting for heterogeneity is important as assuming a homogeneous impact across PFTZs and time may lead to biased estimation results and policy conclusions. The study therefore applies various recently developed estimators for heterogeneous treatment effects (Wooldridge, 2021; Callaway and Sant'Anna, 2021; Dube *et al.*, 2025), which sets this study apart from Bao *et al.* (2023) and Jing *et al.* (2024), who rely on the canonical two-way-fixed effects estimator. The application of this estimator in the case of heterogeneous treatment effects is problematic due to the "forbidden comparisons" problem (Roth *et al.*, 2023).

This study addresses two relevant questions for China: (1) Do PFTZs promote OFDI? (2) Is there heterogeneity in any impact across the different batches of PFTZs? By answering these questions, this study contributes to the literature investigating the determinants of Chinese OFDI and the economic impacts of PFTZs. The broader literature on Chinese OFDI focuses on various host-country-related determinants but frequently neglects home-country-related factors, particularly PFTZs. PFTZs have been linked with inward FDI, the home region's innovative capacity, financial development, enterprise innovation or green innovation efficiency. Financial development and enterprise innovations are key transmission mechanisms determining how PFTZs influence OFDI. Thus, while mediating effects in the PFTZ–OFDI relationship have been thoroughly researched, the total impact of PFTZs on OFDI remains underexplored.

The remainder of this paper is structured as follows. Section 2 provides background on China's PFTZs. Section 3 discusses why PFTZ matter for OFDI. Section 4 summarizes the selected empirical literature on the relationship between PFTZs and FDI. Sections 5 and 6 outline the empirical methodology, data and variables used. Section 7 presents the results. Finally, Section 8 concludes the paper.

2. Chinese PFTZs: institutional background and features

Beginning in 1978, China established SEZs as "testing grounds" for economic reforms. Over time, SEZs have evolved into diverse forms and functions, including PFTZs. In September 2013, China established its first PFTZ, the Shanghai Free Trade Zone. To date, China has established 21 PFTZs in six batches [3].

PFTZs are utilized to explore strategies for coping with global economic and trade developments and to accumulate experience in building an open economy, which is then applied to shape economic reform in other policy areas of the country (UNCTAD, 2023). PFTZs closely align with national strategies and complement China's overarching economic policies, such as the "14th Five-Year Plan" and its "Manufacturing Powerhouse Strategy." PFTZs are pivotal for Beijing's goal of fostering economic integration with neighboring countries, particularly in South-South regional economic partnerships (UNCTAD, 2023).

Regarding investment, including FDI, PFTZs improve the business environment through simplified administrative procedures and a liberalized service sector, such as trade and finance. The institutional innovations implemented by the PFTZs have expedited China's reform and opening in trade, investment and finance. PFTZs have attracted an increasing number of domestic and foreign financial institutions through measures such as establishing an international market for financial transactions, expanding the scope of cross-border RMB use and establishing a free trade accounting system. PFTZs have also conducted a series of institutional innovations in customs supervision, port clearance (trade facilitation) and cross-border financing (Yao and Whalley, 2016). Liberalizing and facilitating cross-border financing enable enterprises to obtain domestic and foreign funds at lower interest rates, thereby reducing their financing costs and promoting the optimal allocation of financial resources (Yao and Whalley, 2016). Any PFTZ-registered firm can benefit from the financial system innovations offered by the PFTZ (Hu *et al.*, 2022). Hence, PFTZs are not biased against foreign or domestic firms [4].

An institutionally important feature of PFTZs in China is that central government agencies only play a coordinating role. Local levels are responsible for developing and implementing the PFTZs. This localized governance structure indicates the sensitivity of PFTZs to local and regional economic and social challenges (UNCTAD, 2023) [5]. The localized decision-making is also conducive to overcoming the "knowledge problem," which is at the heart of many failures of centrally planned (and executed) policy initiatives, including SEZs (Moberg, 2015). As Moberg (2015) noted, "In a politically decentralized system, zone authorities are more likely to try out very different models" (p. 175). While all PFTZs aim at "stabilizing growth, transforming structure, and advancing reform" (UNCTAD, 2023, p. 3), the Chinese PFTZs have "regional specializations based on a province's competitive positioning. Identifying the peculiarities of local conditions and positioning on regional advantages and peculiarities has been emphasized. As such, the 21 PFTZs are not identical and are not based on generic prescriptions" (UNCTAD, 2023, p. 4).

For instance, the Shanghai PFTZ leverages its position as a global financial and logistics (shipping) hub, attracting regional headquarters of multinational corporations and fostering innovation and technological leadership. Conversely, the Hunan PFTZ prioritizes China–Africa economic ties, while the Yunnan and Guangxi PFTZs emphasize cross-border cooperation with ASEAN nations (UNCTAD, 2023). Aligning with their distinct policy goals, the various PFTZs also differentiate themselves through the specific policy instruments used to achieve their objectives. For instance, the Shanghai PFTZ heavily relies on tax concessions, measures to attract domestic and foreign talent, laws and regulations for the international transfer of funds and global data exchange platforms (UNCTAD, 2023). These policy tools are conducive to R&D and in turn to the generation of OAs. Conversely, the Guangxi and Yunnan PFTZs implemented policies to enhance logistics efficiency, for example, through anti-congestion measures such as smart logistics control platforms, which enable automatic early warning of abnormalities (UNCTAD, 2023). The Guangxi PFTZ also promotes trade with ASEAN countries by developing a "Two Countries Twin Parks" cooperation mechanism, an

innovative model of international collaboration where two countries establish interconnected industrial parks to promote economic and trade ties (Zhang, 2021).

Hence, China's 21 PFTZs are localized instruments stabilizing growth, transforming its structure and advancing reform. The PFTZs have different policy objectives and employ various policy instruments. This heterogeneity in goals and instruments makes heterogeneity in the OFDI impact of PFTZs *a priori* more plausible than a homogeneous impact.

An essential challenge PFTZ face is the possible long-term, structural market segmentation between regions within China (Zhao *et al.*, 2022). Reform measures taken by PFTZs should eventually be replicated in non-PFTZ regions. However, due to the long-standing regional division in China, the capacity for regional coordinated development remains weak, leading to significant lags in policy replication (Liu and Kong, 2021). Economic reforms of the business environment are confined to the PFTZ region, with the possibility that non-PFTZ regions may fall further behind in their economic development. In terms of FDI, both inward and outward, this possibility manifests itself in beggar-thy-neighbor effects (Du *et al.*, 2023). At the enterprise level, this possibility manifests itself in differences in access to financial funds between firms within a PFTZ and those outside it (Liu and Kong, 2021).

Another challenge is that PFTZs might create "windfall effects," where financial benefits are received without contributing to the intended purpose, such as subsidies being granted to projects that would have been conducted regardless of the financial aid (e.g. Haan and Simmler, 2018).

PFTZs may also be challenged by an "incentive problem" (Moberg, 2015), arising because policies are implemented by individuals with selfish interests. PFTZs may then become an instrument for personal gains (Moberg, 2015). However, in the case of Chinese PFTZs, the incentive problem's importance is likely relatively minor due to the specific governmental governance system in the country (Bardhan, 2020).

3. Why do PFTZs matter for OFDI?

PFTZs matter for OFDI for two reasons: (1) They help firms in generating new and in using already existing ownership (or firm-specific) advantages and (2) They have a signaling function for Chinese firms.

Hymer's (1960) seminal work introduces the idea that firms need a (monopoly) advantage to successfully compete overseas. The monopoly advantage is necessary to overcome the "liability of foreignness," the additional costs incurred by firms to compete in foreign markets (Zaheer, 1995). Hymer's idea is central in Dunning's eclectic OLI paradigm (e.g. Dunning, 1988). This paradigm posits that an OA is necessary for firms to compete effectively overseas.

One type of OA is asset-based, encompassing product, process innovations and advanced technology. Another type is institution-based, encompassing the formal rules and regulations that govern firms' value activities, such as access to finance (see Table 1 in Lundan, 2010). Hence, OAs' existence and extent crucially hinge on the home country's economic and institutional characteristics, such as the innovation system and public policy toward OFDI (Lundan, 2010).

PFTZs are conducive to generating OAs. PFTZs drive institutional and regulatory innovations, creating a more liberal environment. Tax concessions and an influx of talent enhance knowledge exchange and technological efficiency. Additionally, PFTZs promote firm agglomeration, resulting in knowledge spillovers, enhanced R&D and increased effective resource allocation (Liu and Wang, 2018). Hence, PFTZs are among China's many home-country-specific advantages, which enhance enterprises' innovative capacity, eventually allowing firms to generate OAs (see Rugman *et al.*, 2016). Empirically, PFTZs' positive impact on enterprises' capacity to innovate is well established (e.g. Su and Wang, 2024 and the Online Appendix).

Furthermore, via financial deregulation, PFTZs help firms expand their *existing* OAs abroad. Financial system liberalization within PFTZs provides easier access to funding.

Domestic banks can directly lend to companies' free trade accounts, reducing transaction and corporate financing costs. Cross-border RMB pools and convertibility ease foreign exchange access and transaction settlement (Yao and Whalley, 2016). Conducting OFDI and thus exporting their OAs becomes less costly for firms located within a PFTZ. Empirically, PFTZs' positive impact on financing conditions is well established (e.g. Wang *et al*., 2022; Online Appendix).

The second reason PFTZs matter for OFDI lies in the specific relationship between the Chinese State and domestic firms, the *Lishu relationship* (Buckley, 2018; Becker-Ritterspach *et al*., 2019). The Lishu, or jurisdictional relationship, signifies a specific control system in China. Lishu refers to the notion that the Chinese government, at various levels, directly influences firms' business strategies.

Liu *et al.* (2023) showed that Chinese OFDI is politically motivated. PFTZs signal this policy priority to Chinese firms. Lishu is consistent with the view that "strategic priorities of some Chinese firms reflect political rather than solely commercial objectives, resulting potentially in investments abroad that would not otherwise have occurred." (Becker-Ritterspach *et al*., 2019, p. 70). The empirical relevance of the political connectedness of firms and the relevance of Lishu is, for example, evidenced by the Chinese National Bureau of Statistics (NBS) coding enterprises according to government affiliation (Buckley, 2018, p. 211).

4. PFTZs and FDI: related Empirical literature

Several studies have investigated the impact of PFTZs on inward FDI. Chen *et al.* (2021) employed a difference-in-differences (DiD) approach to investigate PFTZs' impact on inward FDI. They found that the number of newly registered foreign-invested enterprises substantially increased once a city established a PFTZ. They also found some heterogeneity across PFTZs, as the positive impact was confined to cities that had already implemented an SEZ. Similarly, using provincial data (2009–2017), Li *et al.* (2021) showed that FTZs enhance FDI by improving the business environment, easing entry barriers and fostering industrial agglomeration. Zhang and Wang (2023) highlighted spatial interrelationships in inward FDI, using data (2005–2018) from 47 Chinese cities. They found that coastal PFTZs inhibited FDI inflows to neighboring areas, whereas inland PFTZs did not have a significant impact.

The study closest to ours is Bao *et al.* (2023), which, among other variables, analyzed the impact of PFTZs on OFDI at the provincial level. Bao *et al.* (2023) applied a DiD approach and found that establishing PFTZ increases inward FDI, with a limited impact on trade. Bao *et al.* (2023) is the only study to link PFTZs with OFDI and used province-level data (2010–2016) to estimate a homogeneous treatment effect for the first two batches of PFTZs, finding that establishing a PFTZ increases OFDI. Jing *et al.* (2024) investigated the role of PFTZs in the international expansion of firms, using overseas sales revenues of Shanghai and Shenzhen A-share listed enterprises and the number of countries where overseas subsidiaries are located to operationalize firms' overseas expansion and found that PFTZs promote overseas expansion.

As shown in Section 2, China's geographically scattered PFTZs exhibit significant institutional differences, which likely result in diverging degrees of OAs of firms located in the PFTZ. Therefore, homogeneous treatment effects over cohorts and time are a relatively strong assumption. Thus, this study tested the following hypothesis.

H1. The causal impact of establishing a PFTZ on OFDI in China varies over batches of PFTZs and over time.

Investigating the heterogeneity in the PFTZs' effect on OFDI through an appropriate empirical methodology should reveal divergent Average Treatment Effects on the Treated (ATTs) masked under the homogeneity assumption, thereby identifying which PFTZ designs are most effective in promoting OFDI [6].

5. Empirical methodology

Under the assumption of a homogeneous treatment effect, the basic DiD model can be expressed as follows:

$$lnOFDI_{it} = \mu + \alpha_1 D_{it} + \alpha_2 X_{it} + A_i + B_t + \varepsilon_{it} \quad (1a)$$

$$D_{it} = Treat_i * Post_t \quad (1b)$$

where $\boldsymbol{i}$ and $\boldsymbol{t}$ denote province and year; $\boldsymbol{OFDI_{it}}$ is a measure of OFDI from province $\boldsymbol{i}$ in year $\boldsymbol{t}$. $Treat_i = 1$ if the province has established a PFTZ and 0 otherwise; $Post_t$ is coded 1 once a PFTZ has been established in a province and 0 otherwise. $\boldsymbol{X_{it}}$ is a set of control variables and $\boldsymbol{A_i}$ and $\boldsymbol{B_t}$ are province- and time-fixed effects. Coefficient $\boldsymbol{\alpha_1}$ represents the homogeneous ATT.

Equation (1) can be estimated by the two-way fixed effects (TWFE) estimator. The TWFE estimates a weighted average of all possible 2x2 DiD estimates (Roth *et al.*, 2023). However, when effects are heterogeneous and treatment adoption is staggered, comparing treated groups with already treated control units can introduce negative weights and bias the TWFE estimates (Roth *et al.*, 2023).

Hence, this study employs two estimators for heterogeneous treatment effects. Wooldridge (2021) introduced the extended TWFE (ETWFE) estimator. Wooldridge's (2021) approach explicitly models the heterogeneity in the treatment effect. The TWFE estimator is then applied to the more general empirical model. Specifically, the ETWE incorporates interaction terms between the treatment indicator, D_{it}, cohort dummies (representing PFTZ batches), post-treatment periods and cohort-mean-centered, pre-treatment covariates in Equation (1) while excluding time-varying X_{it}. This flexibility allows the ETWFE to estimate heterogeneous treatment effects. Equation (2) summarizes the ETWFE model used in the analysis, abstracting from covariates (see Wooldridge, 2021).

$$lnOFDI_{it} = \mu + \sum_{g=q}^{T} G_{ig}\partial_g + \sum_{s=q}^{T} f_s\gamma_s + \sum_{g=q}^{T}\sum_{s=g}^{T} D_{it}G_{it}f_s\alpha_{gs} + \varepsilon_{it} \quad (2)$$

where f_s signifies post-treatment years, q indicates the first year of treatment and g captures the group to which a treated province belongs (i.e., the batches of PFTZs established). The α_{gs} are the cohort- and time-specific ATTs. The included (time-invariant) covariates interact with the relevant variables in the model, while one must control for variation in the covariates when calculating the standard errors of the estimators (Stata Corp, 2023).

Callaway and Sant'Anna (2021) proposed an alternative to the ETWFE, the regression adjustment estimator (RA) [7]. Similar to the ETWFE estimator, the RA estimator models the outcome equation (Equation (1a)). The RA estimator is based on estimating group-specific ATTs for each pair of years (group-time-specific ATTs), similar to the canonical 2x2 DiD estimator. The control group included either the never-treated or not-yet-treated units (Stata Corp, 2023). The various ATTs are then aggregated to obtain group-specific, time-specific or overall ATTs (Callaway and Sant'Anna, 2021; Roth *et al.*, 2023).

6. Data and variables

6.1 Variables of main interest

OFDI is a province's non-financial FDI outflow. Data were obtained from the Statistical Bulletin of China's OFDI, released by the Ministry of Commerce of China. Non-financial FDI outflow refers to direct investments (greenfield and brownfield) made by enterprises and institutions based in a Chinese province into overseas entities, excluding financial sectors such as banking, insurance and securities. Non-financial FDI stocks and flows account for approximately 90% of total (non-financial plus financial) Chinese OFDI stocks and flows. FDI refers to investments that are directly owned or have 10% or more voting rights (or equivalent) held by Chinese investors (MOFCOM, 2023).

The analysis uses the log of OFDI to capture non-linearities in the relationship between OFDI and the establishment of a PFTZ. From 2003 to 2022, the majority of OFDI data have been non-negative [8]. Only two provinces, Qinghai in 2021 and Chongqing in 2022, reported negative OFDI. Several provinces reported zero or missing OFDI values in 2003 and 2004. Guizhou reported zero values in 2005 and 2006 and Tibet recorded zero OFDI until 2008. The regressions in this study are based on OFDI data spanning from 2009 to 2022. The years 2003–2008 are used to generate constant, pre-sample values of predictor variables. Therefore, only the two negative OFDI observations recorded in 2021 and 2022 are lost.

Given the absence of suitable city-level OFDI data (most cities do not report OFDI in their statistical yearbooks), the analysis focuses on PFTZs' impact on OFDI at the province level [9]. However, PFTZs are predominantly located in a province's economically dominant city or cities, from where the majority of OFDI emerges. Additionally, Liu and Feng (2024) found that PFTZs enhance the innovative capacity in the region in which they are located. Hence, OAs and OFDI in the entire region are spurred by the presence of a PFTZ. Furthermore, Du *et al.* (2023) emphasized that PFTZs might attract firms away from neighboring areas within the same province, resulting in "beggar-thy-neighbor" effects and exacerbating regional disparities within a province. The findings of Liu and Feng (2024) and Du *et al.* (2023) suggest that a focus on the provincial level is justified in itself.

D_{it} is constructed based on the list of PFTZs published by the Ministry of Commerce of China. The study covers the complete set of six PFTZ batches. The treatment group comprises provinces with PFTZs, while the control group includes provinces that have never been treated.

6.2 Control variables

The study considers several control variables related to the probability of establishing a PFTZ, which also influence a province's capacity to help firms generate new and utilize existing opportunities for growth. The Online Appendix (Section A6.2) details the rationale for choosing control variables.

Estimations also include province- and year-fixed effects. Year-fixed effects capture the impact of common shocks on OFDI, such as the COVID-19 pandemic or the aftermath of the 2008 financial crisis. Province-fixed effects capture time-invariant or slowly developing, province-specific determinants of OFDI, for example, the extent and quality of the institutional environment.

In the TWFE estimations, GDP-based control variables are lagged by one year to mitigate the impact of the PFTZ implementation on control variables. In the heterogeneous treatment effect estimations, the average of the control variables over the pre-treatment years 2003–2008 is used. Table A2 [10] includes descriptive statistics for the variables considered in the analysis and Table A3 [10] displays the pairwise correlation coefficients. Correlations are below 0.8, a frequently used cut-off value for multicollinearity issues.

Figures A1a [10] and A1b [10] contain plots of the endogenous variable ($\ln OFDI_{it}$) separated by batches of PFTZs. The general upward trend in OFDI indicates China's growing importance as an FDI source. A pronounced upward shift in OFDI is only visible for the 2013 batch, the Shanghai PFTZ. However, the figures do not report the development of OFDI in the counterfactual scenario where the PFTZ is absent.

7. Results

7.1 Baseline results

Table A4 [10] reports the TWFE regression results for homogeneous ATTs. The table also provides wild-bootstrapped *p*-values (Roodman *et al.*, 2019) in []. The results in Column (4) indicate that establishing a PFTZ leads to an approximately 57% increase in OFDI (100*(exp (0.345) − 1)). This effect aligns with Bao *et al.*'s (2023) finding of a $2.35 increase in OFDI.

Moreover, Jing *et al.* (2024) found that the number of overseas countries increases by around 2.6% and the proportion of overseas sales increases by 0.0052% points, which, evaluated at the mean proportion, results in a rise from 4.6 to 5.1%.

Three control variables fall short of statistical significance. However, the GDP-related variables, financial development and endowment with human capital are statistically significant at conventional significance levels and with expected signs. The results for the treatment variable, D_{it}, are robust to the stepwise exclusion of insignificant control variables. Moreover, the VIFs indicate that multicollinearity among regressor variables is unlikely to drive the statistical insignificance of Openness, $R\&DExpenGDP_{it}$ and $GovExpGDP_{it}$.

The TWFE for homogeneous ATTs is biased in the presence of treatment effect heterogeneity. Table A5 [10] includes results from the ETWFE and RA estimators. The underlying estimations allow for full heterogeneity in ATTs over cohort and time. However, as this analysis is interested in batch-specific ATTs, Table A5 shows the aggregated (over the years) ATT for each batch of PFTZs, suggesting that, for the 2013 batch of PFTZs, a positive causal impact of the PFTZ on OFDI occurs. For the 2017 batch, the RA estimator suggests a statistically positive effect, while the ETWFE estimate falls short of statistical significance.

Table A6 [10] displays the ATTs over time for the 2013 and 2017 batches. For the 2013 batch, the RA-based estimators show mainly positive ATTs, which are statistically significant in most cases. The ETFWE allows only a more conservative interpretation: while most ATTs are positive, many fall short of statistical significance. For the 2017 batch, evidence of a positive impact is substantially weaker, as most ATTs are statistically nonsignificant. Overall, the evidence in Tables A5 [10] and A6 [10] supports the view that establishing the Shanghai PFTZ is conducive to OFDI. This finding is also consistent with Figures A1a [10] and A1b [10].

7.2 Parallel trends plausibility and robustness check

The validity of DiD estimators relies on the assumption of parallel trends (Roth *et al.*, 2023). We use an event-study plot to assess this assumption. We apply the recently developed Local Projection DiD estimator (LP-DiD) for this aim. Dube *et al.*'s (2025) LP-DiD not only allows for the investigation of parallel trends, but its flexibility also allows the inclusion of a lagged dependent variable, a feature we will exploit in the following robustness check. The LP-DiD estimator extends Jordà's (2005) Local Projection approach to the DiD setting. The local projection approach provides a method for estimating impulse responses (IRs) without relying on the specification of a multivariate dynamic system. It involves estimating IRs directly at each forecast horizon (h) using OLS (Jordà, 2005). The LP-DiD concentrates on specific time intervals (h-period forecasts), enabling researchers to observe how the treatment's impact evolves, offering a dynamic perspective. The LP-DiD selects control and treated groups to minimize biases arising from "forbidden comparisons" and negative weighting (Dube *et al.*, 2025).

Figure A2 [10] shows the event-study plot derived using the LP-DiD for our baseline model. The figure underscores the plausibility of parallel trends, as the pre-treatment ATTs do not statistically differ from zero individually and aggregated (p-value = 0.19). The nonsignificant post-treatment ATTs indicate that, when taken together, PFTZs are not conducive to OFDI. However, the Shanghai PFTZ is an exception to this general finding, as indicated by the results in Tables A5 [10] and A6 [10].

The empirical models used in the analyses do not consider inertia in OFDI. While inertia is easily modeled using a lagged-dependent variable (Lag_OFDI_{it} (log)), this poses estimation challenges in a panel data setting. However, Dube *et al.*'s (2025) *LP-DiD allows for* the inclusion of lagged-dependent variables. Figure 1 shows the event-study plot when we extend our baseline model by a lagged-dependent variable. The figure is consistent with parallel trends (p-value of the aggregated ATT = 0.33). Furthermore, post-treatment ATTs are positive

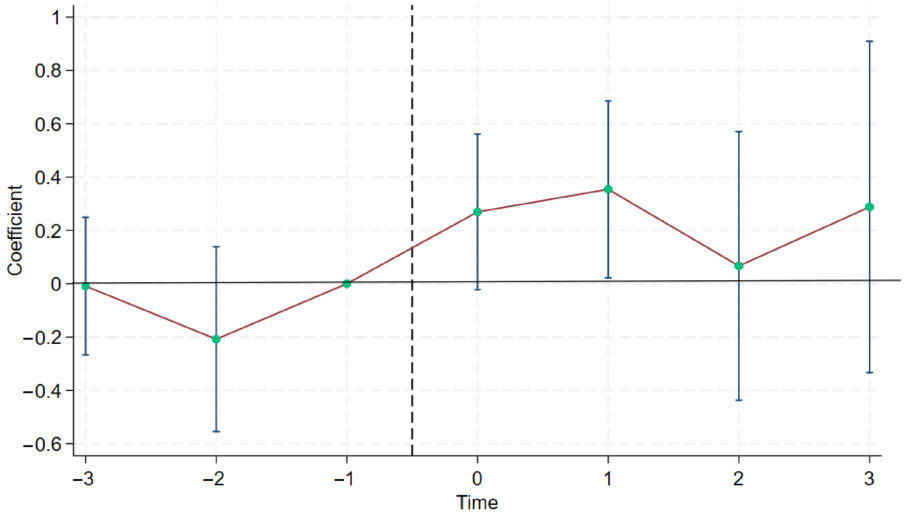

Figure 1. PFTZs and OFDI: dynamic model. Note: Generated using the LPDiD estimator of Busch and Girardi (2023). Source: Figure created by authors

but still fall mostly short of statistical significance, although the evidence for a significant effect is somewhat stronger than in Figure A2 [10]. Hence, explicitly accounting for inertia in OFDI does not change our substantive findings.

8. Conclusions

Several reasons may explain the generally negligible impact of Chinese PFTZs on OFDI. The induced innovations may not be strong enough to generate OAs that can overcome the "liability of foreignness." Hence, "innovations for China" must be transferred or enhanced into "innovations for the world" (see Appelbaum *et al.*, 2018). Another reason for the lack of a positive impact could be the presence of "beggar-thy-neighbor" effects (Du *et al.*, 2023): OFDI emerging from a province is conducted from the PFTZ rather than elsewhere within the province. Hence, while OFDI from the PFTZ is increasing, the net effect for the province is negligible.

Given that China is a leading emerging economy with a state-driven development model, this study has significant implications for other developing and middle-income countries seeking to leverage PFTZs (or similar special economic zones) to stimulate OFDI. Several emerging economies (e.g. Brazil, South Africa, Thailand) are transitioning from being net FDI recipients to outward investors. Understanding whether PFTZs act as OFDI catalysts is crucial for policymakers designing similar zones. Our results indicate that PFTZs are not a panacea in this respect; only the Shanghai PFTZ is conducive to OFDI.

What sets the Shanghai PFTZ apart from the other PFTZs? The Shanghai PFTZ distinguishes itself in several dimensions:

(1) High level of internationalization. The Shanghai PFTZ is characterized by its strong international connectivity, offering a platform for enterprises to engage with global markets (Hu, 2017; Wang, 2017).

(2) Financial openness and innovation. The Shanghai PFTZ serves as a testing ground for financial innovation, offering services such as cross-border RMB transactions and innovative foreign exchange management (Song, 2024).

(3) Policy flexibility and innovation. Its policies are notably more adaptable compared with other PFTZs, allowing timely adjustments in response to market demands and fostering greater opportunities for enterprise growth (Hu, 2017; Wang, 2017).

(4) Enhanced legal environment. It features a legal framework that is both internationally aligned and market-oriented, creating a predictable and stable environment for businesses. Compared with other pilot zones, the Shanghai PFTZ provides a more secure legal setting (Hu, 2017; Song, 2024).

(5) Strong focus on R&D. It serves as an R&D hub, boasting world-class infrastructure and a robust commitment to facilitate R&D collaboration. The PFTZ actively aims to promote the co-location of universities and domestic and international firms, enabling innovations in AI, shipping and financial technologies for China and the world (UNCTAD, 2023).

Hence, the liberalization of the financial industry, providing a stable and credible legal environment and bringing various R&D players together are key to the success of PFTZs in promoting OFDI. Additionally, overcoming the knowledge and incentive problems is crucial (Moberg, 2015). For many emerging economies, a state-driven approach, based on decentralized political decision-making and an incentive scheme that disincentivizes rent-seeking, is a precondition for success.

This study also has limitations. First, estimators for heterogeneous treatment effects may lack statistical power (Egerod and Hollenbach, 2024). Consequently, further research based on more extensive (city-level) and extended OFDI data are necessary to reevaluate the causal impact of PFTZs on OFDI. Moreover, estimators for heterogeneous treatment effects still rely on stringent assumptions. Our robustness checks are consistent with parallel trends (Figure A2 [10]). By using Dube *et al.*'s (2025) estimator and including a lagged-dependent variable in our empirical model, we accounted for (short-lived) anticipation effects. However, spillover effects may exist, which further studies could model by adopting a spatial econometric approach.

Due to data unavailability, we cannot fully control for factors such as institutional differences across provinces. The possibility of a time-varying omitted variable bias, despite the plausibility of parallel trends, cannot be excluded. Relatedly, as Su and Wang (2024) stressed, the placement of PFTZs may not be entirely exogenous. Policymakers may strategically place PFTZs in areas with firms that have a high potential to generate OAs. Su and Wang (2024) employed an IV approach to address endogeneity issues with industrial sulfur dioxide emissions and the length of urban sewage pipes as instrumental variables; while their approach could guide further research, more disaggregated city-level OFDI data are necessary.

Declaration of interest

This manuscript has not been published or presented elsewhere in part or in entirety. The authors declare that there are no conflicts of interest.

Notes

1. Available at https://news.12371.cn/2013/09/27/ARTI1380265262444743.shtml; accessed on 30.11. 2024.
2. Available at https://www.caitec.org.cn/n6/sy_xsyj_yjbg/json/6484.html; accessed on 30.11. 2024.
3. Table A1 [10] captures the establishment of China's PFTZs.
4. China uses a "negative list" approach in its PFTZs, which specifies industries where foreign investment is restricted or prohibited. In this sense, PFTZs discriminate against foreign firms. However, outside these industries, foreign firms are treated identical to domestic ones (for the negative list see: https://www.china-briefing.com/news/china-free-trade-zones-negative-list-for-foreign-investment-english/; accessed on June 3rd 2025). One goal of PFTZs is to attract FDI,

which could lead to a preferential treatment of foreign-owned firms within PFTZs (e.g. special income tax concessions for foreign senior staff). Conversely, domestic firms may benefit from broader government policies and support mechanisms that extend beyond the PFTZs, such as subsidies or access to state-backed financing or preferential treatment in public tenders. Hence, while PFTZs aim for a balanced business environment for domestic and foreign firms, PFTZs' practical impact in this respect can vary depending on the industry, the PFTZ, and even the firm's country of origin.

5. According to UNCTAD (2023), some SEZs, particularly the Chinese "Economic and Technological Development Zones" and "High-tech Industrial Development Zones," fall directly under the Ministry of Commerce and Ministry of Science and Technology of China, respectively.
6. The Online Appendix (Section A4.2. Transmission Mechanisms) includes a brief survey of the empirical literature on the relationship between PFTZs and innovation and financial development.
7. Callaway and Sant'Anna (2021) also developed an inverse probability weights-based estimator and doubly robust estimator. These estimators model the treatment equation. Due to the relatively low number of treated units (PFTZs), these two estimators are unsuitable for this study.
8. 2003 and 2022 are the first and most recent years for which OFDI data have been released (as of December 2024).
9. Two firm-level databases that might be useful for city-level analyses are the China Global Investment Tracker (American Enterprise Institute (AEI)) and Financial Times FDI Markets database. However, while the former is freely available, it only includes large investment projects (> USD 100mn). The latter database includes only greenfield investment projects as detected and collected by the Financial Times and is not freely available.
10. Please see it on the Online Appendix

Supplementary material

The supplementary material for this article can be found online.

References

Appelbaum, R.P., Cao, C., Han, X., Parker, R. and Simon, D. (2018), *Innovation in China: Challenging the Global Science and Technology System*, John Wiley & Sons, Cambridge.

Bao, T., Dai, Y., Feng, Y., Liu, S. and Wang, R. (2023), "Trade liberalisation and trade and capital flows: evidence from China pilot free trade zones", *The World Economy*, Vol. 46 No. 5, pp. 1408-142, doi: 10.1111/twec.13387.

Bardhan, P. (2020), "The Chinese governance system: its strengths and weaknesses in a comparative development perspective", *China Economic Review*, Vol. 61, 101430, doi: 10.1016/j.chieco.2020.101430.

Becker-Ritterspach, F., Allen, M.L., Lange, K. and Allen, M. (2019), "Home-country measures to support outward foreign direct investment: variation and consequences", *Transnational Corporations*, Vol. 26 No. 1, pp. 61-85, doi: 10.18356/a98759e5-en.

Buckley, P.J. (2018), "Internalisation theory and outward direct investment by emerging market multinationals", *Management International Review*, Vol. 58 No. 2, pp. 195-224, doi: 10.1007/s11575-017-0320-4.

Busch, A. and Girardi, D. (2023), "LPDID: stata module implementing local projections difference-in-differences (LP-DiD)", Statistical Software Components S459273, Boston College Department of Economics.

Callaway, B. and Sant'Anna, P.H. (2021), "Difference-in-differences with multiple periods", *Journal of Econometrics*, Vol. 225 No. 2, pp. 200-230, doi: 10.1016/j.jeconom.2020.12.001.

Chen, H., Yuan, B. and Cui, Q. (2021), "'Does the pilot free trade zone policy attract the entry of foreign-invested enterprises?' The evidence from China", *Applied Economics Letters*, Vol. 28 No. 14, pp. 1162-1168, doi: 10.1080/13504851.2020.1803482.

Du, J., King, C. and Shi, X. (2023), "Prosper or beggar thy neighbour: industrial policy effect of free trade zones", *PLoS One*, Vol. 18 No. 10, e0293444, doi: 10.1371/journal.pone.0293444.

Dube, A., Girardi, D., Jordà, Ò. and Taylor, A.M. (2025), "A local projections approach to difference-in-differences", NBER Working Paper 31184.

Dunning, J.H. (1988), "The eclectic paradigm of international production: a restatement and some possible extensions", *Journal of International Business Studies*, Vol. 19 No. 1, pp. 1-31, doi: 10.1057/palgrave.jibs.8490372.

Egerod, B.C.J. and Hollenbach, F.M. (2024), "How many is enough? Sample size in staggered difference-in-differences designs", OSF Preprints ac5ru, Center for Open Science.

Haan, P. and Simmler, M. (2018), "Wind electricity subsidies—a windfall for landowners? Evidence from a Feed-in Tariff in Germany", *Journal of Public Economics*, Vol. 159, pp. 16-32, doi: 10.1016/j.jpubeco.2018.01.011.

Hu, J. (2017), "A retrospective view on the first three years of China (Shanghai) pilot free trade zone", *The Chinese Economy*, Vol. 50 No. 4, pp. 225-237, (in Chinese), doi: 10.1080/10971475.2017.1321458.

Hu, Y., Zhang, Y. and Liu, K. (2022), "Economic externalities of inland free trade zones: 'radiation effect' or 'siphon effect?'", *World Economic Research*, Vol. 02, pp. 54-72, (in Chinese).

Hymer, S.H. (1960), "The international operations of national firms: a study of direct foreign investment", (Doctoral dissertation), Massachusetts Institute of Technology, Boston.

Jing, W., Zheng, Y. and Shen, X. (2024), "Does the establishment of Pilot Free Trade Zones promote international expansion of enterprises? Quasi-natural experimental evidence from China", *PLoS One*, Vol. 19 No. 8, e0308477, doi: 10.1371/journal.pone.0308477.

Jordà, Ò. (2005), "Estimation and inference of impulse responses by local projections", *American Economic Review*, Vol. 95 No. 1, pp. 161-182, doi: 10.1257/0002828053828518.

Li, R., Ao, Y. and Li, Z. (2021), "A quasi-natural experiment research about the impact of FTZ establishment on FDI to China", *Word Economy Studies*, Vol. 8, pp. 91-106+137.

Liu, C. and Feng, G. (2024), "Can pilot free trade zones promote sustainable growth in urban innovation?", *Sustainability*, Vol. 16 No. 13, p. 5360, doi: 10.3390/su16135360.

Liu, Z. and Kong, L. (2021), "From segmentation to integration: obstacles and countermeasures for promoting the construction of a unified domestic market", *China Industrial Economy*, Vol. 08, pp. 20-36, (in Chinese).

Liu, B. and Wang, Y. (2018), "Research on the impact of free trade zones on regional innovation capacity: evidence from the Shanghai pilot free trade zones", *Economic and Management Research*, Vol. 39 No. 9, pp. 65-74.

Liu, Y., Li, X., Zhu, X., Lee, M.K. and Lai, P.L. (2023), "The theoretical systems of OFDI location determinants in the global north and global south economies", *Humanities and Social Sciences Communications*, Vol. 10 No. 1, pp. 130-145, doi: 10.1057/s41599-023-01597-y.

Lundan, S.M. (2010), "What are ownership advantages?", *Multinational Business Review*, Vol. 18 No. 2, pp. 51-70, doi: 10.1108/1525383x201000010.

Ministry of Commerce of the People's Republic of China (MOFCOM) (2023), "2023 statistical Bulletin of China's OFDI", available at: http://www.mofcom.gov.cn (accessed 23 April 2025).

Moberg, L. (2015), "The political economy of special economic zones", *Journal of Institutional Economics*, Vol. 11 No. 1, pp. 167-190, doi: 10.1017/s1744137414000241.

Roodman, D., Nielsen, M.Ø., MacKinnon, J.G. and Webb, M.D. (2019), "Fast and wild: bootstrap inference in Stata using boottest", *The Stata Journal*, Vol. 19 No. 1, pp. 4-60, doi: 10.1177/1536867x19830877.

Roth, J., Sant'Anna, P.H.C., Bilinski, A. and Poe, J. (2023), "What's trending in difference-in-differences? A synthesis of the recent econometrics literature", *Journal of Econometrics*, Vol. 235 No. 2, pp. 2218-2244, doi: 10.1016/j.jeconom.2023.03.008.

Rugman, A.M., Nguyen, Q.T.K. and Wei, Z. (2016), "Rethinking the literature on the performance of Chinese multinational enterprises", *Management and Organization Review*, Vol. 12 No. 2, pp. 269-302, doi: 10.1017/mor.2016.13.

Song, J. (2024), "Shanghai free trade zone: sample for high-level opening up to the outside world", *China Economic Weekly*, Vol. 18, pp. 33-35, (in Chinese).

Stata Corp. (2023), "Stata causal inference and treatment effects estimation reference manual", Release 18, Stata Corporation.

Su, X. and Wang, S. (2024), "Impact of China's free trade zones on the innovation performance of firms: evidence from a quasi-natural experiment", *Humanities and Social Sciences Communications*, Vol. 11 No. 1, pp. 1-17, doi: 10.1057/s41599-023-02523-y.

UNCTAD (2023), "The role of China's pilot free trade zones in promoting institutional innovation, industrial transformation and South-South cooperation", United Nations, Geneva.

Wang, B. (2017), "Arbitration within the China (Shanghai) pilot free trade zone", *The Chinese Economy*, Vol. 50 No. 4, pp. 274-282, (in Chinese), doi: 10.1080/10971475.2017.1321893.

Wang, L., Liu, Z. and Shi, H. (2022), "The impact of the pilot free trade zone on regional financial development", *China and World Economy*, Vol. 30 No. 5, pp. 154-184, doi: 10.1111/cwe.12441.

Wooldridge, J.M. (2021), "Two-way fixed effects, the two-way Mundlak regression, and difference-in-differences estimators", SSRN 3906345.

Yao, D. and Whalley, J. (2016), "The China (Shanghai) pilot free trade zone: background, developments, and prospects", NBER Working Paper No. 20528, National Bureau of Economic Research.

Zaheer, S. (1995), "Overcoming the liability of foreignness", *Academy of Management Journal*, Vol. 38 No. 2, pp. 341-363, doi: 10.2307/256683.

Zhang, X. (2021), "China, Indonesia hold first 'Two Countries Twin Parks' joint working committee meeting", MOFCOM Press release, available at: http://zhangxiangchen2.mofcom.gov.cn/article/activity/202104/20210403049832.shtml (accessed 25 April 2025).

Zhang, T. and Wang, W. (2023), "The spatial spillover effects of establishing free trade pilot zones on FDI: empirical evidence from China", *Heliyon*, Vol. 9 No. 10, e20587, doi: 10.1016/j.heliyon.2023.e20587.

Zhao, D., Yu, A. and Guo, J. (2022), "Judicial institutions, local protection and market segmentation: evidence from the establishment of interprovincial circuit tribunals in China", *China Economic Review*, Vol. 75, 101829, doi: 10.1016/j.chieco.2022.101829.

Corresponding author
Zhoufu Yan can be contacted at: zfyan@shou.edu.cn