Special Economic Zones and Firm Performance: Evidence from Vietnamese Firms

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Abstract

This paper examines the impact of Special Economic Zones (SEZs) on firm performance in Vietnam, using firm-level dataset and employing cancelled SEZs as a control group to address endogeneity concerns. We find that SEZ entry leads to significant improvements in firm outcomes, with direct effects including a 18.3% increase in employment, a 55.3% rise in sales, and a 25.9% boost in labor productivity. Indirect spillover effects are also observed within communes hosting SEZs, particularly through improved labor productivity and sales of non-SEZ firms. Heterogeneity analyses reveal that foreign firms, large firms, science-based, and supplier-dominated firms benefit the most. Firms located in industrial SEZs seem to drive our results. We also provide insights into the mechanisms driving these effects, including enhanced credit access to explain why direct effects are stronger than indirect ones. Input-output linkage might explain why we have substantial effects for employment and sales, especially for spillover effects. However, the technology gap still remains a challenge for domestic firms as they experience labor productivity improvement when learning from SEZ firms with foreign direct investment originating from developing countries but show no significant gains when FDI originates from developed countries.

Keywords: technology, multinational, firms, place-based policies, Special Economic Zones (SEZ), firm performance, technology transfer, spillovers
JEL Codes: F21, R58, D24, H25

1 Introduction

Increasing firms' performance through a higher level of productivity (output per worker), or an increase in output, or an increase in sales (revenue) is one of the main goal for developing countries to improve its standard of living over time, and moving from lower level of income to a higher level of income as comparable to other developed countries. A way for developing countries to close the gap is to learn from foreign firms to increase domestic firms' knowledge capabilities, investment and R&D. To achieve this, these countries can learn from foreign firms, thereby augmenting the knowledge, investment, and research and development capabilities of their domestic firms. This learning can occur through various channels, such as gaining insights from exporting practices (Loecker, 2013), engaging in global value chains (Taglioni and Winkler, 2016), or benefiting from knowledge transfer via labor mobility (Balsvik, 2011; Stoyanov and Zubanov, 2012).

One policy that could play an important role in closing the gap for developing countries is to set up special economic zones. These zones aim to attract foreign firms (usually multinational firms) to set up their operation in developing countries, and then in hope to create spillover effects to domestic firms. Special Economic Zones use fiscal localized incentives to attract FDI and transfer skills and technology from foreign/ multinational firms to domestic/local firms in developing and emerging economies. Creating SEZs is a popular policy, especially for developing countries, to attract FDI. The number of economies with SEZs increased from 29 economies with 79 SEZs in 1975 to 147 economies with around 5400 SEZs in 2018 (UNCTAD, 2018). However, their benefits are still in question. Although SEZs in China show a success in attracting FDI and foster local economic activity (Wang, 2013; Lu et al., 2019, 2023), failures are seen for SEZs in India (Alkon, 2018; Görg and Mulyukova, 2022) and Indonesia (Rothenberg et al., 2017). Therefore, spillover effects may not be expected.

Theoretically, SEZs provide ground for agglomeration economies, enabling firms to benefit from shared infrastructure, knowledge spillovers, and improved access to supply chains. Firms within SEZs might experience cost reductions and productivity gains through proximity to suppliers and customers, access to skilled labor, and exposure to new technologies. However, these benefits may not materialize uniformly, as they depend on factors such as the absorptive capacity of firms, the nature of economic linkages within the SEZ, and the type of industries clustered there. Moreover, the externalities generated by SEZs could extend beyond their boundaries, influencing firms located in the same region but outside the SEZ. These indirect effects remain less studied and are critical for understanding the broader

economic implications of SEZs.

Previous studies mostly focus on effects at aggregated level. For example, Alkon (2018); Nguyen and Tien (2021); Brussevich (2024) use analysis at district/ state level to identify several effects of SEZs. At granular scale, Gallé et al. (2023) measure the effects of SEZs at municipality level or at village level by Lu et al. (2019). Although in their studies, they sometimes mention the effects of SEZs on firms, their main research questions lie on the aggregated effects at village/ municipality/ state/ /district level. Only a few research focus directly on the effects on firms. A recent study is from Görg and Mulyukova (2022) on Indian firms which focus on productivity growth and find that SEZs do hot increase productivity growth for Indian firms. They explain the reasons might lie on the fact SEZs in India can be only a single-firm located and there is a possiblity of rent-seeking in the area. However, India case might not be representative for other developing countries due to their size and population compared to the rest of the developing world. Research in this area is still need to be done to evaluate the effects of SEZs on firms' performance through improving technological and innovative capabilities.

Vietnam is another case study for Special Economic Zones. Over the past three decades, Vietnam has made significant efforts to attract foreign direct investment (FDI) by creating 18 coastal economic zones and a comprehensive network of 433 state-endorsed special economic zones across the country [1]. The Vietnamese government offers various incentives to firms and employees operating within SEZs, including tax breaks, complete tariff exemptions on certain goods, reduced corporate income tax rates, lowered rents and fees, and employee benefits, such as a 50% tax reduction for SEZ employees. Between 1991 and 2022, Vietnam has established SEZs in 61/63 provinces [2]. The policy aim for SEZs in Vietnam is to attract FDI and support economic growth from technology transfer. By establishing SEZs in almost all provinces in Vietnam, the government aims for regional development within Vietnam.

This paper seeks to answer **whether SEZs help to improve firms' performance** with a focus on employment, sales, and productivity. We employ a difference-in-differences (DID) framework to estimate both the direct effects of SEZs on firms operating within their boundaries and the indirect spillover effects on firms located in the same communes but outside SEZs. To address the potential endogeneity of SEZ placement, we leverage quasi-random variations using a control group of "cancelled SEZs," where planned SEZs were not imple-

[1] Data is from the report by Ministry of Investment and Planning. Report can be accessed through this link: https://datafiles.chinhphu.vn/cpp/files/duthaovbpl/hosodenghixaydungluat.pdf. 433 includes national industrial parks (state-endorsed), export processing zones, high-tech zones and border zones.

[2] See figure 1 for the development of number of SEZs over time from 1991 - 2022

mented due to political or financial constraints. This approach allows us to disentangle the causal impact of SEZ policies from pre-existing regional trends and ensures the robustness of our findings.

We find that SEZs have significant positive effects on employment, sales, and productivity for firms within SEZs, indicating the presence of substantial agglomeration economies. Moreover, there are notable spillover effects on firms located outside SEZs but within the same communes, suggesting that SEZs influence the broader local economy. These findings hold across different control groups, including firms in cancelled SEZs, those in non-neighboring communes, and those matched control firms using propensity scores matching, underscoring the robustness of the results.

Beyond quantifying the impacts of SEZs, we explore the mechanisms driving these effects. Specifically, we examine the role of input-output linkages, access to credit, and firms' absorptive capacity in mediating the relationship between SEZs and firm performance. We find that firms with higher input demand and greater technological capacity benefit more from SEZ policies, highlighting the importance of economic linkages and firm characteristics in shaping the outcomes of SEZs. Additionally, we observe that SEZs are more effective in promoting growth for private domestic firms and smaller firms, while foreign firms and state-owned enterprises exhibit heterogeneous responses depending on the type of SEZ and their industry.

Most papers on the impacts of FDI focus on spillover effects to domestic firms through vertical or horizontal linkages (Keller, 2021; Lu et al., 2017). Our paper, however, focuses first on the impacts of FDI through linkages between multinational firms and their affiliates, and then from affiliates to other domestic firms, located inside or outside of SEZs. Doing so, our paper will try to link the multinational firm operation in Vietnam with their headquarters/ the multinational firms in their home country. Our approach is related to Görg and Mulyukova (2022) in terms of setting this linkage, who, however, matched their data in an opposite direction. That is, they have a list of US multinational firms, and then try to find the subsidiaries of these firms in China. Our methodology will be the opposite way – from tax information, to track the names of the multinational firms, and match with international dataset.

Second, the literature on the impacts of SEZs can only proxy for the impacts of SEZs mostly at district levels (Wang, 2013) or at village levels (Lu et al., 2019). The reason is there is no data available to track the exact locations of the enterprises. However, this type of

proxy can overestimate the levels of impacts of SEZs since most SEZs only has a piece of land in a village (district) or spreads out through many villages (districts). Our paper can exactly determine whether a firm is located inside or outside and SEZs, based on their exact address. The Vietnamese data allows us to track the exact location (whether they belong to the SEZs or not), instead of proxying their location at the village or district level. We can thereby estimate more precisely the spillover effects from affiliates to domestic firms located within SEZs, and located outside SEZs (even could estimate the level of distance for spillover effects). In addition, we also manually collect not only data on national SEZ, but also on provincial SEZs. As far as we know, this also an additional feature compared to previous studies where they mostly focus on state-endorsed or national SEZs [3].

Third, in terms of methodology, we add into the literature by employing cancelled SEZs as a control group to estimate the causal effects of SEZs on firm performance. This approach mitigates concerns related to endogeneity in SEZ placement by comparing treated firms with those in regions where SEZs were planned but ultimately not implemented. This methodology aligns with and extends the identification strategy employed by (Greenstone et al., 2010), who utilized runner-up locations in industrial site selection to isolate causal impacts. By leveraging this quasi-natural experiment, our study enhances the robustness of causal inference in the evaluation of SEZ policies.

While our study focuses on the case of Vietnam, findings will be of broader interest for policy discussions in low- and middle-income countries, given: the persistent popularity of SEZs as an FDI-attraction tool; middle-income traps amid increasing levels of FDI but without increasing capabilities among domestic firms in technology and R&D investment. To be specific, our study helps to improve our understanding spillover effects of SEZs, helping governments to decide on how to support domestic firms and at the same time, promote attracting FDI. This study will be particularly important for countries that are similar to Vietnam – a small emerging economy that relies on FDI to promote development. We believe that our project can expand the academic frontier and provide a practical policy guide for developing countries.

[3]See Table for a descriptive analysis of national and provincial SEZs in Vietnam

2 Background on Vietnam SEZs

2.1 Brief History

Vietnam has started implementing special economic zones since 1993. The main motivation behind establishing SEZs is to have a specific areas as a piloting reforms of the economy to attract foreign and domestic investment, promote international trade, increase employment, and stimulate technology transfer. The 7th Congress's Political Report in 1991 outlined a five-year plan (1991-1995) focusing on economic stability and growth, emphasizing policies to attract foreign investment, particularly in manufacturing. This pivotal strategy laid the groundwork for the development of Export Processing Zones (EPZs) and Special Economic Zones (or Industrial Parks) (SEZs) in Vietnam. Following this, critical legal frameworks were established, including the 1994 Law on Domestic Investment Promotion and the Foreign Investment Law of 1987 (amended in 1990, 1992, 1996), along with specific decrees on EPZs and SEZs (1994, amended in 1997, 2008, 2015, 2018, 2022). The first Tan Thuan EPZ in Ho Chi Minh City was created in 1991, leading to the establishment of 12 EPZs and SEZs by 1995, primarily in Ho Chi Minh City and Hanoi. SEZ specified in the decree 1994 are concentrated industrial zones established by decision of the Government, with defined geographical boundaries, specializing in industrial production and providing industrial production support services, not populated (Government Degree, 1994). Vietnam then established its first Open Economic Zones called Chu Lai in Quang Nam Province (Decision No. 108/2003/QD-TTg). The Vietnamese SEZ program is similar to the SEZ program in China which is described by the World Bank as a unique zone-within-zone case because large opened economic zones (the whole municipality) hosted smaller zones (state-level and province-level economic zones) within their territory.

Firms in SEZs have important preferential policies include:

Tax Deductions and Customs Duty Exemptions. - Corporate income tax rates ranging from 12 to 18 percent for manufacturing firms (exempt from income tax in two years since having profits) and 22 percent for service firms (exempt from income tax in one year after having profits) (Decree 192/CP, 1994) - applies to only foreign firms. For domestic firms, the tax rates are similar to other Vietnamese firms located outside SEZs. In 2002, there are some changes for tax deductions of foreign firms. High-tech manufacturing and service firms in high-tech zones pay 10% income tax, with an 8-year profit tax exemption from the first profitable year. For export processing firms, manufacturing firms pay 10% income tax, with

a 4-year profit tax exemption. Service firms pay 15% income tax, with a 2-year profit tax exemption. For SEZs firms, those exporting less than 50% of products pay 15% income tax and get a 2-year profit tax exemption. For 50% to 80% export, there's an additional 50% profit tax reduction for the next 2 years; over 80% export, the rate is 10% with the same exemptions and reductions. Service firms pay 20% income tax, with a 1-year profit tax exemption. For 2008 regulation, new firms from investment projects are eligible for a corporate income tax rate of 20% for 10 years. They also receive a corporate income tax exemption for the first 4 years, followed by a 50% reduction in tax due for the next 9 years. SEZs benefit from incentives outlined for regions with challenging socio-economic conditions. Those SEZs established in locations with particularly difficult socio-economic conditions receive further advantages aligned with these specific areas. Economic zones are entitled to the preferential policies that apply to regions facing particularly difficult socio-economic challenges. The standard tax rate is 25 percent in Vietnam.

Land Rent Exemption. - Firms can receive land rent exemption during the construction period and land rent exemption for 11 years from the date the project is completed and put into operation.

Preferential Policy in Securing Bank Loans. - Firms are permitted to access state investment credit, limited to a maximum of 70% of the total investment amount [4]

Reduced Tax for Employees in the Zones. - There are 50% income tax reduction for people whose income is subject to income tax, including Vietnamese and foreigners working in the zones.

As of December 2022, Vietnam has developed a widespread network of SEZs (industrial parks) and economic zones. This network includes: (i) Special Economic Zones (or also called Industrial Parks, from now on we refer this is SEZs): There are 403 SEZs and 4 export processing zones. These SEZs are established in 61 of the 63 provinces and cities, except Dien Bien and Lai Chau. Out of these, 292 SEZs are operational, the rest are still being developed. Vietnam also has Border Gate Economic Zones. There are 26 of these zones in 21 provinces and cities with land borders. In our analysis, we do not include this type of zone as SEZs as they serve different purposes. The Border Gate Economic Zones are mostly used for goods exchange and duty-free shopping rather than technology transfer. The last type is Coastal Economic Zones. There are 18 zones in 17 provinces and cities along the coast. These coastal zones have planned for various functional use, including non-

[4]https://baochinhphu.vn/de-xuat-cac-chinh-sach-uu-dai-ho-tro-phat-trien-cum-cong-nghiep-102230117164131883.htm

tariff, industrial, commercial, tourism, and service sectors. Figure 1 shows the geographic distribution of the SEZs established in five waves: the 1991-1993 wave, the 1994-1996 wave, the 1997-2002 wave, the 2003-2008 wave, and the 2009-2019 wave.

Table 1: SEZ in Vietnam breakdown

	1991-1993	1994-1996	1997-2002	2003-2008	2009-present
Number of zones newly established	3	17	66	221	210
National-level SEZs	3	17	66	221	210
- Northern region	0	3	14	98	107
- Middle region	1	3	12	35	58
- Southern region	2	11	40	88	78

National SEZs

	1991-1993	1994-1996	1997-2002	2003-2011	2012-2019
National-level SEZs	**5**	**14**	**56**	**262**	**85**
By type					
Industrial zones	3	14	43	237	77
High-tech zones	0	0	2	1	1
Export processing zones	2	0	0	1	0
Border economic zones	0	0	11	9	4
Coastal economic zones	0	0	0	14	3
By region					
Northern region	0	4	15	97	34
Middle region	1	3	18	59	30
Southern region	4	7	23	106	21

Table 2: SEZ Wave Establishment by Type, and Region

Provincial SEZs

	Northern region	Middle region	Southern region
Province-level SEZs	311	270	117

Table 3: Province-level SEZs by Region

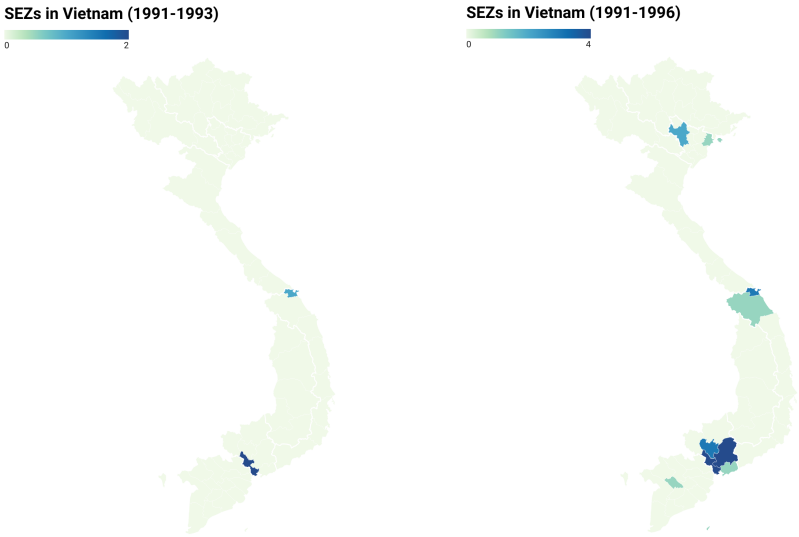
Vietnam's SEZs differ from other place-based programs in developed countries context. First, their beginning goal is to attract foreign investment and have the areas as leading regions in the country to drive the country's economic growth as well as the regions' economic growth while for US or European's context, these place-based programs mainly to reduce inequality between regions. Therefore, in Vietnam's context, it can create unbalanced economic development between SEZs and non-SEZs regions Second, a as a developing country, Vietnam also faces with weak governance and limited funding. Before the introduction of SEZs, Vietnam's infrastructure such as utilities, telecommunications, transports, and other basic services are poor, therefore, the introduction of SEZs is also a commitment from the Government to improve the infrastructure in these specific areas while for other parts of Vietnam, the business environment has largely remained unchanged This also contrasted a difference between Vietnam and other developed countries where they invested in lagging regions but the other regions already have investment in infrastructure and good business environment. In a way, Vietnam's SEZs are also a mirror of Chinese's SEZs where they also have national and provincial SEZs, and the goal is also to attract foreign investment which favourable policies and investment in infrastructure in the SEZs. However, SEZs from Vietnam can give us another perspective where the policy is implemented in a small open economy which faces even harder competition with other big economies like China and India. The tax rate in Vietnam is 10% for firms in SEZs areas, while for China is 15 percent - 24 percent (Lu et al., 2019). Vietnam also faces with an even harder limited budget for infrastructure development in these areas compared to China

2.2 Selection into SEZs

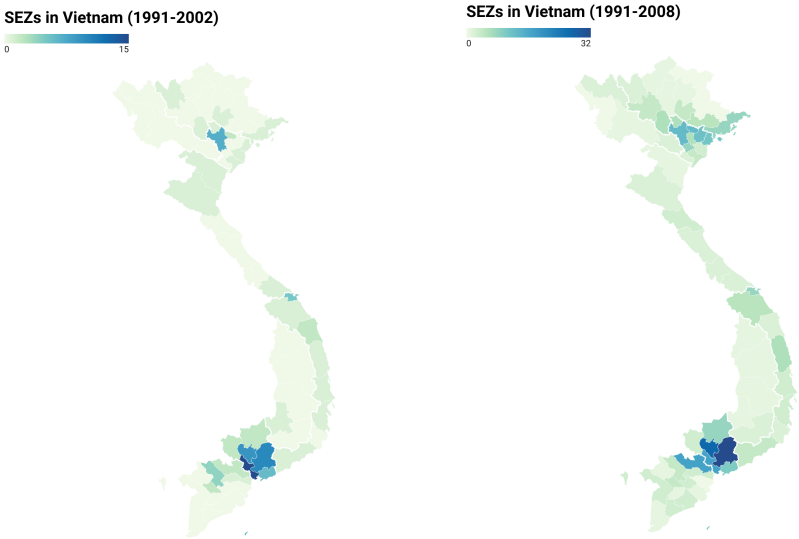
SEZs in Vietnam are not established randomly, but were decided based on their critical and favourable geographic location with good human capital, especially for the first SEZs - which only established in Hanoi and Ho Chi Minh City - which were the two largest cities in Vietnam at the time. This selection bias could overestimate our results in estimating the effects of SEZs on firms' performance and technology transfer as firms located in these areas could be already in a positive performance trends even without establishments of

SEZs. Furthermore, Figure 1 illustrates that there is great heterogeneity with respect to the number of established zones across provinces, with some provinces having 38 zones (Dong Nai) compared to some provinces having only 1 or 0 zone (Dien Bien, Son La, etc - in the Northern part of Vietnam). However, as SEZs were later expanded to almost all of provinces in Vietnam (see Figure 1), we will focus on the later years from 2011 - 2019 in the first set of exercise, then in the future, we could expand to the earlier years where we have complete data since year 2000 - we will explain more in the data and sample.

(A) Left: SEZs in Vietnam (1991-1993); Right: SEZs in Vietnam (1991-1996)



(B) Left: SEZs in Vietnam (1991-2002); Right: SEZs in Vietnam (1991-2008)



(C) SEZs in Vietnam (1991-2022)

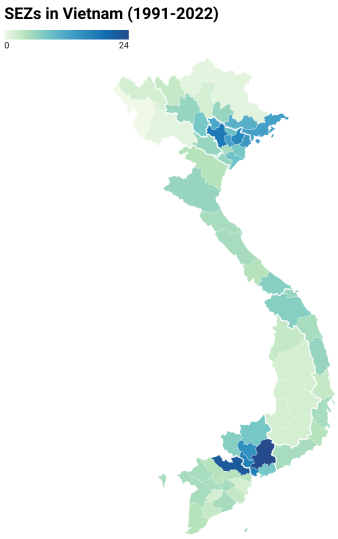


Figure 1: SEZs development in Vietnam from 1991-2022

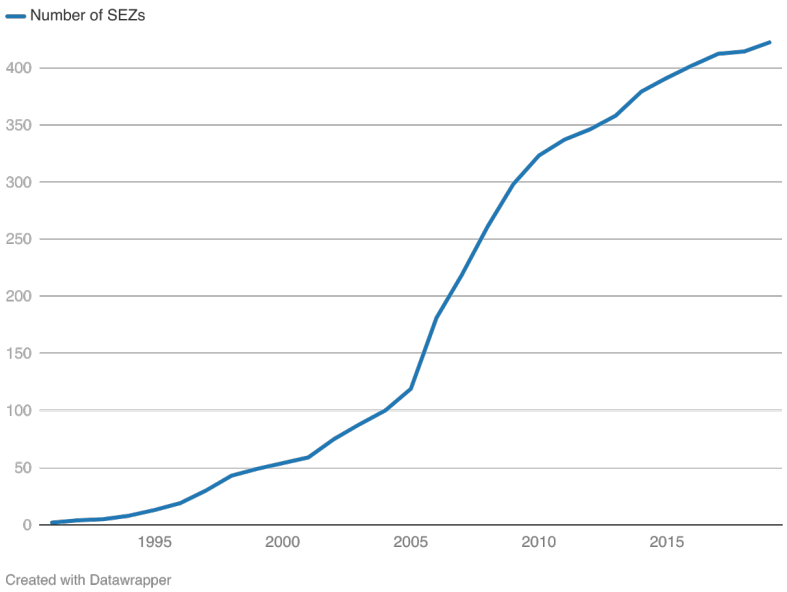


Figure 2: Number of national SEZs over time
(1991 - 2019)
Source: Authors' representation based on data from the Ministry of Foreign Investment and Planning of Vietnam, 2022

The selection bias mentioned earlier comes from between province selection bias. However, even within a given a province, SEZs were not randomly located. For example, SEZs in a province will be chosen based on their central geographic located in the province. Therefore, we will have another site selection bias. The selection bias described above coming from SEZs selection bias. However, what we focus here is firms. But firms when choose their location were also considering where to locate their businesses. We have another selection bias coming from firms choosing their own location to set up business. Therefore, a critical question is how to choose a comparable control group? We will explain this in more details in section empirical strategy.

3 Data and Empirical strategy

3.1 Data

Firm Data.—The Enterprise Survey collects information from all firms operating in Vietnam on their identification, industry activities, labor, and firms' outcomes. The main infor-

mation includes firm identification (name, address, activities, business type, and branches); labor and income (number of employees and their income, etc.); firms' results and costs (performance, expenses, investment, product output, energy use, etc.); and sometimes information about export and import activities of the firm.

The Survey is conducted by General Statistics Office of Vietnam, and is collected annually starting from 2000. We have available data from 2000 - 2019, however, as explained in the last section, SEZs in prior years suffer from bias in selection of SEZs geographically in the country. In the later years, SEZs expand to almost all provinces in Vietnam, we will focus on the later years to avoid selection bias. We use "ma_thue" variable (tax identification number - unique for each firm across years) to create a panel data from 2011-2019 [5]. The "ma_thue" variable is a 10-digit character to identify each firm and the tax office that they belong to. However, the data from 2000-2010 includes the "ma_thue" variable with only 9-digit character and not directly linking to the 10-digit character. Therefore, to match with this period, we need to use other matching strategies to match firms. Because of these two reasons: selection bias and data limitations, our main and first exercise is to estimate the impact of SEZs on technology transfer of firms in the period 2011-2019. Appendix A3 describes our process of cleaning the dataset.

Firm SEZ Status.—The Survey includes information about the exact address of the firms (whether they are located in SEZs or not). We will use this information combined with manually collected data on SEZs information from Ministry of Planning and Investment and other private sources about SEZs to check if a firm is located in a SEZ or not.

SEZs information.—We manually collected data on SEZs information from Vietnamese Ministry of Planning and Investment and other private sources about SEZs. The full dataset includes information about name, address, year of notification, area and main investor of the SEZ. A SEZ to operate needs to go through different stages: notification from the Central Government, preparation from the local government and operational stage. Not all notified SEZs become eventually operational. However, at the time of formal notification, preparation can begin, which may already affect the performance of firms. This is not too important in our context, as we have the exact address of firm whether they belong to a SEZ, so if their address has already shown that they are in a SEZ, it means this SEZ has been operated. In

[5]McCaig et al. (2022) use "madn" to match between years. Indeed, this variable does not have many duplicates like "ma_thue", however, as we want to check firms' names and address later with the government website providing information related to tax id, firms' names, and address, we prefer to use "ma_thue" to match between years. In addition, for some years like 2000-2010 or year 2014 without "ma_thue" or 9-digit "ma_thue", we also use madn and other variables to identify firms

our dataset, SEZs that are expanded are also considered as newly zone established in this table (to account for the change in the area and they may have different investors in the SEZ and year expanded/ establised). Therefore, our number for total SEZs are higher than the total number from Vietnam Ministry of Planning and Investment. In addition, we consider SEZs as established when they are allowed by the national government/ local government to have the area specifically designed for the SEZs (regardless whether they already have the land, or build the infrastructure or not). We only take into account national-level economic zones, not including province-level economic zones (CCN) (¡75 ha, ¿10 ha; mostly small and medium enterprises, tax of 10% for 15 years). We also do not take into account the economic zones that are now (in 2023) no longer in the lists of the operational SEZs. For example, Tho Hoang economic zone was established with the permission from the national government. However, the local government proposed after (maybe around 5-10 years after), the economic zone does not work effectively or cannot attract the investment, or the focused industry is no longer suitable with the local government's economic strategy. Then the national government would consider and agree to remove this economic zone from the list of national-level economic zones. Note that: there would still be some firms already present in these economic zones though. We also do not take into account EPZs as SEZs due to their different goals and tax incentives compared to normal SEZs [6]

Regression Data.—Our sample includes firms from 2011-2019 period. In this period, some firms may be treated in the later years (located in SEZs in later years), some firms may be treated from the beginning (located in SEZs from the beginning - year 2011), and some firms will never be treated (never located in SEZs).

3.2 Empirical strategy

Our study aims to assess the impact of SEZs on firm performance, particularly focusing on how SEZs establishments affect within firm located in SEZs areas and the spillover effects of SEZs establishment on firm performance in nearby areas, or within the same commune

[6]It is important to note that among SEZs, they also have different tax incentives. Normal SEZs are eligible for a corporate income tax rate of 20% for 10 years. SEZs located in open economic zones are eligible for a more favourable corporate income tax rate - similar to SEZs located in an area facing particularly difficult socio-economic challenges which is 10% for 15 years. If a district is given open economic area status, the whole district becomes a big SEZ for foreign investors. Some places got the status of an open economic area first and then got to set up state-level and province-level zones later on. This means an open economic zone might have a few smaller SEZs inside it. By 2020, Vietnam has 18 economic zones, all by the coastal line. On the other hand, districts away from the coast (inland areas) usually didn't get to be open economic areas.

with the SEZs. Our identification strategy relies on one source of variation: spatiotemporal variation in SEZs establishments at the commune level. To achieve this, we employ a difference-in-difference analysis. This method involves comparing changes in outcomes of firms before and after the introduction of SEZs at certain communes (first difference) and measuring these changes against the trends observed at firms which did not have SEZs built. Therefore, we have two treated groups and one control group. The first treated group is the firms located in the SEZs areas - they are the ones that move into these newly built area of SEZs [7]. We use this group to measure the within firm effects of SEZs located in the SEZs areas. The second treated group is the firms located in the SEZs communes, excluding firms located in the SEZs areas. We use this group to measure the spillover effects of SEZs to firms nearby.

The choice of control group is important to identify causal relationship between SEZs and firms outcomes. To make valid inferences about the impact of SEZ establishment in the presence of heterogeneity related to the expected local production costs and the value that regions place on attracting SEZs, it is generally necessary to understand the exact selection rule that determines where SEZs are established and why firms chose that location. However, as seen in many cases of SEZ establishment, the factors influencing these location decisions—such as infrastructure availability, political considerations, and regional development strategies—are often unobservable to researchers. Even in rare cases where such factors are partially known, they remain difficult to quantify. Consequently, the effects of SEZ establishment on firms' performance are likely confounded by pre-existing differences in characteristics that make certain locations more attractive to SEZ planners. To address this identification challenge, we use the reported cancelled SEZ locations to construct a valid counterfactual for what would have happened to firms in regions selected for SEZ establishment. Specifically, we manually collect data for communes which reported to have SEZs openings, but then were utimately cancelled, and never established. The cancelled communes—those that planned to have a SEZ opening but ultimately were not chosen—serve as a close counterfactual group, as they share many similarities with the SEZ communes. By comparing the outcomes of firms in SEZ communes and cancelled SEZs, we aim to isolate the causal effects of SEZ establishment, accounting for the heterogeneity in location-specific factors that may otherwise bias estimates. This approach mitigates concerns of confounding by leveraging the quasi-random nature of the final selection among communes that were already deemed suitable for

[7] These firms could be in the same commune or from a different commune or a newly established firm to locate in the newly established SEZs. In our context, we limit to the firms located in the same commune with the SEZ commune before it moved to the SEZ area. The reason we chose to limit to these firms is to distangle the effects that being in a SEZ changes firms' performance, and not due to the change in firms' locations - from less advantaged areas to a more advantaged area.

SEZ development. This choice of cancelled SEZs is similar to the approach by (Greenstone et al., 2010) when identifying "winning" and "losing" regions. For robustness, we use control group as never-treated firms in non-neighboring communes.

The econometric specification uses a staggered difference-in-differences (DiD) approach to account for the varying timing of SEZ implementation across communes[8]. The model can be expressed as follows:

$$Y_{i,t} = \alpha + \sum_{g \in G} \sum_{t=t_0}^{g-1} \theta_{g,t}^{pre} D_{i,g,t} + \sum_{g \in G} \sum_{t=g}^{T} \theta_{g,t}^{post} D_{i,g,t} + \xi_i + \xi_t + \varepsilon_{i,t},$$

where $Y_{i,t}$ represents the outcome variable for firm i in year t, $D_{i,g,t}$ is a dummy variable indicating whether firm i in group g is treated at time t, and G denotes the treatment year. The terms ξ_i and ξ_t capture firm- and year-fixed effects, respectively, while $\varepsilon_{i,t}$ is the error term clustered at the commune level.

This staggered DiD approach uses the Event-Time Weighted Fixed Effects (ETWFE) methodology introduced by (Wooldridge, 2023) to address potential biases arising from heterogeneous treatment effects. The specification includes covariates such as firm size and two-digit industry classifications to control for confounding factors.

3.3 Summary Statistics

Table 4 shows the t-test to compare between SEZs firms (firms located in SEZs) and non-SEZs firms (firms not located in SEZs), as well as differentiate between foreign, domestic, and state firms. State firms include central, local, joint stock having state capital and collective. Domestic private firms include private enterprise, collective name, private having small state capital, joint stock not having state capital, joint stock having state capital ¡ 50%. And foreign firms are firms with 100% foreign capital, joint venture between state and foreign, joint venture between others and foreign.

[8]The literature increasingly shows that interpreting estimates from traditional two-way fixed-effects regressions as average treatment effects (ATTs) can be challenging in scenarios like ours. This difficulty arises from variations in when treatments are applied and the likelihood of treatment effects varying over time and among different treated groups (Borusyak et al., 2021; Callaway and Sant'Anna, 2021; Goodman-Bacon et al., 2019).

	Within Area (Direct Effects)			Within Commune (Indirect Effects)		
	SEZ Firms	Nb of Obs	Non-SEZ Firms	SEZ Firms	Nb of Obs	Non-SEZ Firms
Average Number of Employees	247.03	3,607,664	26.70	27.560	3,607,664	26.70
Average Revenue	276,955.3	3,603,041	31,539.7	25,957.07	3,603,041	31,539.7
Average Labour Productivity (log)	4.417	3,147,169	3.799	3.662	3,147,169	3.799
Tax Rate	0.043	3,515,857	0.045	0.038	3,515,857	0.045
Import-Export Tax Rate	0.149	23,727	0.025	0.015	23,727	0.025

Table 4: Comparison between SEZ firms and non-SEZ firms (direct and indirect effects)

Note: Table 4 compares the descriptive statistics for SEZ firms and non-SEZ firms within areas (direct effects) and within communes (spillover effects). Non-SEZ firms are the same for both within areas and within communes. SEZ firms within areas are defined as firms in a specific SEZ area (smaller than an area of a commune) and in the same commune before they enter into this area[9]. SEZ firms within communes are defined as firms within a commune that has one or more than one SEZs established, excluding firms in SEZ areas to disentangle spillover effects. Average number of employees is the average number of employees at the end of the year. Labour productivity is calculated by using value added divided by the number of employees, where value added equals revenue from goods sold minus the cost of goods sold at the end of the year. We calculate tax rate as total tax divided by revenue, import-export tax rate as import-export tax divided by revenue. Similarly, we assume tax rate, import-export tax rate are missing if their values are smaller or equal to 0, or greater than 1.

4 Results

4.1 Baseline results

4.1.1 Direct effects

Firm sizes

Table 5 presents the estimated effects of SEZs on the number of employees and sales, distinguishing between direct effects (columns 1 and 3) and indirect effects (columns 2 and 4). The analysis is conducted using two separate control groups: Panel A uses never-treated firms in canceled SEZs as the control group, while Panel B uses never-treated firms in non-neighboring communes.

The direct effects on employment reveal a significant positive impact of SEZs. In Panel A, the coefficient of 0.183 is statistically significant at the 5% level, indicating that firms located within SEZs experience an average increase of 18.3% in their workforce compared to firms in the control group of never-treated firms in canceled SEZs. This result may indicate the effectiveness of SEZ policies when referring to average treatment on the treated, help firms to expand their operations and hire more employees. Similarly, in Panel B, where the control group consists of never-treated firms in non-neighboring communes, the coefficient of 0.162, significant at the 5% level, confirms the robustness of this finding. Although slightly smaller in magnitude than in Panel A, the result still reflects a substantial increase in employment

within SEZ firms. This consistency across control groups reinforces the role of SEZs in directly stimulating job creation within their boundaries.

The effects of SEZs on firm sales are even more pronounced. In Panel A, the direct effects' coefficient shows a substantial increase of 0.553 in sales for firms within SEZs, significant at the 1% level. This large coefficient underscores the impact of SEZ policies on firm revenue, likely driven by access to input-output linkage associated with operating within SEZs. We will confirm this channel in part of this paper. In Panel B, the direct effects on sales remain strong, with a coefficient of 0.494, significant at the 1% level. This slightly smaller magnitude compared to Panel A may reflect differences in the composition of the control group but still confirms the substantial benefits of SEZs for firms located within their boundaries.

Measures of productivity

We estimate labor productivity using value added [10] divided by number of employees at the end of the year for each firm i at time t. In Panel A, the direct effects on labor productivity are positive and statistically significant. The coefficient of 0.259, significant at the 5% level, indicates that firms located within SEZs exhibit a 25.9% increase in labor productivity compared to firms in the control group of never-treated firms in canceled SEZs. The results in Panel B confirm the robustness of these findings. The coefficient of 0.245, significant at the 5% level, indicates a 24.5% increase in labor productivity for SEZ firms relative to never-treated firms in non-neighboring communes. While slightly smaller than the corresponding coefficient in Panel A, this result remains both economically and statistically significant. The consistency of the productivity gains across two distinct control groups underscores the robustness of the findings.

[10] We measure value added by using revenue minus input costs

Table 5: Main results

Dep var:	**Number of employees**		**Sales**		**Labour productivity**	
Effect	Direct	Indirect	Direct	Indirect	Direct	Indirect
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Control group is never-treated firms in the cancelled SEZs						
SEZ	0.183**	0.071**	0.553***	0.292***	0.259**	0.085**
	(0.073)	(0.026)	(0.128)	(0.035)	(0.106)	(0.041)
Obs	21,962	146,800	21,947	146,681	18,072	118,377
Panel B. Control group is never-treated firms in non-neighboring communes						
SEZ	0.162**	0.074***	0.494***	0.339***	0.245**	0.138***
	(0.065)	(0.011)	(0.113)	(0.024)	(0.095)	(0.029)
Obs	3,608,392	3,611,910	3,603,769	3,607,242	3,054,861	3,048,655

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group in Panel A consists of never-treated firms in canceled SEZs, while the control group in Panel B consists of never-treated firms in non-neighboring communes. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Parallel assumption and dynamic effects

Figure 3 presents the estimated β_k event study coefficients from a regression based on Equation **??**, where the dependent variables are, in turn, the log number of employees, log sales, and log labor productivity. The event is defined as the year when a firm enters an SEZ area or when an SEZ is established in the area where the firm is located. The control group consists of firms in canceled SEZs. The coefficients represent the average treatment effect on the treated (ATT) in each period before and after entry into an SEZ area, normalized such that β_{-1}, the year prior to entry, is set to zero. The vertical lines display 95% confidence intervals.

To validate the parallel trends assumption, the coefficients for pre-treatment periods (β_{-5} to β_{-2}) are examined. Across all three panels, the pre-treatment coefficients are statistically indistinguishable from zero, supporting the parallel trends assumption. This finding suggests that prior to entering an SEZ area, treated firms follow trends similar to those in the control group, mitigating concerns about endogeneity or pre-existing differences driving the observed effects. This is clear for log number of employees. For log sales, most of the coefficients, along with their 95% confidence intervals, consistently overlap with zero, demonstrating that there is so statistically detectable difference between treated and control groups before

the event. Only at $t = -3$, the coefficient is statistically significant, however, together the pre-treatment coefficients are statistically insignificant. This is similar to pre-treatment coefficients for labor productivity.

In the post-treatment periods (β_0 to β_5), the coefficients reveal significant positive dynamics. For the number of employees (top-left panel), the coefficients exhibit a gradual upward trend, with significant increases beginning from year $t = 2$, indicating that firms in SEZ areas progressively expand their workforce after entry. For sales (top-right panel), a significant upward trend begins in year $t = 1$, with larger effects observed in later periods. This reflects the immediate and growing benefits of SEZ policies on firm revenues. For labor productivity (bottom panel), the coefficients show more variation over time but are generally positive and significant from $t = 1$ onward. This indicates that SEZ firms experience efficiency gains shortly after entry.

The consistency of pre-treatment coefficients centered around zero and statistically insignificant lends strong support to the parallel trends assumption, which is critical for the validity of our event study design. The dynamic post-treatment effects highlight the long-term benefits of SEZ entry on firm performance, with significant increases in employment, sales, and productivity that grow over time. The widening confidence intervals in later periods likely reflect reduced sample sizes as fewer firms are observed five years after SEZ entry.

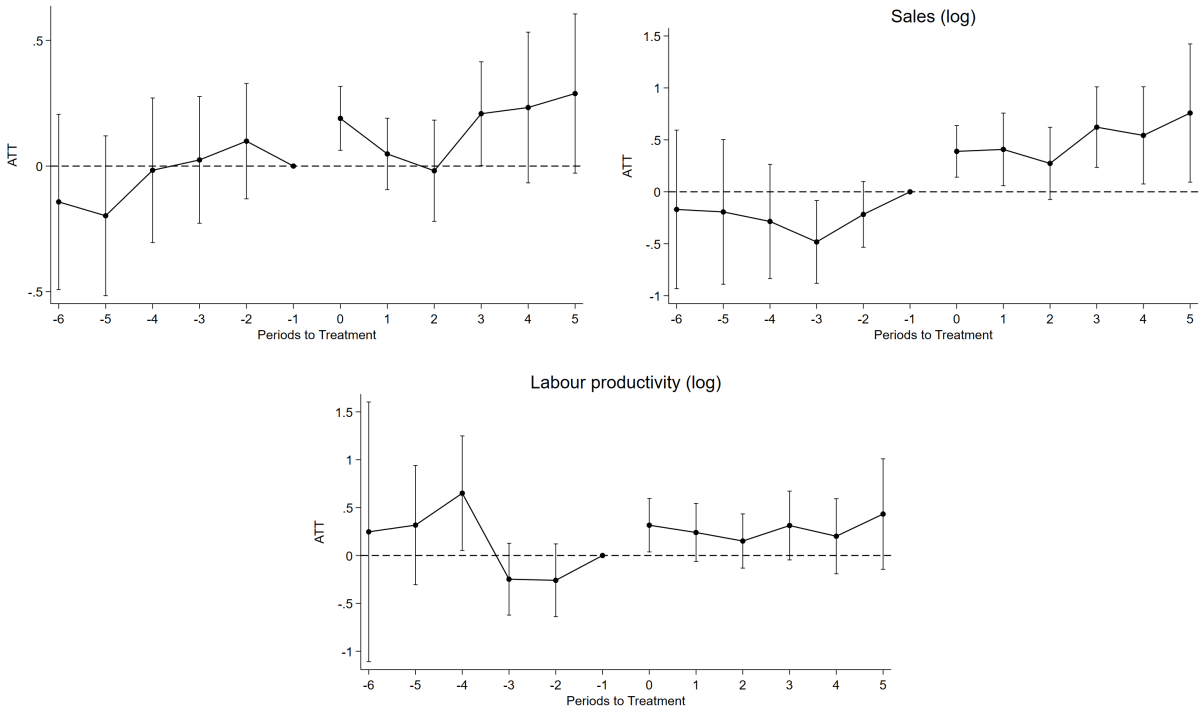


Figure 3: Sizes and measures of productivity indicators after entering into SEZ areas

Note: Figure 3 plots the estimated event study coefficients from a regression of the form given in equation **??** using Wooldridge (2021), where the dependent variable is, in turn, log number of employees, log sales and log labour productivity. The event is defined as when firms enter into a SEZ area or when a SEZ established in that area (if firms enter in the same year as the year SEZ established). The control group is located in cancelled SEZs. β_{-1}, the coefficient of the year prior to when firms enter into SEZs, is normalized to zero. The vertical lines represent 95% confidence intervals.

4.1.2 Indirect effects

Firm sizes

Table 5 also presents the estimated coefficients for the indirect effects of SEZs on the number of employees and sales for firms located in SEZ communes but outside the designated SEZ areas. These coefficients capture the spillover effects of SEZs on firms that are indirectly influenced by the presence of SEZs within their communes, rather than receiving direct benefits from SEZ-specific policies or infrastructure.

The indirect effects on employment are positive and statistically significant across both Panels A and B. In Panel A, the coefficient of 0.071 is significant at the 5% level, indicating that firms located in SEZ communes experience a 7.1% increase in employment relative to the control group of never-treated firms in canceled SEZs. This result suggests that the presence of SEZs generates positive externalities for neighboring firms, likely through increased local demand for goods and services. Panel B reinforces this finding, with a coefficient of 0.074,

significant at the 1% level, when the control group consists of never-treated firms in non-neighboring communes. The slight increase in magnitude relative to Panel A may reflect the broader economic dynamism of communes with SEZs compared to non-neighboring areas. These results imply that the economic benefits of SEZs extend beyond their immediate boundaries, creating employment opportunities even for firms that do not directly operate within the SEZs. The indirect effect on employment in Panel A and B is smaller but still statistically significant. The difference in magnitude underscores the fact that firms outside SEZ areas do not benefit directly from SEZ-specific policies but still experience positive externalities, such as increased demand for labor due to input-output linkage.

The spillover effects of SEZs on sales are similarly significant and economically meaningful. In Panel A, the coefficient of 0.292 is statistically significant at the 1% level, indicating that firms in SEZ communes outside the SEZ areas experience a 29.2% increase in sales compared to the control group. This substantial increase highlights the indirect economic benefits of SEZs, which may arise from enhanced connectivity, and greater integration into local supply chains in the region driven by SEZ firms. In Panel B, the coefficient for sales is 0.339, also significant at the 1% level - still similar in magnitude compared to Panel A. The results reflect the ability of SEZs to stimulate local economic activity and enhance firm performance even for firms that are not directly eligible for SEZ-specific incentives.The indirect effects are again smaller than the direct effect, reinforcing the idea that proximity to the SEZ matters for the magnitude of benefits.

Measures of productivity The results indicate positive and statistically significant spillover effects on labor productivity for firms outside SEZ areas but within SEZ communes. In Panel A, the coefficient for the indirect effect is 0.085, significant at the 5% level, implying an 8.5% increase in labor productivity relative to the control group of never-treated firms in canceled SEZs. This suggests that SEZs create positive externalities for neighboring firms. Panel B confirms the robustness of these findings, with a coefficient of 0.138, significant at the 1% level. This larger magnitude compared to Panel A may reflect the broader economic dynamism of SEZ communes relative to non-neighboring communes used as the control group. The consistent positive effects indicate that SEZs influence productivity not only directly but also indirectly. The smaller magnitude of the indirect effects compared to direct effects (discussed below) aligns with expectations, as firms outside SEZ areas do not receive the same direct benefits such as tax breaks and regulatory support. However, the significant positive coefficients highlight the role of SEZs in creating agglomeration economies and improving the overall economic environment within SEZ communes.

Parallel assumption and dynamic effects

Figure 4 presents the β_k event study coefficients for the indirect effects of SEZ establishment on the log number of employees, log sales, and log labor productivity for firms located in SEZ communes but outside SEZ areas. The control group consists of firms in canceled SEZs. The coefficients represent the average treatment on the treated (ATT) for each period relative to the year prior to SEZ establishment ($t = -1$), which is normalized to zero. The vertical lines represent 95% confidence intervals.

The validation of the parallel trends assumption relies on the pre-treatment coefficients (β_{-5} to β_{-2}). Across all three panels, the pre-treatment coefficients are statistically indistinguishable from zero, as their confidence intervals consistently overlap with zero. This finding suggests that treated and control firms in SEZ communes followed similar trends before SEZ establishment, supporting the validity of the parallel trends assumption.

For the number of employees (top-left panel), the pre-treatment coefficients fluctuate slightly but remain close to zero, with no statistically significant deviations. This indicates that firms in SEZ communes did not experience systematic differences in employment trends relative to the control group prior to SEZ establishment. Similarly, for sales (top-right panel), the pre-treatment coefficients are centered around zero, with no significant deviations observed. For labor productivity (bottom panel), the pre-treatment coefficients are also statistically insignificant, further supporting the parallel trends assumption.

The post-treatment coefficients (β_0 to β_5) reveal significant dynamic effects for number of employees, sales, and labor productivity. For number of employees, the post-treatment coefficients show a gradual upward trend starting from $t = 1$, with significant increases observed in later periods. This indicates that the presence of SEZs indirectly stimulates employment growth among neighboring firms over time. For sales, the post-treatment effects exhibit a similar pattern. Significant increases begin in $t = 1$, with coefficients growing in magnitude over time. These results suggest that SEZ establishment boosts the revenue of nearby firms. For labor productivity, the post-treatment effects are more variable but show a consistent positive trend starting from $t = 1$. The coefficients remain positive in most periods, but becomes statistically insignificant from period $t = 3$ onwards.

Therefore, the parallel trends assumption is supported by the pre-treatment coefficients, which are statistically indistinguishable from zero across all three outcomes. The dynamic post-treatment effects reveal significant and growing benefits for neighboring firms in terms of employment, sales, and productivity.

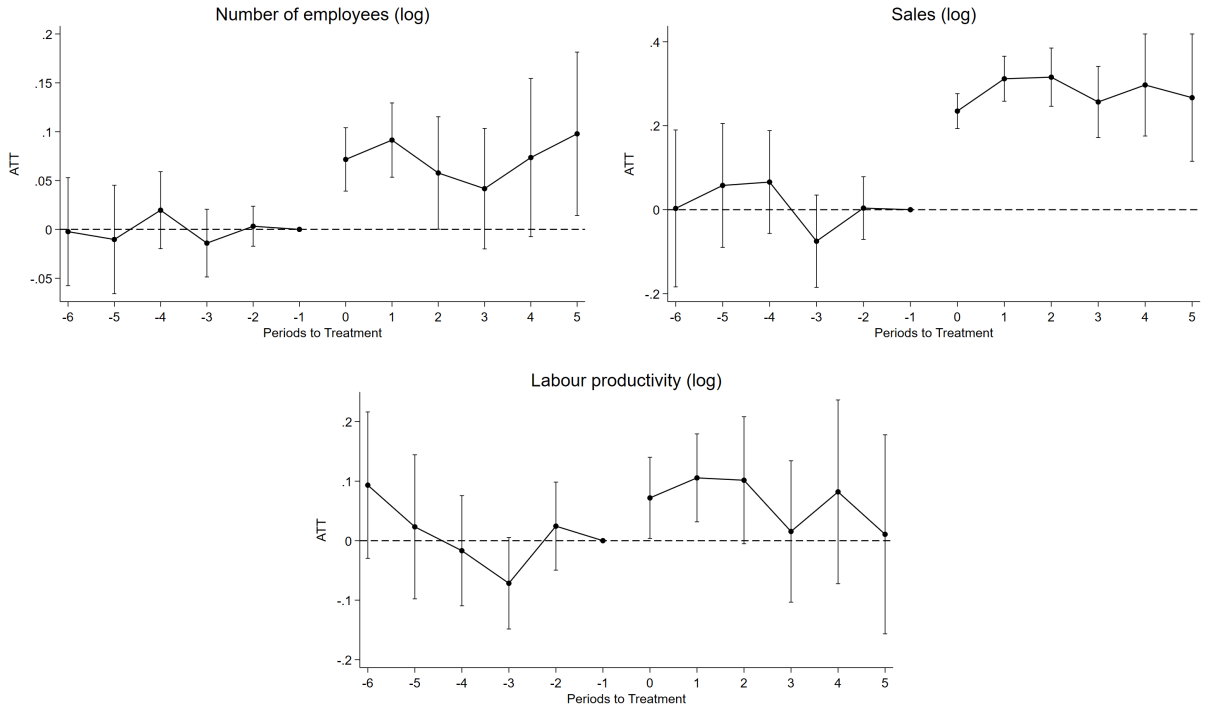


Figure 4: Sizes and measures of productivity indicators after SEZ establishment in a commune

Note: Figure 4 plots the estimated β_k event study coefficients from a regression of the form given in equation **??** using Wooldridge (2021), where the dependent variable is, in turn, log number of employees, log sales, log labour productivity. The event is defined as when a SEZ was established in a commune. The control group is located in cancelled SEZs. β_{-1}, the coefficient of the year prior to a first SEZ established in a commune, is normalized to zero. The vertical lines represent 95% confidence intervals.

4.2 Robustness check

4.2.1 Alternative empirical strategies - Using propensity score matching and event study

Firms that enter SEZs typically exhibit superior performance indicators on average compared to firms not located in SEZs, whether outside the SEZ area or in the same commune, as summarized in table 4. This pattern reflects not only a selection bias in the types of firms entering SEZs but also a selection bias in the locations where SEZs are established, as discussed in Section 2.2. To address these biases, we implement a standard propensity score matching (PSM) approach.

Using a set of never-treated firms, we construct a matched comparison group C_i for each treated firm i, based on a vector of baseline covariates X_{it}. Specifically, we estimate the propensity score for firm i to be located in an SEZ in year t by employing a flexible year-by-

year probit model. In this model, the treatment indicator $D_i = 1$ if firm i is located in an SEZ area, and $D_i = 0$ for never-treated firms. The covariate vector X_{it} includes pre-treatment characteristics such as two-digit sector fixed effects, firm ownership type (foreign, private, or state-owned), and firm performance indicators (mean sales and mean number of employees) measured two years prior to the SEZ entry. The results of the probit regressions, performed using three nearest neighbors with replacement, are presented in Online Appendix Table 19.

Following the matching procedure, we estimate an event study based on Equation **??**. This methodology compares the outcomes of treated firms with those of their matched control group, constructed through propensity score matching.

Table 6 reports the event study estimates derived from the propensity score matching procedure. The table focuses on the primary outcome variables, including the number of employees, total sales, and labor productivity (measured as value added per employee in logarithmic form).

Table 6: Robustness check - using alternative empirical strategy

Dep var:	**Number of employees**		**Sales**		**Labour productivity**	
	In SEZ	**In commune**	**In SEZ**	**In commune**	**In SEZ**	**In commune**
Effect	Direct	Indirect	Direct	Indirect	Direct	Indirect
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Control group is matched never-treated firms						
SEZ	0.186***	0.091***	0.216***	0.154***	0.230**	0.066**
	(0.062)	(0.017)	(0.079)	(0.030)	(0.056)	(0.033)
Obs	25,375	287,011	25,278	286,890	21,912	250,532

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is matched never-treated firms. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 6 presents the event study estimates for the effects of SEZ establishment on the number of employees, total sales, and labor productivity for firms located both directly within SEZ areas (direct effects) and indirectly in SEZ communes but outside the designated SEZ areas (indirect effects). The results are based on the propensity score matching approach, with the control group consisting of matched never-treated firms. The dependent variables are measured as logarithmic transformations, and the estimates reflect the average treatment

effect on the treated (ATT).

Columns (1) and (2) present the effects of SEZ establishment on employment. The direct effects for firms located within SEZ areas are positive and statistically significant, with a coefficient of 0.186 (significant at the 1% level). This result implies an 18.6% increase in the number of employees for firms operating directly within SEZs. The indirect effects, shown in column (2), are also positive and statistically significant, with a coefficient of 0.091 (1% level). This indicates a 9.1% increase in employment for firms located in SEZ communes but outside SEZ areas.

Columns (3) and (4) report the impact of SEZ establishment on total sales. The direct effects are again positive and highly significant, with a coefficient of 0.216 (1% level), suggesting that firms within SEZs experience a 21.6% increase in sales relative to the control group. The indirect effects on sales, shown in column (4), are also positive and significant, with a coefficient of 0.154 (1% level). This result indicates a 15.4% increase in sales for firms in SEZ communes but outside SEZ areas. Columns (5) and (6) examine the effects on labor productivity, measured as value added per employee in logarithmic form.

Therefore, our results for both direct and indirect effects in terms of firms sizes and productivity reflect robustness of our findings in the base results.

4.2.2 Remove two star cities

To further ensure the robustness of our results, we exclude the two largest metropolitan areas, Ho Chi Minh City and Ha Noi, which are cities directly governed by the central government. These cities each host more than ten state- and province-level SEZs and are home to powerful interest groups with significant political influence. Given their unique political and economic characteristics, these cities are likely to attract various additional resources and policy advantages beyond SEZs, potentially introducing omitted variable bias into the analysis. By removing these two cities from our sample, we aim to isolate the effects of SEZs from broader regional and political factors that could confound the results. Table 7 presents the findings after excluding Ho Chi Minh City and Hanoi, demonstrating the robustness of our estimates under this restricted sample.

Table 7: Robustness check: remove two star cities

Dep var:	**Number of employees**		**Sales**		**Labour productivity**	
	In SEZ	**In commune**	**In SEZ**	**In commune**	**In SEZ**	**In commune**
Effect	Direct	Indirect	Direct	Indirect	Direct	Indirect
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Control group is never-treated firms in the cancelled SEZs						
SEZ	0.147*	0.006	0.661***	0.250***	0.381***	0.061
	(0.080)	(0.018)	(0.153)	(0.034)	(0.114)	(0.040)
Obs	12,177	104,314	12,171	104,250	9,879	83,753

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is firms located in cancelled SEZs. We remove two star cities from the sample. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

In the full sample (Table 5, Panel A), the direct effect is 0.183 and statistically significant at the 5% level. In Table 7, the direct effect remains positive and significant, though slightly smaller in magnitude (0.147, significant at the 10% level). This reduction suggests that the employment effects of SEZs are partially driven by firms in Ho Chi Minh City and Hanoi. In contrast, the indirect effects on employment are significant in the full sample (0.071, significant at the 5% level) but become statistically insignificant after excluding the two cities (0.006). This sensitivity highlights the reliance of spillover employment benefits on the economic activity and labor market integration present in metropolitan areas.

The direct effects on sales remain robust and statistically significant across both samples. In the full sample, the coefficient is 0.553 (significant at the 1% level), while in the restricted sample it increases slightly to 0.661 (1% level). This result suggests that SEZ-induced revenue growth is not overly reliant on firms in metropolitan areas and reflects broader benefits applicable to firms across various regions. The indirect effects on sales are also positive and significant in both tables, with a coefficient of 0.292 (1% level) in the full sample and 0.250 (1% level) in the restricted sample. Therefore, the spillover effects in both sample are still similar.

The results for labor productivity reveal a divergence in direct and indirect effects. The direct effects remain robust and significant across both samples. In the full sample, the coefficient is 0.259 (significant at the 5% level), while in the restricted sample it increases to 0.381 (1% level). This increase suggests that productivity gains from SEZs may be stronger

in smaller communes, where firms benefit more directly from SEZ infrastructure and policy advantages. The indirect effects on productivity, however, lose significance after excluding Ho Chi Minh City and Hanoi. In the full sample, the coefficient is 0.085 (significant at the 5% level), but it becomes insignificant (0.061) in the restricted sample. This result indicates that the observed spillover effects on productivity are largely driven by the dynamic economic environment of metropolitan areas.

4.3 Heterogeneous Effects

4.3.1 By types of SEZs

All types of SEZs offer a favorable tax policy for firms operating there. However, there are several dimensions that these SEZs' types are different from each other as explained in the background. Therefore, in this part, we will analyze the effects of different types of SEZs on our interested outcomes, including employment, sales, and labor productivity. The results are summarized in table 8.

Table 8: Heterogeneity Results: By Types of SEZs

	Number of employees		Sales		Labour productivity	
	Direct	**Indirect**	**Direct**	**Indirect**	**Direct**	**Indirect**
Panel A. Industrial zones						
SEZs	0.114*	0.083***	0.369***	0.383***	0.235***	0.147***
	(0.058)	(0.020)	(0.087)	(0.039)	(0.074)	(0.035)
Obs	24,862	55,785	24,791	55,739	20,537	45,306
Panel B. Economic zones						
SEZs	0.215***	0.141***	0.107	0.297***	-0.003	-0.140**
	(0.036)	(0.029)	(0.098)	(0.062)	(0.096)	(0.066)
Obs	22,327	23,366	22,317	23,351	18,561	18,567
Panel C. Border zones						
SEZs	0.019	0.177***	0.097	0.352***	0.065	-0.265***
	(0.056)	(0.032)	(0.125)	(0.067)	(0.125)	(0.065)
Obs	21,530	25,532	21,498	25,519	17,590	20,074
Panel D. Provincial zones						
SEZs	0.135***	0.085***	0.351***	0.252***	0.006	0.060**
	(0.047)	(0.014)	(0.083)	(0.029)	(0.066)	(0.026)
Obs	23,710	99,698	23,678	99,620	19,803	82,056

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is firms located in cancelled SEZs. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

The effects on employment vary considerably across SEZ types. The largest direct effect is observed in *economic zones* (0.215, significant at the 1% level), which exceeds the main result in table 5, Panel A (0.183). This finding suggests that economic zones, which typically feature broader infrastructure and service provisions, attract firms that generate substantial employment opportunities. *Industrial zones* and *provincial zones* also exhibit positive direct effects on employment (0.114 and 0.135, respectively), though smaller in magnitude than economic zones. In contrast, the direct effect in *border zones* is close to zero (0.019) and statistically insignificant, reflecting the limited labor market and industrial base in border areas. Spillover effects on employment are significant across all SEZ types, with the largest effect observed in *border zones* (0.177), followed by *economic zones* (0.141). These findings suggest that, despite weak direct effects, border zones stimulate local labor markets and supply chains, generating substantial spillovers. Spillover effects in *industrial zones* (0.083)

and *provincial zones* (0.085) are smaller but remain significant, aligning closely with the spillover findings in table 5, Panel A (0.071).

SEZs consistently demonstrate strong positive effects on firm sales across all types, though the magnitude varies. The largest direct effects are observed in *industrial zones* (0.369) and *economic zones* (0.297), both statistically significant at the 1% level. These findings are broadly consistent with the main results in table 5, Panel A (0.553). *Provincial zones* also exhibit significant direct effects on sales (0.351), whereas *border zones* display smaller effects (0.097), suggesting that limited market access and infrastructure in border areas constrain sales growth for firms operating there. Spillover effects on sales are significant across all SEZ types, with the largest effects in *industrial zones* (0.383) and *border zones* (0.352).

The direct effects on labor productivity are positive and significant in *industrial zones* (0.235) and *provincial zones* (0.006), but insignificant or negative in *economic zones* (−0.003) and *border zones* (0.065). The positive effects in industrial zones likely reflect efficiency gains from sector-specific infrastructure and clustering. Conversely, the lack of significant productivity gains in economic and border zones may arise from these zones prioritizing broader development goals over efficiency improvements. Indirect effects on productivity vary significantly across SEZ types. Negative and significant effects are observed in *economic zones* (−0.140) and *border zones* (−0.265), potentially reflecting resource constraints or competitive pressures in SEZ communes. In contrast, *industrial zones* (0.147) and *provincial zones* (0.060) show positive and significant spillover effects, suggesting enhanced local firm productivity through knowledge spillovers and infrastructure access.

Industrial zones might benefit from sector-specific infrastructure, driving both direct and indirect effects on productivity and sales. In contrast, *economic zones* prioritize broader objectives, such as job creation, which may dilute productivity gains. *Border zones* face challenges such as limited market access, weaker infrastructure, and high transportation costs, which constrain direct benefits but stimulate local economic activity through spillovers.

4.3.2 By firm sizes

Firm size represents another critical dimension of heterogeneity, particularly in the context of Vietnam, where micro and small enterprises account for more than 90% of all firms. To examine the differential impacts of SEZs by firm size, we classify firms into four categories

based on the official government standard[11]. Specifically, firms are categorized as follows: *very small firms* (fewer than 10 employees), *small firms and medium firms* (10 to 200 employees), and *large firms* (more than 200 employees). This classification allows us to explore how SEZs impact firms of varying sizes, given the substantial structural differences in resource availability, market reach, and growth potential across these categories.

Table 9: Heterogeneity Analysis - Firm Sizes

	Number of employees		**Sales**		**Labour productivity**	
	Direct	**Indirect**	**Direct**	**Indirect**	**Direct**	**Indirect**
Panel A. Very Small Firms						
SEZs	0.061	0.133***	-0.177	0.331***	-0.014	0.029
	(0.062)	(0.035)	(0.169)	(0.049)	(0.185)	(0.046)
Obs	13,099	81,253	13,092	81,219	10,928	65,269
Panel B. Small and Medium Firms						
SEZs	0.194**	0.010	0.585***	0.283***	0.218	0.145***
	(0.084)	(0.029)	(0.156)	(0.051)	(0.141)	(0.053)
Obs	8,210	61,892	8,207	61,863	6,651	50,258
Panel C. Big Firms						
SEZs	-0.149	0.026	0.822***	0.489***	0.715	0.290**
	(0.277)	(0.111)	(0.243)	(0.161)	(0.462)	(0.129)
Obs	653	3,655	648	3,599	493	2,850

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is firms located in cancelled SEZs. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 9 presents the estimated effects of SEZ establishment on firm performance by firm size. The outcomes include the number of employees, sales, and labor productivity, analyzed as direct effects (for firms operating within SEZs) and indirect effects (spillovers for firms located in SEZ communes but outside SEZ areas).

The direct effects on employment are significant for *small and medium firms* (0.194, significant at the 5% level), suggesting that SEZs are particularly effective in creating jobs for firms in this size category, which are likely to have the capacity to expand operations but

[11]The classification is defined in Decree 80/2021/ND-CP. While the decree includes revenue as an additional criterion for defining firm size, this paper uses the number of employees at the end of the year as the sole measure.

may lack the resources to do so without SEZ support. For *very small firms*, the direct effect is positive but statistically insignificant (0.061), indicating that SEZs may not directly drive employment growth for micro-enterprises due to resource constraints or limited scalability. For *big firms*, the direct effect is negative and statistically insignificant (−0.149), suggesting that larger firms are less reliant on SEZ incentives for workforce expansion. Spillover effects on employment are strongest for *very small firms* (0.133, significant at the 1% level). Indirect effects for *small and medium firms* and *big firms* are smaller and statistically insignificant (0.010 and 0.026, respectively).

The effects on sales are highly significant across all firm sizes, with the largest magnitudes observed for *big firms* (0.822, significant at the 1% level) and *small and medium firms* (0.585, significant at the 1% level). These findings suggest that larger firms benefit substantially from SEZ infrastructure and market access, while small and medium firms also experience strong revenue growth by scaling operations. For *very small firms*, the direct effect is negative and statistically insignificant (−0.177), indicating that very small firms may struggle to fully capitalize on SEZ opportunities. Spillover effects on sales are positive and significant for all firm sizes. The largest indirect effects are observed for *very small firms* (0.331, significant at the 1% level). Spillover effects for *small and medium firms* (0.283) and *big firms* (0.489) are also significant, reflecting the broader economic activity stimulated by SEZs.

Spillover effects on productivity are significant for *small and medium firms* (0.145, significant at the 1% level) and *big firms* (0.290, significant at the 5% level). For *very small firms*, the indirect effect is positive but statistically insignificant (0.029), suggesting weaker spillover effects for very small firms.

Very small firms may lack the resources and workforce to fully exploit SEZ benefits, resulting in weaker direct effects on employment and productivity. However, they benefit significantly from indirect effects through supply chain linkages and local demand. *Small and medium firms* and *big firms* are better positioned to scale operations, allowing them to realize substantial direct benefits from SEZs.

4.3.3 By types of firms

We argue from the beginning, how SEZs may affect firms' outcomes compared to non-SEZs firms are because of the type of firms that they are trying to attract (multinational firms) and the agglomeration effect. In our dataset, we could distinguish between types of firms,

including foreign, private domestic, and state domestic firms. We will test whether when we limit to only foreign firms, or only private domestic firms, or only state domestic firms - the results will be similar or different.

Table 10: Heterogeneity analysis - Types of Firms

	Number of employees		**Sales**		**Labour productivity**	
	Direct	**Indirect**	**Direct**	**Indirect**	**Direct**	**Indirect**
Panel A. Foreign Firms						
SEZs	0.663***	-0.072	1.611***	0.442*	0.476**	-0.198
	(0.124)	(0.101)	(0.230)	(0.252)	(0.185)	(0.232)
Obs	971	2,344	965	2,320	719	1,716
Panel B. Private Domestic Firms						
SEZs	0.161**	0.086***	0.397***	0.299***	0.130	0.079*
	(0.079)	(0.026)	(0.123)	(0.035)	(0.127)	(0.043)
Obs	20,411	135,882	20,402	135,798	16,893	109,431
Panel C. State Domestic Firms						
SEZs	0.078	-0.037	2.179**	0.168	0.227	0.150
	(0.279)	(0.076)	(1.018)	(0.156)	(0.344)	(0.129)
Obs	569	8,267	569	8,256	449	7,017

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is firms located in cancelled SEZs. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 10 presents the effects of SEZ establishment on firm performance across three types of firms: foreign firms, private domestic firms, and state domestic firms. The outcomes include the number of employees, sales, and labor productivity, with effects categorized into direct impacts (for firms located within SEZs) and indirect spillovers (for firms located in SEZ communes but outside SEZ areas). For the direct effect of SEZs on employment, the effect is largest for *foreign firms* (0.663, significant at the 1% level). This effect is much larger than the aggregate results in Table 5, Panel A (0.183), indicating that foreign firms benefit significantly from SEZ incentives, likely due to their capital-intensive nature and ability to scale operations quickly. For *private domestic firms*, the direct effect is smaller but positive and significant (0.161, significant at the 5% level), reflecting their capacity to expand but facing more constraints compared to foreign firms. For *state domestic firms*, the direct effect is positive but statistically insignificant (0.078), suggesting that state-owned enterprises are

less responsive to SEZ incentives for workforce expansion. Spillover effects on employment are significant only for *private domestic firms* (0.086, significant at the 1% level). This finding indicates that private domestic firms in SEZ communes benefit indirectly through supply chain linkages or subcontracting opportunities. For *foreign firms* and *state domestic firms*, the indirect effects are negative and insignificant (-0.072 and -0.037, respectively), suggesting minimal spillover benefits for these firm types.

SEZs have the strongest direct effect on sales for *state domestic firms* (2.179, significant at the 5% level), much larger than the results in Table **??**, Panel A (0.553). This result suggests that state-owned enterprises may leverage SEZ policies to significantly increase output, potentially benefiting from preferential access to SEZ resources. For *foreign firms*, the direct effect on sales is also substantial (1.611, significant at the 1% level), highlighting their ability to utilize SEZ infrastructure and tax benefits to achieve significant revenue growth. For *private domestic firms*, the direct effect is smaller but still significant (0.397, significant at the 1% level), reflecting more limited capacity to expand compared to foreign or state firms. Spillover effects on sales are positive and significant for both *private domestic firms* (0.299, significant at the 1% level) and *foreign firms* (0.442, significant at the 10% level), indicating that SEZ communes stimulate broader economic activity, benefiting these firms through improved market linkages. For *state domestic firms*, the indirect effect is positive but insignificant (0.168), reflecting weaker spillovers, possibly due to their limited integration with local supply chains. SEZs significantly improve labor productivity for *foreign firms* (0.476 for direct effects, significant at the 5% level. Spillover effects on productivity are significant only for *private domestic firms* (0.079, significant at the 10% level).

Foreign firms benefit from access to international markets, advanced technology, and capital, allowing them to capitalize on SEZ incentives. State firms may gain preferential access to SEZ resources but face structural inefficiencies. Private firms, while resource-constrained, benefit significantly from SEZ spillovers. Private domestic firms show stronger spillover effects due to their reliance on local supply chains. Foreign firms prioritize efficiency and profitability, leading to substantial productivity gains. Private domestic firms balance growth and efficiency, while state firms focus on output expansion, driving sales growth without proportional employment or productivity improvements.

4.3.4 By industry

The Pavitt taxonomy (Bogliacino and Pianta, 2010) groups firms based on their sources of technological capability and innovation:

- **Supplier-dominated firms**: Firms in traditional sectors that rely on external suppliers for innovation.
- **Scale-intensive firms**: Firms benefiting from economies of scale, often in manufacturing and large-scale production.
- **Science-based firms**: Firms with strong in-house R&D capabilities, such as technology or pharmaceutical firms.
- **Specialized suppliers**: Firms that produce specialized inputs or machinery for other industries.

This taxonomy allows us to evaluate whether SEZ policies disproportionately benefit firms in specific industries.

Table 11 reports the results of SEZ effects on firm outcomes—number of employees, sales, and labor productivity—across industries classified under Pavitt's taxonomy. The analysis considers four industry types: supplier-dominated firms, scale-intensive firms, science-based firms, and specialized suppliers. Science-based firms exhibit the strongest direct effects across all outcomes. The estimated coefficient for sales is 1.143 (significant at the 1% level), substantially larger than the baseline results for SEZ firms in table 5, where the direct effect on sales was 0.553. Labor productivity also sees considerable gains (0.915, significant at the 1% level), reflecting the ability of SEZ policies to support R&D-driven activities. The direct effect on employment (0.370) further underscores the capacity of SEZs to facilitate workforce expansion in science-based industries. Indirect effects for science-based firms, however, are limited, with labor productivity (0.128) and employment (0.126) showing insignificant spillovers. This suggests that the benefits of SEZs for science-based firms are largely confined to firms operating within SEZs, with minimal knowledge diffusion to firms in SEZ communes.

Supplier-dominated firms benefit significantly from both direct and indirect effects. Direct effects include a positive and significant impact on employment (0.105, significant at the 1% level), sales (0.278, significant at the 1% level), and labor productivity (0.143, significant at the 5% level). Spillover effects are particularly notable, with significant positive coefficients

for sales (0.361) and labor productivity (0.111), reflecting strong linkages between supplier-dominated firms in SEZ areas and those located in SEZ communes.

Specialized suppliers exhibit limited benefits from SEZ policies. This may stem from their focus on niche markets and high reliance on specific value chains that are not fully integrated with SEZ or commune-level activities. Scale-intensive firms exhibit weaker effects compared to other industry categories. Direct effects on sales (0.306, significant at the 5% level), while labor productivity (0.125) remains insignificant. Spillover effects are negligible, with labor productivity even showing a negative but insignificant coefficient (-0.060).

The strong spillovers for supplier-dominated firms reflect their reliance on local suppliers and value chains, which amplify the indirect effects of SEZs. Scale-intensive firms, which are highly capital-intensive, may not benefit as much from SEZ policies tailored to labor-intensive or R&D-focused industries, while specialized suppliers, which often operate in niche markets, may face limitations in leveraging SEZ resources or integrating with local value chains.

Table 11: Heterogeneity analysis - By industry: Pavitt Taxonomy

Dep var:	**Number of employees**		**Sales**		**Labour productivity**	
Treated group	**In SEZ**	**In commune**	**In SEZ**	**In commune**	**In SEZ**	**In commune**
Effect	**Direct**	**Indirect**	**Direct**	**Indirect**	**Direct**	**Indirect**
Panel A. By Pavitt taxonomy						
Panel A1. Only supplier-dominated firms						
SEZ	0.105***	0.081***	0.278***	0.361***	0.143**	0.111***
	(0.037)	(0.013)	(0.069)	(0.029)	(0.062)	(0.027)
Obs	24,036	94,096	23,988	94,031	19,200	75,765
Panel A2. Only scale-intensive firms						
SEZ	0.110	0.038	0.306**	0.179**	0.125	-0.060
	(0.076)	(0.040)	(0.135)	(0.077)	(0.112)	(0.065)
Obs	4,454	10,457	4,422	10,445	3,619	8,605
Panel A3. Only science-based firms						
SEZ	0.370*	0.126	1.143***	0.158	0.915***	0.128
	(0.220)	(0.155)	(0.130)	(0.242)	(0.273)	(0.233)
Obs	1,145	2,242	1,115	2,236	891	1,859
Panel A4. Only specialized suppliers firms						
SEZ	0.156	0.110**	0.509*	0.180	0.083	0.015
	(0.119)	(0.052)	(0.243)	(0.111)	(0.217)	(0.097)
Obs	2,644	8,355	2,641	8,338	2,069	6,663

Notes: The dependent variables in Columns (1)–(2), (3)–(4), and (5)–(6) are the number of employees, sales, and labor productivity (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is firms located in cancelled SEZs. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5 Mechanisms

In this section, we investigate potential mechanisms driving the observed effects of SEZ establishment on firm-level outcomes. Specifically, we explore three key pathways: input-output linkages, access to credit, and the technology gap (or absorptive capacity). First, we examine the role of input-output linkages, where SEZ firms stimulate demand for inputs

from local suppliers. Using the Vietnam Input-Output (IO) table, we construct sector-level input coefficients to capture the importance of specific sectors in the production networks of SEZ firms. We hypothesize that SEZ firms create backward linkages by sourcing inputs from firms within SEZ communes, which in turn boosts the performance of local non-SEZ firms through increased sales and production activity. Second, we assess the impact of enhanced access to credit facilitated by SEZ policies. SEZ firms often benefit from favorable financing conditions, such as lower interest rates or government-backed guarantees. We test this hypothesis by examining whether SEZ firms have higher probability of accessing to credit. Third, we explore the role of the technology gap (or absorptive capacity) in determining the spillover effects of SEZs. SEZ firms, particularly those with foreign direct investment (FDI), often introduce advanced technologies and management practices. However, it depends on the technology distance between domestic firms with FDI firms. We hypothize that since Vietnam is still a developing country, it is harder for them to learn from technology-frontier firms.

5.1 Input-Output Linkage

To understand why treated firms grow in employment and sales, we investigate input-output linkage channel. To quantify and isolate the impact of SEZ on input demand, we develop a measure that incorporates both sector-specific pre-trends and annual fluctuations. This measure is designed to capture how SEZs influence the demand for inputs within specific industries, accounting for the structural relationships in the economy and the temporal dynamics of sectoral activity.

The construction of this measure relies on the Vietnam Input-Output (IO) table from 2007, which provides the input coefficients (w_{si}^{U}) needed to evaluate the significance of sector s in the production processes of industry i. These input coefficients reflect the technological importance of specific sectors in the production structure, serving as fixed weights derived from the IO framework. The assumption is that these coefficients remain stable over time, reflecting the underlying production technology in the economy.

In addition, the measure incorporates sector weights (w_{it}^{m}), which vary over time and capture the dominance of specific industries in SEZs relative to the economy as a whole. Sector weights are calculated as the share of sales by firms operating within SEZs in industry i at time t divided by the total sales of industry i at the same time. This dynamic weighting approach ensures that the measure adapts to the temporal changes in industrial activity and

SEZ participation across industries.

Formally, the SEZ-induced input demand measure for sector s at time t is defined as:

$$SEZ_{st} = \sum_i w_{si}^U \times w_{it}^m,$$

where w_{si}^U denotes the fixed input coefficient capturing the interdependence between sector s and industry i, and w_{it}^m represents the time-varying sector weight of industry i. The inclusion of w_{it}^m ensures that the measure reflects the economic weight of SEZ activities at any given point in time.

By combining these elements, the SEZ_{st} measure estimates the influence of SEZs on sectoral input demand. It reflects both the structural dependencies captured by the input coefficients and the dynamic changes in SEZ-related activity captured by the sector weights. This approach enables us to disentangle the role of SEZs in shaping production linkages and input demand while controlling for sectoral-specific pre-trends and broader economic fluctuations.

The results in table 12 report findings from testing this mechanism. For firms with high input demand, the direct effects of SEZs on both employment (0.408, significant at the 5% level) and sales (1.043, significant at the 5% level) are substantial. These findings suggest that SEZs enable high-input-demand firms to expand their operations by leveraging enhanced access to critical inputs, specialized suppliers, and infrastructure provided by SEZs. The indirect effects on employment (0.361, significant at the 1% level) and sales (0.543, significant at the 1% level) further demonstrate that SEZs generate significant economic spillovers to non-SEZ firms within the same commune. These spillovers are likely driven by increased local demand for intermediate goods and services, which stimulates production and employment among firms outside the SEZ boundaries. The strong performance of high-input-demand firms supports the hypothesis that SEZs create **backward linkages** by fostering robust local supply chains. Firms within SEZs may source inputs from local non-SEZ firms, incentivizing these firms to scale their production and workforce capacity in response to higher demand.

For firms with low input demand, the **direct effects** of SEZs on employment (0.108) and sales (0.115) are positive but statistically insignificant, indicating limited direct benefits for these firms. However, the **indirect effects** remain significant, particularly for sales (0.537, significant at the 5% level). These findings suggest that low-input-demand firms located in SEZ communes benefit indirectly from the economic dynamism generated by SEZs.

Such spillover effects on sales may arise from participation in downstream activities or from increased local consumer demand stimulated by the higher incomes of SEZ employees.

Table 12: Mechanism - Input-Output Linkage

Dep var:	**Number of employees**		**Sales**	
Effect	Direct	Indirect	Direct	Indirect
Panel A. High input demand				
SEZ	0.408**	0.361***	1.043**	0.543***
	(0.194)	(0.088)	(0.404)	(0.149)
Obs	1,884	3,336	1,859	3,330
Panel B. Low input demand				
SEZ	0.108	0.309**	0.115	0.537**
	(0.131)	(0.134)	(0.269)	(0.226)
Obs	922	2,080	921	2,072

Notes: The dependent variables in Columns (1)–(2), (3)–(4) are the number of employees and sales (log), respectively. The direct effects capture the impact on firms located within SEZ areas, while the indirect effects capture the spillover impact on firms located in SEZ communes but outside the SEZ areas. The control group is firms located in cancelled SEZs. Standard errors are in brackets. *, **, and *** indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.2 Access to credit

The results in able 13 highlight the impact of SEZ participation on the likelihood of firms obtaining credit. The findings reveal a statistically significant and positive direct effect of SEZ participation (0.072, significant at the 1% level) on the probability of securing credit, while the indirect effect is small and statistically insignificant (0.004). These results underscore that the benefits of SEZs in facilitating credit access are largely concentrated among firms operating within SEZ boundaries.

Therefore, this result confirms that firms in SEZ areas have higher chance to access to credit - which is one of SEZ policies to provide subsidized credit, preferential loan terms, and government-backed guarantees. Firms outside the SEZ boundaries are typically excluded from such programs, which limits their ability to benefit indirectly from these policies. Sec-

ond, the presence of financial institutions within or near SEZs facilitates easier access to credit for SEZ firms. Many financial institutions co-locate in SEZs to serve the firms there, reducing transaction costs and improving firms' ability to secure financing. Firms in the same commune but outside SEZ boundaries do not have the same level of access, as financial institutions may prioritize firms located directly within SEZs. Finally, the limited indirect effects suggest that the benefits of SEZs do not spill over significantly to non-SEZ firms within the same commune. SEZ policies are often highly targeted, focusing on the competitiveness of firms within the SEZ boundaries. As a result, firms outside SEZs may face challenges in accessing the financial resources or institutional support needed to secure credit, even when located in the same geographic area. This explains why the effects we found in the main results in table 5 are stronger for firms within SEZs (direct effects) than firms in the SEZs communes (indirect effects).

Table 13: Mechanism - Probability of Getting Credit

Dep var:	**Probability of getting credit**	
Effect	Direct	Indirect
SEZ	0.072***	0.004
	(0.013)	(0.005)
Obs	34,854	127,337

5.3 Technology gap

Absorptive capacity refers to a firm's proficiency in identifying, assimilating, and utilizing new information for commercial purposes (Cohen and Levinthal, 1990). Cohen and Levinthal suggest that firms enhance their absorptive capacity by participating in activities that require related prior knowledge. Kokko (1994), using cross-sectional industry-level data from Mexico, tested the idea that FDI spillovers on domestic firms depend on the technological distance between foreign multinationals and domestic firms. The hypothesis that the degree of FDI spillover hinges on the absorptive capcaity of domestic firms has been further explored in the literature. For example, Blalock and Gertler (2009), using a panel dataset of Indonesian manufacturing firms for the 1988 to 1996 period, find that firms with more R&D investment benefit more from the presence of foreign multinationals. We present an evidence consistent with absorptive capacity hindering firms to benefit from SEZs.

To explore the technology gap within SEZs, we classify communes with SEZs based on the prevalence of firms receiving Foreign Direct Investment (FDI) from developed or developing countries. This classification provides insights into the extent of technological transfer and its implications for local economic development.

The methodology comprises three main steps.

First, at the firm level, firms are categorized based on the origin of their FDI. Specifically, firms receiving FDI from developed countries are coded as $FDI\ source = 1$, while those receiving FDI from developing countries are coded as $FDI\ source = 0$. This classification differentiates firms based on their potential access to advanced technologies and management practices associated with FDI from developed economies.

Second, at the commune level, aggregation is performed for each commune that hosts an SEZ. For each of these communes, we calculate the total number of firms receiving FDI from developed countries. Subsequently, the median number of such firms across all SEZ communes is determined. This median serves as a threshold for identifying communes with relatively higher or lower access to FDI from developed countries.

Finally, communes are classified based on the median threshold of FDI from developed countries. Communes where the number of firms receiving FDI from developed countries exceeds the median are classified as *only from developed countries*. These communes are hypothesized to have greater exposure to advanced technologies and managerial practices. In contrast, communes where the number of firms with FDI from developed countries is equal to or below the median are classified as *only from developing countries*. These communes are presumed to rely more heavily on technological inputs and practices from developing countries, which may be less advanced.

Table 14: Mechanism - Origins of FDI

Dep var:	**Labour productivity**	
Effect	Direct	Indirect
Panel A1. FDI only from developed countries		
SEZ	-0.077	0.043
	(0.196)	(0.051)
Obs	16,338	30,455
Panel A2. FDI only from developing countries		
SEZ	0.544***	0.201***
	(0.184)	(0.029)
Obs	14,071	77,092

Table 14 reports the role of the origin of FDI in shaping the effects of SEZs on labor productivity. The results in Panel A suggest that FDI from developed countries has no statistically significant impact on labor productivity for firms operating directly within SEZs (-0.077 or indirectly in the surrounding communes (0.043. This finding may reflect a mismatch between the advanced technologies introduced by firms from developed countries and the absorptive capacity of local firms, particularly those in SEZs. The large technology gap between firms from developed countries and local firms might limit the potential for effective knowledge transfer and spillovers, thereby diminishing the benefits of such FDI in improving labor productivity.

In contrast, Panel B shows that FDI from developing countries significantly enhances labor productivity both directly within SEZs (0.544, significant at the 1% level) and indirectly in neighboring communes (0.201, significant at the 1% level). This result suggests that the smaller technology gap between firms from developing countries and local firms facilitates more effective technology transfer and adoption. Firms from developing countries often use technologies and production methods that are closer to the capabilities of local firms, allowing for easier assimilation and adaptation. This dynamic likely drives the observed productivity gains.

The difference between the effects of FDI from developed and developing countries hightlights the importance of absorptive capacity in determining the productivity impacts of foreign investment, and SEZs. While FDI from developed countries introduces advanced technologies, the lack of complementary local capabilities may hinder the realization of productivity benefits. On the other hand, FDI from developing countries appears to provide technologies that are more accessible to local firms, enabling a smoother transfer of knowledge and skills.

6 Conclusion

This paper provides empirical evidence of the impact of SEZs on firm performance in Vietnam, employing a unique approach that employs cancelled SEZs as a control group to address endogeneity concerns. Our findings indicate that the establishment of SEZs significantly improves firm outcomes. Specifically, firms located within SEZs experience notable direct effects, including an 18.3% increase in employment, a 55.3% rise in sales, and a 25.9% improvement in labor productivity. In addition, indirect spillover effects are observed within communes hosting SEZs, with non-SEZ firms benefiting from increased labor productivity, sales, and employment.

Heterogeneity analysis reveals that the magnitude of these effects varies across firm characteristics and SEZ types. Foreign firms, large firms, science-based firms, and supplier-dominated firms exhibit the most substantial gains, while industrial SEZs drive the majority of the observed effects. Our analysis also sheds light on the mechanisms driving these effects. Enhanced access to credit emerges as a significant factor explaining the stronger direct effects within SEZs compared to spillovers outside SEZs. Furthermore, input-output linkages play a role in driving employment and sales growth, particularly through indirect effects on non-SEZ firms. However, the persistence of the technology gap for domestic firms underscores the need for targeted policies to facilitate knowledge spillovers and technological learning.

These findings carry important implications for the design and evaluation of SEZs as a policy tool for economic development. The success of SEZs in fostering firm performance hinges not only on tax incentives and infrastructure but also on fostering linkages between SEZ firms and local firms, promoting technology transfer, and addressing structural barriers to productivity growth for domestic firms. Moreover, the observed heterogeneity across firm types and SEZ configurations highlights the importance of tailoring SEZ policies to local economic contexts and firm capabilities. As Vietnam and other developing countries continue

to expand SEZs as a strategy for economic development, policymakers should prioritize mechanisms that enhance the absorptive capacity of domestic firms, reduce the technology gap, and maximize spillover effects to non-SEZ firms. Future research could explore the long-term effects, particularly in the context of shifting global trade patterns and the evolving role of SEZs in the global value chain. Whether SEZs can continue to drive economic growth in the face of these challenges remains a critical question requiring further investigation.

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7 Appendix

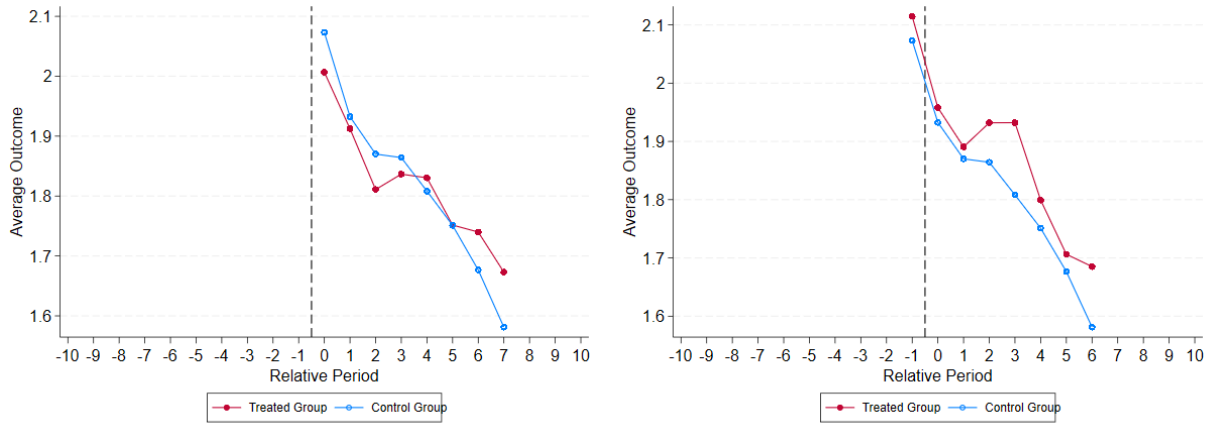
Appendix A1. Sample

Panel	Sample	Nb of Firms	Nb of Observations
A	All Sample	172,004	285,762
	SEZ Firms	13,985	113,712
	Firms in SEZ Communes	152,826	565,455
	Non-SEZ Firms	5,193	19,224
B	All Sample	985,293	4,141,739
	SEZ Firms	13,985	113,712
	Firms in SEZ Communes	152,826	565,455
	Non-SEZ Firms	818,482	3,875,201

Table 15: Sample Construction

Appendix A2. Raw data compared treated and control groups over employment

(A) Left: Employment Year 2012; Right: Employment Year 2013



(B) Left: Employment Year 2014; Right: Employment Year 2015

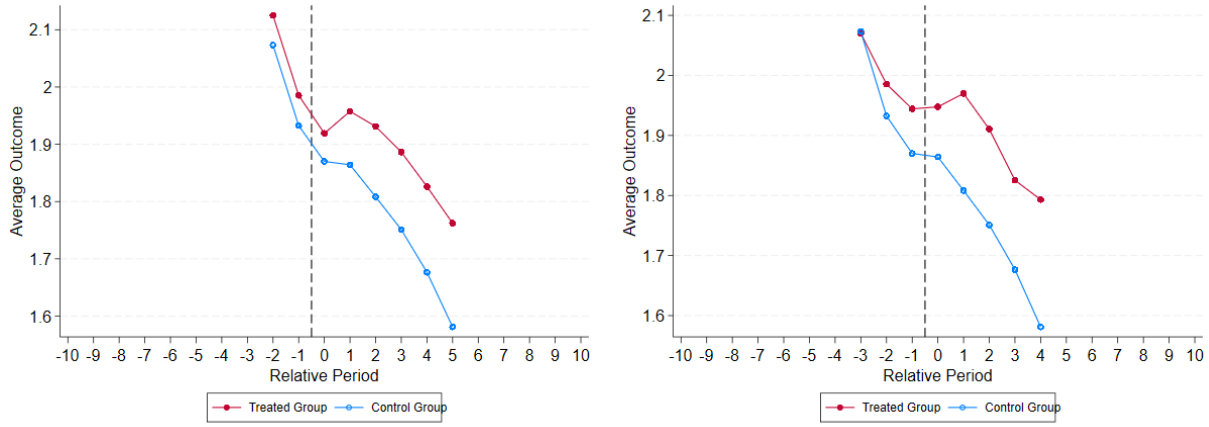
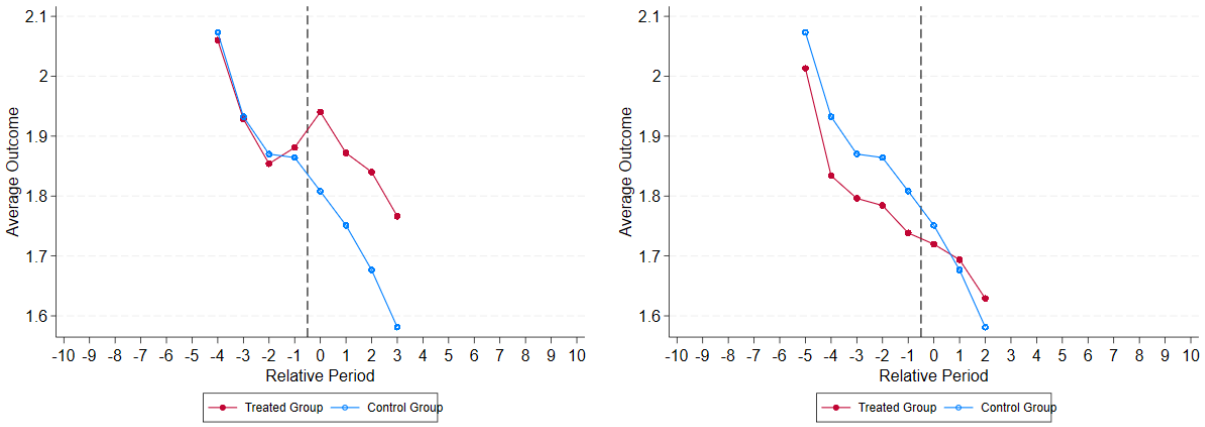


Figure 5: Raw data compared treated and control groups over employment

Appendix A2. Raw data compared treated and control groups over employment

(C) Left: Employment Year 2016; Right: Employment Year 2017



(C) Left: Employment Year 2018; Right: Employment Year 2019

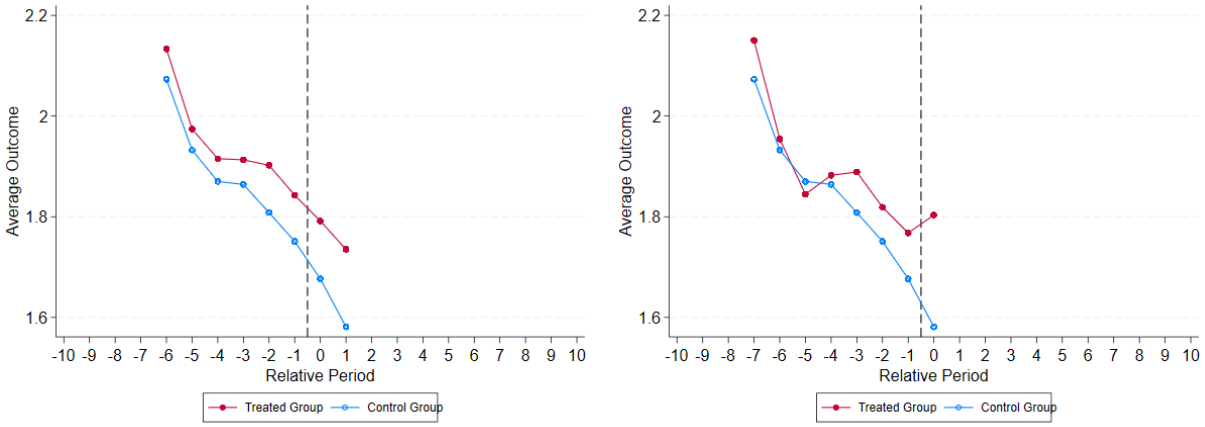
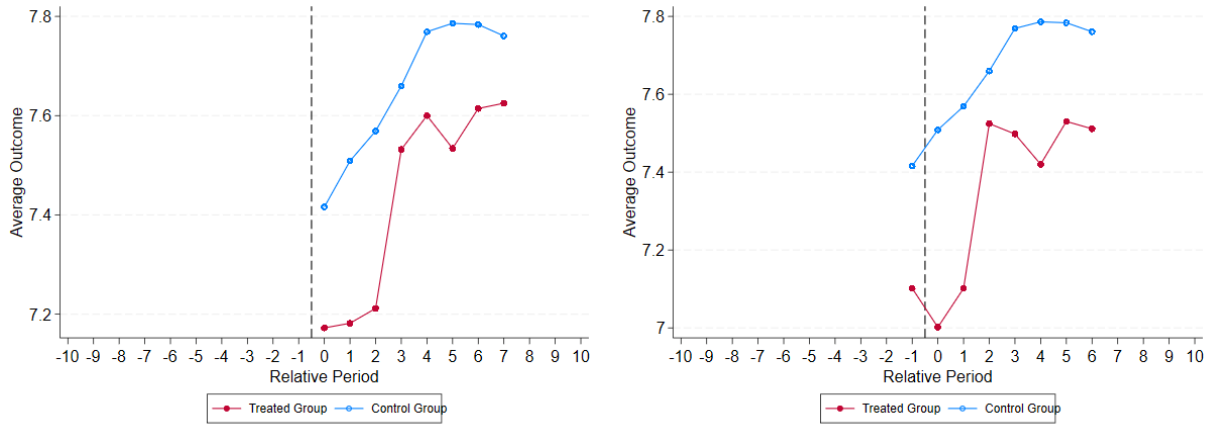


Figure 6: Raw data compared treated and control groups over employment

Appendix A3. Raw data compared treated and control groups over revenue

(A) Left: Revenue Year 2012; Right: Revenue Year 2013



(B) Left: Revenue Year 2014; Right: Revenue Year 2015

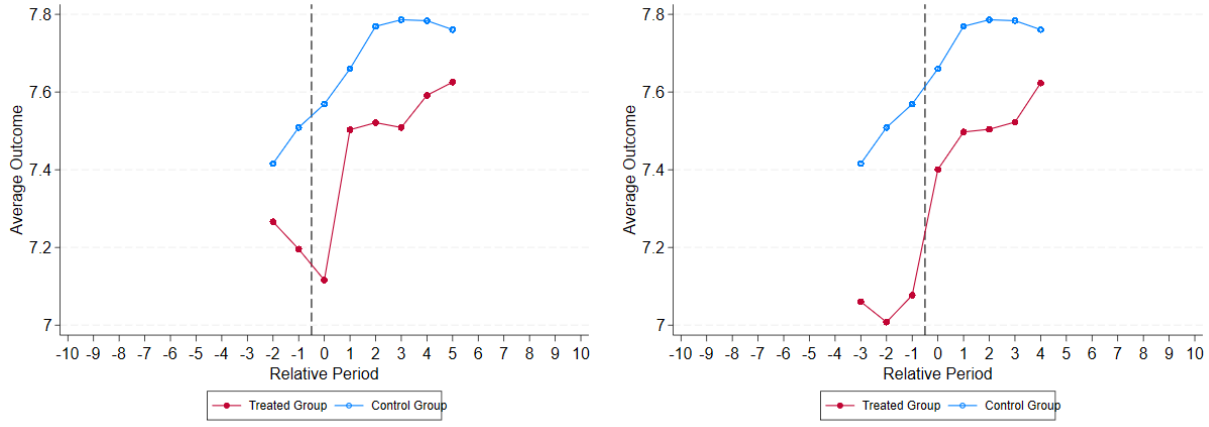
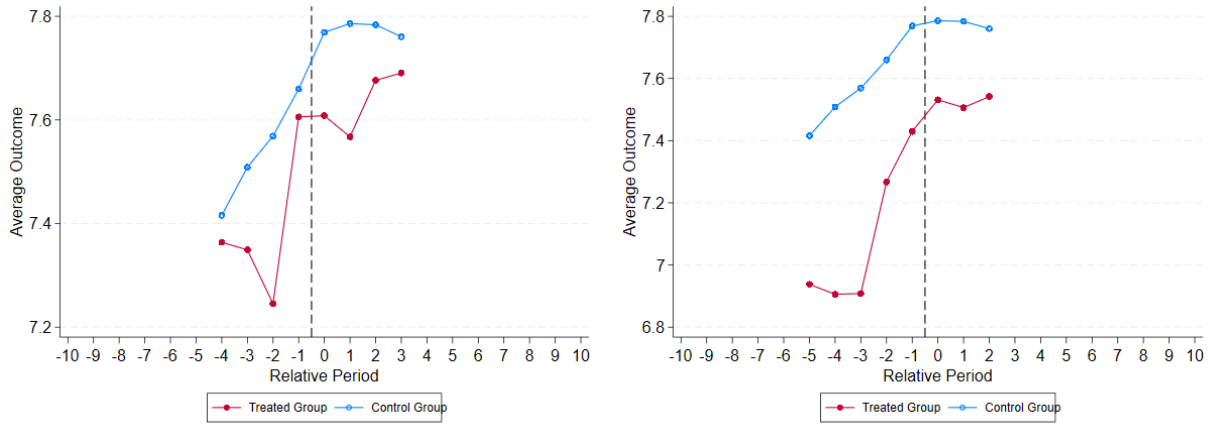


Figure 7: Raw data compared treated and control groups over revenue

Appendix A3. Raw data compared treated and control groups over revenue

(C) Left: Revenue Year 2016; Right: Revenue Year 2017



(C) Left: Revenue Year 2018; Right: Revenue Year 2019

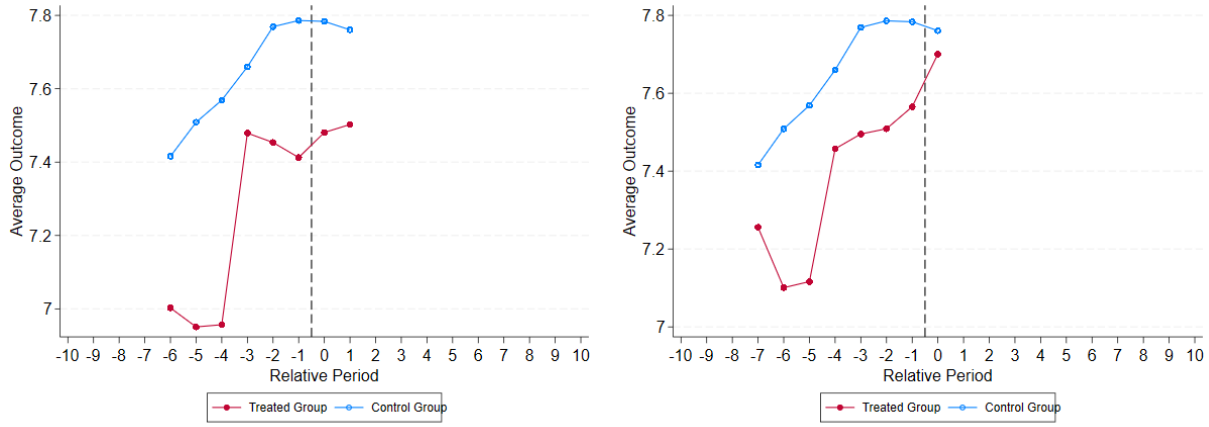


Figure 8: Raw data compared treated and control groups over revenue

Online Appendix B

Our Vietnamese enterprise survey dataset contains information surveyed by Statistics Office of Vietnam of formal active firms over the 2007 to 2019 period. The firms surveyed in the dataset include all formal active firms with more than 10 employees, however, some firms with fewer employees also appear in the dataset The survey contains a wide range of information from firms' details (number of employees, industry, types of firms), to balance sheet data (total sales, total net assets, total cost, profits). We use total fixed assets as a proxy for total net assets of firms, and total costs include. In the dataset, several firms with the same tax ID. For plants with the same tax ID, we aggregate their information and use

address of the headquarter as the address of the firms. For several firs with the same tax ID information and information related to number of employees, number of female employees as well as address information, we mark these firms as duplicates, and only keep one firm while dropping the other firms.

We drop firms with missing data employment, revenue, industry, types of firms, assets, and missing information on province/city and commune address information. We also change to missing for some observations with outliers in labour productivity and TFP.

Online Appendix C

Robustness of Baseline Estimates

Table 16: Summary Statistics - No Matching

	Nb of obs	SEZ area firms (1)	Nb of obs	Never treated firms (2)	Difference (2) - (1) (3)
Agriculture, Forestry	113,712	0.0002	3,875,201	0.001	0.001***
and Fishing		(0.000)		(0.000)	(0.000)
Mining and quarrying	113,712	0.108	3,875,201	0.029	-0.080***
		(0.001)		(0.000)	(0.000)
Manufacturing food	113,712	0.063	3,875,201	0.018	-0.045***
and tobacco		(0.001)		(0.000)	(0.000)
Manufacturing textiles	113,712	0.071	3,875,201	0.034	-0.037***
		(0.001)		(0.000)	(0.001)
Manufacturing woods	113,712	0.053	3,875,201	0.007	-0.045***
		(0.001)		(0.000)	(0.000)
Manufacturing coke,	113,712	0.218	3,875,201	0.045	-0.173***
rubber, chemicals		(0.002)		(0.000)	(0.001)
Manufacturing metals	113,712	0.061	3,875,201	0.004	-0.057***
		(0.001)		(0.000)	(0.000)
Manufacturing machinery	113,712	0.109	3,875,201	0.029	-0.081***
		(0.001)		(0.000)	(0.001)
Construction	113,712	0.011	3,875,201	0.025	0.014***
		(0.000)		(0.000)	(0.001)
Wholesale and Retail Trade	113,712	0.014	3,875,201	0.020	0.006***
		(0.000)		(0.000)	(0.001)
Transportation and Storage	113,712	0.004	3,875,201	0.018	0.014***
		(0.000)		(0.000)	(0.000)
Accommodation and	113,712	0.009	3,875,201	0.019	0.010***
Food Services		(0.000)		(0.000)	(0.001)
Information and	113,712	0.002	3,875,201	0.006	0.004***
Communication		(0.000)		(0.000)	(0.000)
Professional, Scientific	113,712	0.002	3,875,201	0.019	0.018***
and Technical		(0.000)		(0.000)	(0.001)
Other Services	113,712	0.027	3,875,201	0.105	0.077***
		(0.001)		(0.000)	(0.001)
Foreign	113,712	0.393	3,875,201	0.018	-0.374***
		(0.002)		(0.000)	(0.001)
Private Domestic	113,712	0.581	3,875,201	0.947	0.367***
		(0.002)		(0.000)	(0.001)
State Domestic	113,712	0.027	3,875,201	0.034	0.007***
		(0.001)		(0.000)	(0.001)
Sales	113,712	276,955.3	3,875,201	31,539.7	-245,415.6***
		(0.009)		(0.001)	(0.008)
Number of Workers	113,712	247.034	3,875,201	26.70	-220.34***
		(0.006)		(0.001)	(0.004)
Share of social	67,345	0.676	1,865,843	0.417	-0.260***
security workers		(0.001)		(0.000)	(0.001)

Notes: Column 1 shows means (standard deviations) for our main treated sample for direct effects - firms in SEZ areas. Column 2 shows means (standard deviation) for our main treated sample for spillover effects - firms outside SEZ areas and inside SEZ communes. Never treated group means firms located in communes that never have SEZ establishment. Column 4 shows estimated differences in means (p-values) between the treatment group and control group from column 1 and column 3, and column 5 shows estimated differences in means between the treatment group and control group from column 2 and column 3. The means are unweighted. All descriptive statistics pertain to one year prior to the event.
Source: Data are drawn from Vietnam Enterprise survey 2007-2019. See Section IIA for further information on sample construction.

Table 17: Summary Statistics - With Matching

	Nb of obs	SEZ area firms (1)	Nb of obs	Matching Never treated firms (2)	Difference (2) - (1) (3)
Agriculture, Forestry	6,882	0	19,034	0.002	0.002
and Fishing		(0)		(0.000)	(0.000)
Mining and quarrying	6,882	0.146	19,034	0.107	-0.040***
		(0.001)		(0.006)	(0.005)
Manufacturing food	6,882	0.071	19,034	0.046	-0.025***
and tobacco		(0.001)		(0.002)	(0.004)
Manufacturing textiles	6,882	0.095	19,034	0.070	-0.026***
		(0.001)		(0.004)	(0.003)
Manufacturing woods	6,882	0.040	19,034	0.037	-0.002
		(0.001)		(0.000)	(0.003)
Manufacturing coke,	6,882	0.241	19,034	0.167	-0.074***
rubber, chemicals		(0.002)		(0.000)	(0.006)
Manufacturing metals	6,882	0.044	19,034	0.034	-0.009***
		(0.001)		(0.000)	(0.003)
Manufacturing machinery	6,882	0.125	19,034	0.080	-0.044***
		(0.001)		(0.000)	(0.005)
Construction	6,882	0.016	19,034	0.022	0.006***
		(0.000)		(0.000)	(0.002)
Wholesale and Retail Trade	6,882	0.001	19,034	0.006	0.005***
		(0.000)		(0.000)	(0.001)
Transportation and Storage	6,882	0.005	19,034	0.008	0.002**
		(0.000)		(0.000)	(0.001)
Accommodation and	6,882	0	19,034	0.003	0.003***
Food Services		(0.000)		(0.000)	(0.000)
Information and	6,882	0.001	19,034	0.002	0.001
Communication		(0.000)		(0.000)	(0.001)
Professional, Scientific	6,882	0.005	19,034	0.005	0.000
and Technical		(0.000)		(0.000)	(0.001)
Other Services	6,882	0.015	19,034	0.050	0.034***
		(0.001)		(0.000)	(0.002)
Foreign	6,882	0.241	19,034	0.163	-0.078***
		(0.002)		(0.000)	(0.006)
Private Domestic	6,882	0.731	19,034	0.779	0.029***
		(0.002)		(0.000)	(0.001)
State Domestic	6,882	0.029	19,034	0.058	0.029***
		(0.001)		(0.000)	(0.003)
Sales	6,882	165028.7	19,034	113864.4	-51164.3***
		(0.009)		(0.001)	(6462.327)
Number of Workers	6,882	256.087	19,034	170.907	-85.179***
		(0.006)		(0.001)	(16.704)
Share of social	4,519	0.576	11,366	0.554	-0.022***
security workers		(0.001)		(0.000)	(0.005)

Notes: Column 1 shows means (standard deviations) for our main treated sample for direct effects - firms in SEZ areas. Column 2 shows means (standard deviation) for our main treated sample for spillover effects - firms outside SEZ areas and inside SEZ communes. Never treated group means firms located in communes that never have SEZ establishment. Column 4 shows estimated differences in means (p-values) between the treatment group and control group from column 1 and column 3, and column 5 shows estimated differences in means between the treatment group and control group from column 2 and column 3. The means are unweighted. All descriptive statistics pertain to one year prior to the event.
Source: Data are drawn from Vietnam Enterprise survey 2007-2019. See Section IIA for further information on sample construction.

Table 18: Summary Statistics - No Matching

	Nb of obs	SEZ commune firms (1)	Nb of obs	Never treated firms (2)	Difference (1) - (2) (3)
Agriculture, Forestry	634,779	0.0007	3,716,765	0.001	0.001***
and Fishing		(0.000)		(0.000)	(0.000)
Mining and quarrying	634,779	0.034	3,716,765	0.028	-0.006***
		(0.001)		(0.000)	(0.000)
Manufacturing food	634,779	0.022	3,716,765	0.018	-0.004***
and tobacco		(0.000)		(0.000)	(0.000)
Manufacturing textiles	634,779	0.042	3,716,765	0.033	-0.009***
		(0.001)		(0.000)	(0.000)
Manufacturing woods	634,779	0.010	3,716,765	0.007	-0.002***
		(0.000)		(0.000)	(0.000)
Manufacturing coke,	634,779	0.076	3,716,765	0.044	-0.031***
rubber, chemicals		(0.000)		(0.000)	(0.000)
Manufacturing metals	634,779	0.007	3,716,765	0.004	-0.002***
		(0.000)		(0.000)	(0.000)
Manufacturing machinery	634,779	0.039	3,716,765	0.029	-0.010***
		(0.000)		(0.000)	(0.000)
Construction	634,779	0.027	3,716,765	0.025	-0.002***
		(0.000)		(0.000)	(0.001)
Wholesale and Retail Trade	634,779	0.015	3,716,765	0.020	0.005***
		(0.000)		(0.000)	(0.001)
Transportation and Storage	634,779	0.013	3,716,765	0.018	0.005***
		(0.000)		(0.000)	(0.000)
Accommodation and	634,779	0.016	3,716,765	0.019	0.003***
Food Services		(0.000)		(0.000)	(0.000)
Information and	634,779	0.007	3,716,765	0.006	-0.0003***
Communication		(0.000)		(0.000)	(0.000)
Professional, Scientific	634,779	0.012	3,716,765	0.020	0.008***
and Technical		(0.000)		(0.000)	(0.000)
Other Services	634,779	0.094	3,716,765	0.105	0.012***
		(0.000)		(0.000)	(0.000)
Foreign	634,779	0.025	3,716,765	0.019	-0.006***
		(0.002)		(0.000)	(0.001)
Private Domestic	634,779	0.945	3,716,765	0.946	0.001***
		(0.000)		(0.000)	(0.000)
State Domestic	634,779	0.030	3,716,765	0.034	0.005***
		(0.000)		(0.000)	(0.000)
Sales	634,779	25957.07	3,716,765	32044.68	6087.60***
		(0.003)		(0.001)	(0.003)
Number of Workers	634,779	27.56	3,716,499	26.74	-0.823**
		(0.002)		(0.001)	(0.002)
Share of social	290,996	0.405	1,777,136	0.417	0.012***
security workers		(0.001)		(0.000)	(0.001)

Notes: Column 1 shows means (standard deviations) for our main treated sample for direct effects - firms in SEZ areas. Column 2 shows means (standard deviation) for our main treated sample for spillover effects - firms outside SEZ areas and inside SEZ communes. Never treated group means firms located in communes that never have SEZ establishment. Column 4 shows estimated differences in means (p-values) between the treatment group and control group from column 1 and column 3, and column 5 shows estimated differences in means between the treatment group and control group from column 2 and column 3. The means are unweighted. All descriptive statistics pertain to one year prior to the event.
Source: Data are drawn from Vietnam Enterprise survey 2007-2019. See Section IIA for further information on sample construction.

Table 19: Summary Statistics - With Matching

	Nb of obs	SEZ commune firms (1)	Nb of obs	Matching Never treated firms (2)	Difference (1) - (2) (3)
Agriculture, Forestry	69,075	0.001	219,827	0.001	0.000
and Fishing		(0.000)		(0.000)	(0.000)
Mining and quarrying	69,075	0.062	219,827	0.055	0.007***
		(0.001)		(0.000)	(0.000)
Manufacturing food	69,075	0.024	219,827	0.020	0.004***
and tobacco		(0.000)		(0.000)	(0.000)
Manufacturing textiles	69,075	0.060	219,827	0.055	0.005***
		(0.001)		(0.000)	(0.000)
Manufacturing woods	69,075	0.010	219,827	0.010	-0.000
		(0.000)		(0.000)	(0.000)
Manufacturing coke,	69,075	0.086	219,827	0.081	-.005***
rubber, chemicals		(0.000)		(0.000)	(0.000)
Manufacturing metals	69,075	0.004	219,827	0.004	-0.001***
		(0.000)		(0.000)	(0.000)
Manufacturing machinery	69,075	0.047	219,827	0.046	0.000
		(0.000)		(0.000)	(0.000)
Construction	69,075	0.031	219,827	0.028	0.003***
		(0.000)		(0.000)	(0.001)
Wholesale and Retail Trade	69,075	0.007	219,827	0.009	-0.002***
		(0.000)		(0.000)	(0.001)
Transportation and Storage	69,075	0.013	219,827	0.014	-0.000
		(0.000)		(0.000)	(0.000)
Accommodation and	69,075	0.007	219,827	0.009	-0.002***
Food Services		(0.000)		(0.000)	(0.000)
Information and	69,075	0.004	219,827	0.004	-0.000
Communication		(0.000)		(0.000)	(0.000)
Professional, Scientific	69,075	0.004	219,827	0.007	-0.004***
and Technical		(0.000)		(0.000)	(0.000)
Other Services	69,075	0.081	219,827	0.080	0.001
		(0.000)		(0.000)	(0.000)
Foreign	69,075	0.015	219,827	0.015	-0.000
		(0.002)		(0.000)	(0.001)
Private Domestic	69,075	0.919	219,827	0.921	0.002**
		(0.000)		(0.000)	(0.000)
State Domestic	69,075	0.066	219,827	0.063	0.003***
		(0.000)		(0.000)	(0.000)
Sales	69,075	32,365.61	219,827	32,944.72	579.12
		(0.003)		(0.001)	(0.003)
Number of Workers	69,075	46.145	219,827	42.25	3.892***
		(0.002)		(0.001)	(0.002)
Share of social	69,075	0.390	117,287	0.426	-0.035***
security workers		(0.001)		(0.000)	(0.001)

Notes: Column 1 shows means (standard deviations) for our main treated sample for direct effects - firms in SEZ areas. Column 2 shows means (standard deviation) for our main treated sample for spillover effects - firms outside SEZ areas and inside SEZ communes. Never treated group means firms located in communes that never have SEZ establishment. Column 4 shows estimated differences in means (p-values) between the treatment group and control group from column 1 and column 3, and column 5 shows estimated differences in means between the treatment group and control group from column 2 and column 3. The means are unweighted. All descriptive statistics pertain to one year prior to the event.
Source: Data are drawn from Vietnam Enterprise survey 2007-2019. See Section IIA for further information on sample construction.

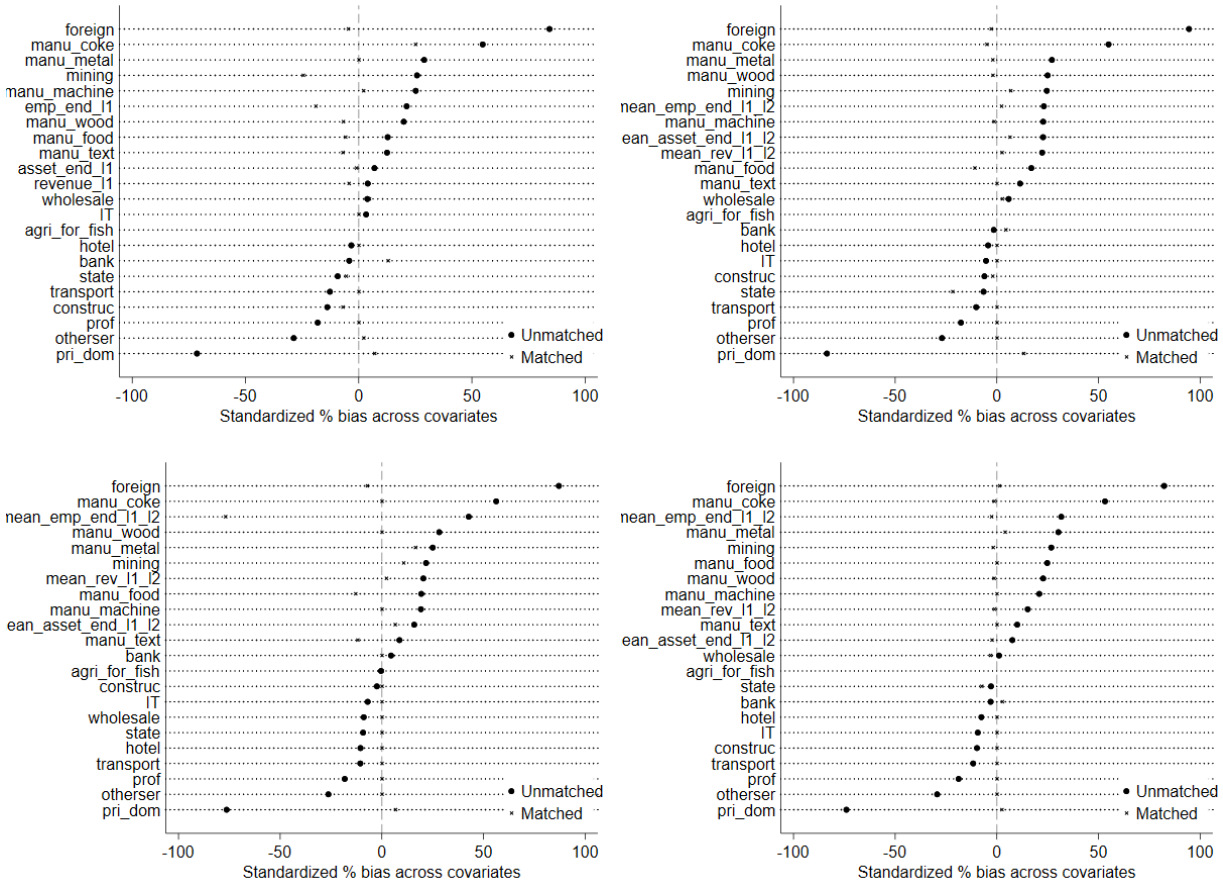


Figure 9: Balanced test between treated and control firms after before and after matching - within SEZ areas

Note: Figure 14 plots the balanced test between treated and control firms before and after matching within SEZ areas. The top left, top right, bottom left, bottom right are for year 2008, 2009, 2010, 2011, respectively.

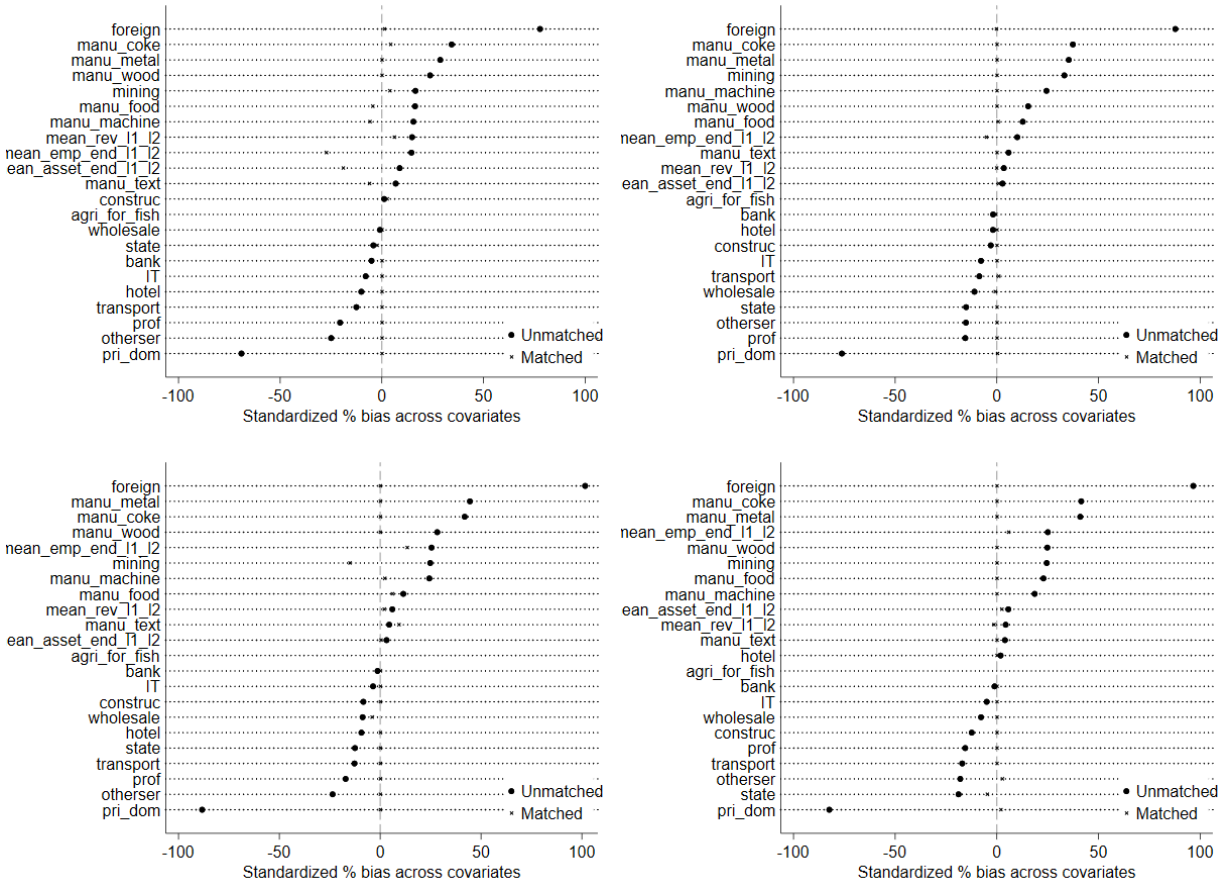


Figure 10: Balanced test between treated and control firms after before and after matching - within SEZ areas

Note: Figure 14 plots the balanced test between treated and control firms before and after matching within SEZ areas. The top left, top right, bottom left, bottom right are for year 2012, 2013, 2014, 2015, respectively.

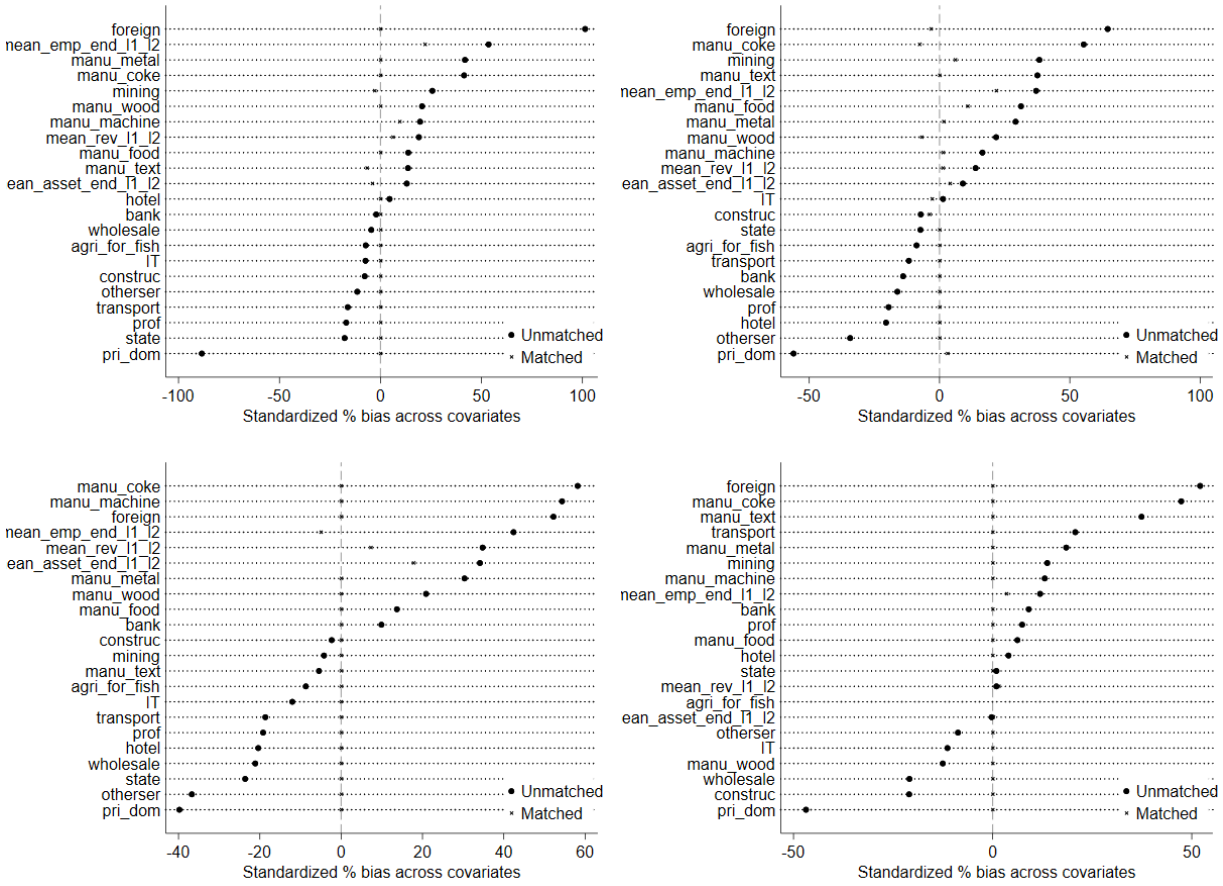


Figure 11: Balanced test between treated and control firms after before and after matching - within SEZ areas

Note: Figure 14 plots the balanced test between treated and control firms before and after matching within SEZ areas. The top left, top right, bottom left, bottom right are for year 2016, 2017, 2018, 2019, respectively.

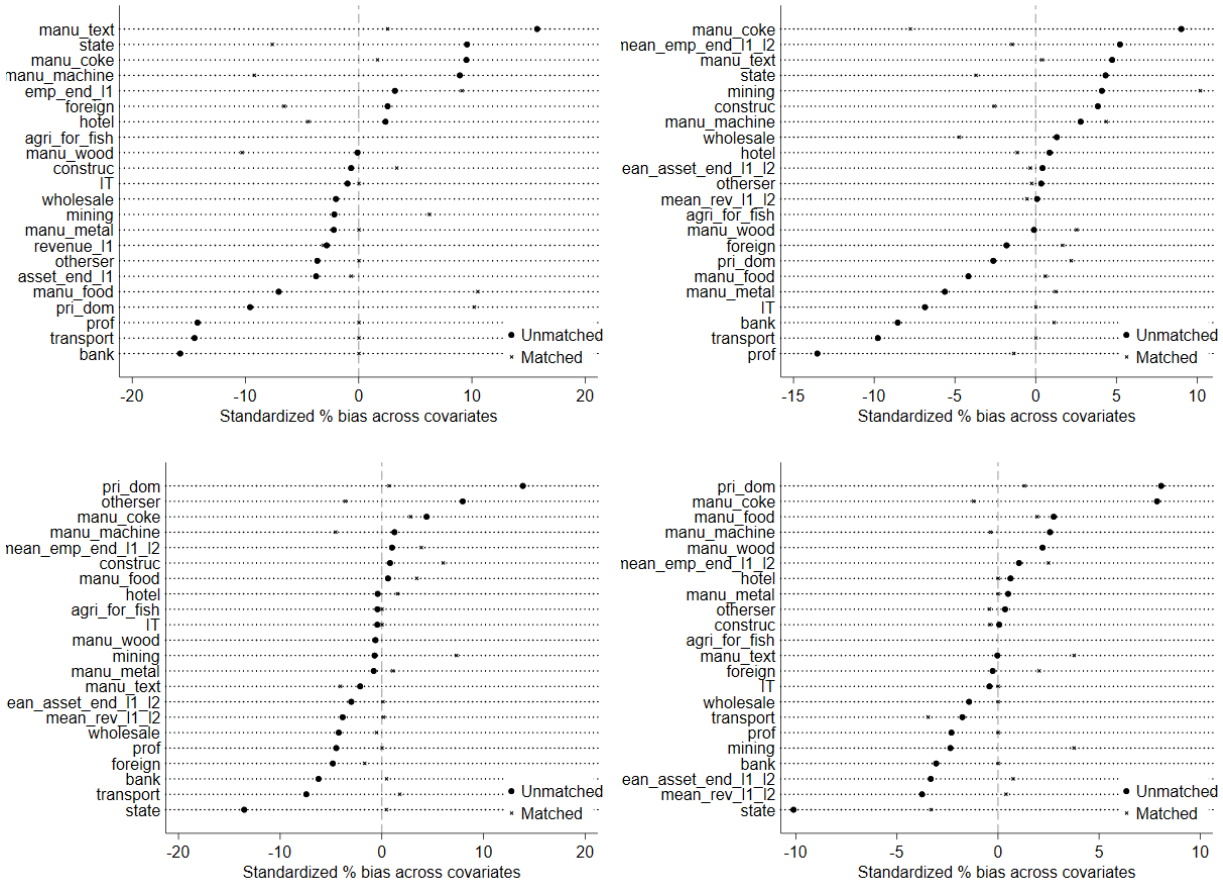


Figure 12: Balanced test between treated and control firms after before and after matching - within SEZ communes

Note: Figure 12 plots the balanced test between treated and control firms before and after matching within SEZ communes. The top left, top right, bottom left, bottom right are for year 2008, 2009, 2010, 2011, respectively.

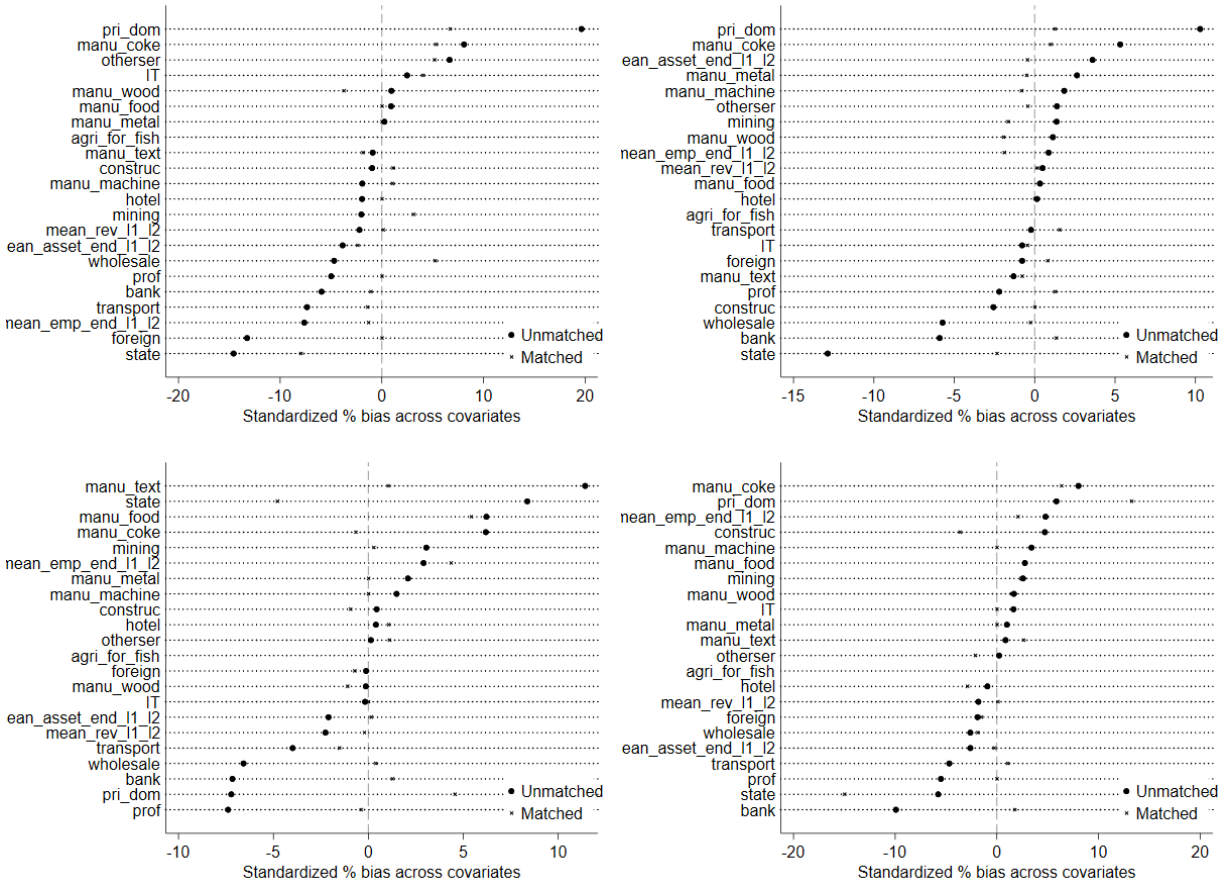


Figure 13: Balanced test between treated and control firms after before and after matching - within SEZ communes

Note: Figure 14 plots the balanced test between treated and control firms before and after matching within SEZ communes. The top left, top right, bottom left, bottom right are for year 2012, 2013, 2014, 2015, respectively.

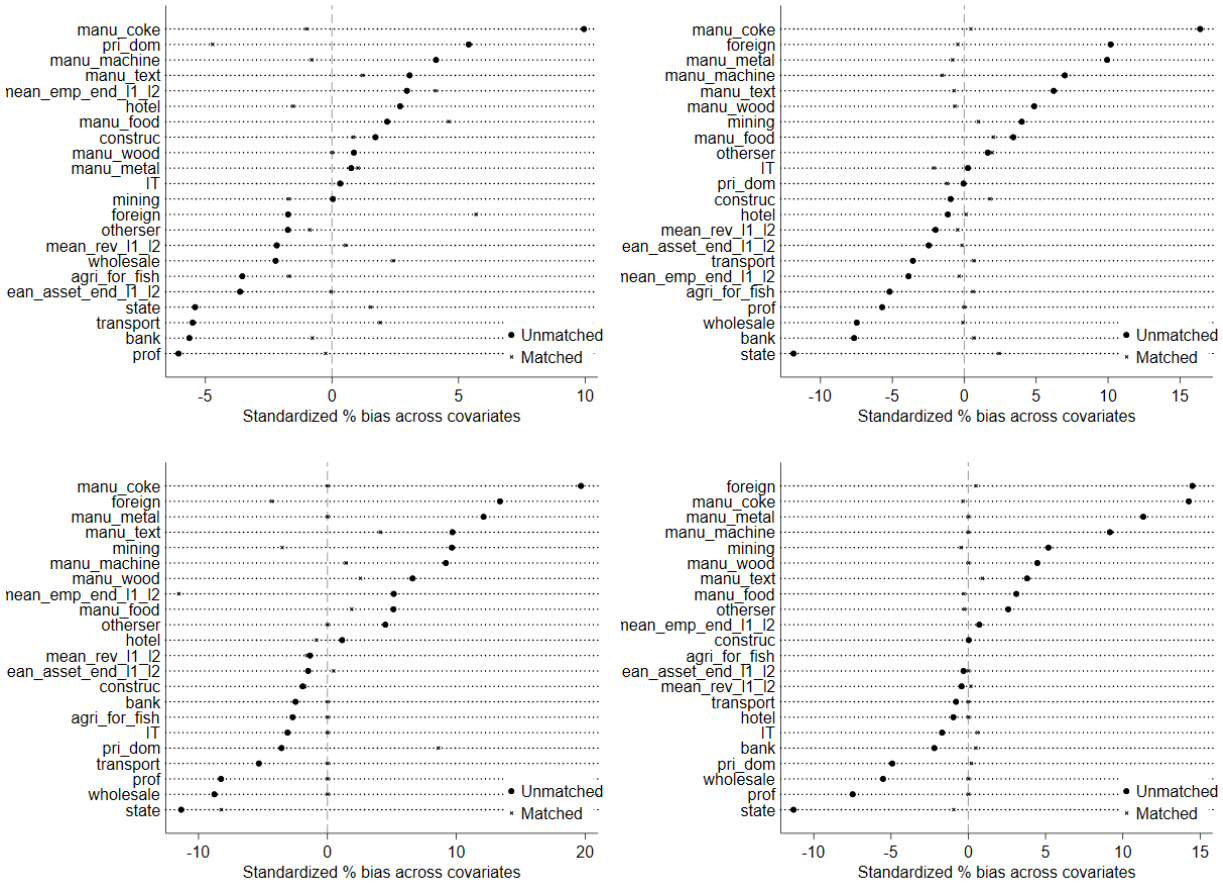


Figure 14: Balanced test between treated and control firms after before and after matching - within SEZ communes

Note: Figure 14 plots the balanced test between treated and control firms before and after matching within SEZ communes. The top left, top right, bottom left, bottom right are for year 2016, 2017, 2018, 2019, respectively.