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Do China's Special Economic Zones Increase Incentives to Invest in R&D?

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Abstract

China's special economic zones (SEZs) have been established to foster business growth and innovation by improving the institutional context of specific sub-regional areas. We examine the effect of SEZs on the contribution of research and development (R&D) to the market value of firms located in these areas. The market value reflects investors' expectations of future returns to R&D, providing crucial information for strategic investment decisions. Larger R&D contributions to the market value create stronger incentives for firms to invest in innovation. Empirical results suggest that the contribution of R&D to the market value increases through the SEZs program, particularly for R&D intensive firms. This suggests that regional policies, while increasing incentives to innovate, may widen the gap between less and more R&D intensive firms, potentially impacting competition and long-term growth.

Keywords: Special economic zones (SEZs); China; Market value; R&D; Institutional development; Innovation incentives.

JEL Codes: O32, R58, O25

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Introduction

Economic development policies targeted at specific geographical regions became popular over the past decades (Farole and Akinci 2011; United Nations Conference on Trade and Development 2019). In particular, since 1979, China has made extensive use of its so-called Special Economic Zones (SEZs) program[1] (Hua, Partridge, and Sun 2023) to tackle the challenges that China-based businesses faced due to the weak institutional environment characterized by poor enforcement of property rights protection, underdeveloped financial systems, and a weak economic infrastructure (Alder, Shao, and Zilibotti 2016). A weak institutional environment can hinder innovation and business growth by creating uncertainties and regulatory burdens, discouraging investment in research and development (R&D), and stifling entrepreneurial activities (Acharya and Subramanian 2009; Acharya, Baghai, and Subramanian 2013; Donges, Meier, and Silva 2023; Moser 2005; North 1991). The SEZs program was established to counteract such institutional inefficiencies so that entrepreneurial and innovation activities could flourish in the selected geographical regions (Alder et al. 2016; Barbieri, Pollio, and Prota 2020; Hartwell 2018; Liu and Jin 2022; Liu, Wu, and Zhu 2023; Lu, Wang, and Zhu 2019; Ma, Cao, and Zhao 2023; Song et al. 2020).

In this paper, we investigate whether the SEZs program achieved one of its objectives of promoting and incentivizing innovation within firms through an improvement of the regional

[1] Duranton and Venables (2018, p. 25, footnote 19) define SEZs broadly as "any special district with favourable fiscal or institutional treatment." This definition, which is widely used in the literature (see e.g. also Hua et al., 2023), includes development zones (DZs). In the literature, SEZs and DZs are typically pooled together. For example, Lu, Wang, and Zhu (2019, pp. 332) refer to SEZs as follows: "there are several types of SEZs […]. Economic and technological *development zones* (ETDZs) are broadly defined zones with a wide spectrum of investors. High-tech industrial *development zones* (HIDZs) are intended to promote high-tech industrialization […]. Specialized *industrial zones* (SIZs) are cluster-type industrial parks aiming to develop particular industries, which should be consistent with local comparative advantages. […] Export *processing zones* (EPZs) […] are solely for export processing (to develop export-oriented industries)." (see also footnote 2 in Lu, Wang, and Zhu 2019, or the literature review section in Ma, Cao, and Zhao 2023). All the above-mentioned types of DZs are included in our definition of SEZs. We excluded national SEZs because they affect the entire economy and are implemented with regional heterogeneity which renders causal analysis difficult.

institutional context.[2] Considering that incentives to innovate are mostly intangible and difficult to observe,[3] we focus on the effect of the SEZs program on the contribution of firms' investment in R&D to its market value. A larger contribution of R&D investment to the firm's market value reflects increased expected future returns and, in turn, incentivizes the focal firm to invest more in R&D (Chadha and Oriani 2010; Munari and Oriani 2005). This logic builds on the insight that decision-makers learn new information from secondary market prices and use this information to guide their future strategic decisions (Bond, Edmans, and Goldstein 2012; Bond and Goldstein 2015; Bai, Philippon, and Savov 2016; Dang and Xu 2018). In this context, as stock market prices are a relevant source of information also for firm insiders,[4] a larger contribution of R&D investment to the firm's value represents a strong incentive for managers to adjust their future strategic investment decisions and engage more strongly in R&D.

A larger contribution of R&D to the market value of firms is beneficial to the firms as it improves the innovating firm's credibility and reputation (Arora, Fosfuri, and Gambardella 2001a; Long 2002), serves as an indication of the firm's ability to convert research investments into potentially valuable knowledge (Levitas and McFadyen 2009), and eases the process of securing funding for future R&D. This, in turn, results in lower capital costs, ultimately contributing to the generation of future profits and firm growth (Hottenrott, Hall, and Czarnitzki 2016; Lev, Sarath, and Sougiannis 2005).

[2] The SEZs program had also other goals such as increasing foreign and domestic investment, and promoting international trade on top of stimulating technological cooperation and innovation (Lu et al. 2019).
[3] While the outcomes of innovation efforts, such as new products or patents, are observable, incentives generated by policies such as the SEZs program are mostly intangible in nature so that they cannot be easily observed. More specifically, the SEZs program improves the regional institutional environment which should facilitate innovation activities because R&D can be more easily financed and the returns to innovation can be more easily appropriated.
[4] As explained by Bond et al. (2012, p. 341), "the assumption needed for financial markets to have a real effect [on firms' choices] via the transmission of information is not that real decision makers are less informed than traders, but only that they do not have perfect information about every decision-relevant factor, and so outsiders may possess some *incremental* information that is useful to them. Thus, real decision makers may be the most informed agents in the economy about the firm, but there are still aspects about which they can learn from outsiders."

In sum, a large contribution of R&D to the market value of firms generates incentives for firms to invest in R&D. If SEZs increase the contribution of R&D to the market value of firms, they reach the objective of fostering innovation and, therewith, putting the region on track to achieve enhanced business activity and economic growth.

This study, therefore, investigates whether regional institutional improvements through SEZs increase the contribution of R&D to the market value of a firm, reflecting strengthened incentives for firms to further invest in R&D. Differently from other studies, we refrain from investigating whether SEZs lead to a direct increase in R&D investment (Wu, Liu, and Huang 2021) because R&D projects need planning and potentially the acquisition of specialized equipment and human capital so that their effect will occur with a delay and will be spread over several years. Given that stock markets adjust quickly to changes in the business environment, the market value is a more direct and immediate measure of the incentives that firms have to innovate resulting from the SEZs program.

The SEZs program facilitates the distinction between "treated" firms—those located in regions targeted by the program—and "untreated" firms in non-SEZ regions. This distinction enables the use of causal methods by comparing the contribution of R&D to the market value of treated firms with that of untreated firms (the control group). By doing so, we can abstract from different economic trends over time and isolate the effect of the SEZs. We employ a boundary discontinuity (BD) framework (Holmes 1998) which relies on a control group of untreated firms that are geographically close to regions that were turned into SEZs. The underlying assumption is that economic conditions alter abruptly at the borders of an SEZ due to differences in policies, regulations, or infrastructure, while at the same time, the firms themselves are very similar on both sides. The BD design is powerful in our context because SEZs borders do not coincide with administrative boundaries (Lu et al. 2019). To demonstrate the robustness of our results across different methods, we employ a coarsened exact matching approach and a random sampling procedure involving 500 randomly selected control samples of three firms each. Additionally, we check the robustness of these results by expanding the treatment group to include firms with subsidiaries located in SEZs and conducting heterogeneity analyses based on various firm and region characteristics.

Our empirical results consistently show that the contribution of R&D to the market value of firms is positively affected by the SEZs program, which suggests that the program achieved its aim to increase incentives for innovation.

In addition to an overall positive effect of the SEZs program on the market value of R&D, we find that R&D-intensive firms, defined as the firms with the highest level of R&D investment scaled by their total assets, benefit most from the program. This finding suggests that, although the SEZs program reached its aim to promote innovation, it also increased the gap between less and more R&D-intensive firms. This is an unintended consequence of the policy with potential long-term implications for competition, innovation, and growth.

We contribute to the literature in several ways. First, while previous studies on China focused mostly on the national institutional context (e.g. Hsu, Tian, and Xu 2014; Liu and White 2001; Motohashi and Yun 2007), the SEZs program allows us to focus on the regional institutional environment. Regional variation in China’s institutional context has only recently started to gain attention (e.g. Barca et al. 2012; Howell 2019; Barbieri et al. 2020; Liu et al. 2023; Koster et al. 2019; Lu et al. 2019; Hua et al. 2023; Ma et al. 2023) and it highlights the importance of analyzing the *local* institutional environment where firms operate as a key determinant of their innovation activities (Barasa et al. 2017; Rodríguez-Pose and Zhang 2020) rather than the national ones.

We specifically contribute to the literature on the SEZs program which has been shown to positively affect regional productivity (Howell 2019; Ma et al. 2023), firm productivity and performance (Koster et al. 2019; Liu et al. 2023), foreign direct investment (FDI), output growth (Barbieri et al. 2020; Lu et al. 2019; Wang 2013; Zheng et al. 2015) and the number of patent applications, patent grants, and patent citations (Wu et al. 2021). Other than Wu et al. (2021), we do not focus directly on innovative inputs and outputs, such as R&D and patents, but show how the contribution of R&D to the market value of firms changes if firms are involved in the SEZs program. A change in the contribution of R&D to the market value of firms reflects a change in firms' incentives to innovate. This approach provides further insights because the innovation process, from the search for financial means and human talent to the launch of a final product, is long-term, so that the immediate change in R&D investment or output only captures a small part of the actual effect, while changes to firm's incentive can provide insights into expected long-term benefits.

Second, we provide nuanced evidence on the effects of the SEZs program and show that the positive effect of the SEZs program on the contribution of R&D to the market value of firms is greater for R&D-intensive firms in the affected regions. While fostering innovation among less R&D-intensive firms promotes economic diversity and improves the competitive landscape as these firms often bring fresh ideas and disruptive technologies to the market, driving overall economic growth and dynamism (Schumpeter 1942; Gilbert and Newberry 1982), stimulating R&D-intensive firms' innovation activity can lead to a lower overall innovation output because R&D-intensive firms have less incentives to innovate as new products would cannibalize profits from existing ones (Reinganum 1983; Arrow 1962). Hence, we show an unintended side effect of the SEZs program in the form of an increasing gap in the incentives for more and less R&D-intensive firms to invest in R&D.

Third, we contribute to the literature on the market value of R&D by adding evidence for China as a developing economy. Since the majority of studies have focused on developed countries (e.g. Bloom and Van Reenen 2002; Czarnitzki, Hussinger, and Leten 2020; Griliches 1981; Hall, Jaffe, and Trajtenberg 2005; Pindado, De Queiroz, and De La Torre 2010; Toivanen, Stoneman, and Bosworth 2002; see Czarnitzki, Hall, and Oriani 2006, for a survey), together with Chadha and Oriani (2010) and Kanwar and Hall (2015) which focus on India, we are the first to study the contribution of R&D to the market value of firms for a developing economy. Differently from these two studies, we draw conclusions from a within-country analysis, exploiting sub-regional variation in institutional development through the SEZs program in China.

Institutions and the Market Value of R&D

Institutional contexts directly affect firms' engagement in innovation, and their ability to translate innovative efforts into performance advances (Acharya and Subramanian 2009; Acharya et al. 2013; Donges et al. 2023; Moser 2005; North 1991). Well-developed institutional contexts are characterized by strong and reliable financial and legal systems (Acharya and Subramanian 2009; Acharya et al. 2013) which mitigate the uncertainty surrounding innovation activities and ensure the enforcement of intellectual property rights (IPRs) (Moser 2005) and property rights in general which are crucial for the appropriation of returns (He and Tian 2020).

A well-developed institutional context is characterized by strong enforcement of property rights, including IPRs, a functioning system of laws, rules, and contract enforcement, has efficient intermediary and financial institutions, reliable access to information, access to capital, developed capital markets, and efficient capital allocation systems, well-developed fiscal, monetary, and financial policies, developed banking and regulatory system (see, for example, Fernandez and Tamayo 2017; Hsu et al. 2014; Kumar, Rajan, and Zingales 1999).

The degree of financial development affects the value of innovative assets in several ways (Fernandez and Tamayo 2017; King and Levine 1993a; Levine 1997). First, more developed equity markets provide firms with greater access to external financing for innovation (Hsu et al. 2014). Considering the difficulties intrinsic to the valuation of innovative assets, developed equity markets allow information about such assets to reach investors more rapidly providing timely and accurate securities' prices and assets' values. Second, a more liberalized stock market improves innovation via the relaxation of financial constraints, enhanced risk-sharing, and improved corporate governance (Moshirian et al. 2021), which then results, together with higher participation in the marketplace, in a more precise and unbiased value of firms' assets. Third, more efficient capital allocation systems and better access to capital allow firms to engage more strongly in innovation activities (Kumar et al. 1999; Xin, Zhang, and Zheng 2017), while whenever access to credit is restricted, large, incumbent firms are in a favorable position as compared to small entrants which are often unable to acquire the required capital for investing in R&D (Davis and Henrekson 1999).

Legal institutions also affect the market value of innovative assets in several ways. First, in regions where IPR protection is only marginally enforced, there is a greater risk that innovative firms might not be able to appropriate the economic rents of their innovation activities (Qian et al. 2017). Considering the direct link between the appropriation of economic rents and innovative assets' value, it is straightforward that a less efficient IPR protection system can lead to a lower market value of innovative assets (Chadha and Oriani 2010; Teece 1986). Second, more enforced property rights facilitate markets for innovation (Spulber 2013), while a low degree of investor protection facilitates information asymmetries and when paired with a weak level of contract enforcement results again in a higher risk of rent misappropriation and lower market value of innovation (Himmelberg, Hubbard, and Love 2004). Third, more developed patent laws have been shown to increase innovation activities in a wide variety of sectors (Moser 2005) and are critical for firms' ability to protect the economic rents derived from their innovation efforts (Levin et al. 1987; Cohen, Nelson, and Walsh 2000).

In a well-developed institutional context, the private returns to R&D are expected to be greater as the financing of innovation and the appropriability of its returns are easier. This should be reflected in the contribution of R&D to the market value of firms. In other words, if the institutional context improves, firms should receive a larger contribution of the same level of R&D to their market value as the private returns from R&D can be expected to be greater and more certain.

Hypothesis (H1). The contribution of R&D to the market value of a firm increases after it is included in the SEZs program relative to firms located in regions untargeted by the SEZs program.

Special Economic Zones: the Case of China

Launched in 1979 in the cities of Shenzhen, Zhuhai, Shantou, and Xiamen, China's SEZs program, a key industrial policy program aiming at strengthening the performance of China's businesses, was expanded greatly over time and across the country. In fact, since the above-mentioned four SEZs were considered a great success, in 1984, the State Council approved 14 more SEZs in the coastal cities of Qinhuangdao, Tianjin and Ningbo (Wu et al. 2021). After 1984, especially after Deng Xiaoping's famous southern tour in 1992, the number of SEZs increased gradually. As of 2018, even though there are considerable debates on the effectiveness of such policies (Barca, Mccann, and Rodriguez-Pose 2012), China counted 2,543 SEZs fairly divided across the 31 different provinces, cities, and independent regions (see Figure A1, Panel A).

SEZs' main objectives are to foster agglomeration economies by building industrial clusters, increasing employment, and attracting technologically advanced industrial facilities by increasing foreign and domestic investments, promoting international trade, and stimulating technological cooperation and innovation in a specific geographic region (Alder et al. 2016). The vast majority of the SEZs (2,039 out of the 2,543 as of 2018) are provincial SEZs (see Figure A1, Panel C), which means that they are under the control of the provincial government which enjoys a certain degree of independence and the freedom to define its own regional policies (Lu et al. 2019). In fact, each SEZ has its own administration committee and, as their success is directly linked to the political careers of regional government officials, their supervisors are strongly incentivized to strive for the best possible outcome in their respective SEZ (Xu 2011; Lu et al. 2019). Firms located within a provincial SEZ are granted privileges way beyond the national standard in terms of, e.g. tax deductions and customs duty exemptions, discounted land-use fees, and special treatment in securing bank loans (Lu et al. 2019). In addition, as China's business environment was characterized by weak institutions, including poor protection of private property rights, limited access to financial resources, and weak infrastructure, which limited entrepreneurship and innovation, provincial SEZs were seen as experiments aimed at providing better institutions, reducing inefficiencies in the institutional environment, and improving innovation (Alder et al. 2016; Lu et al. 2019). In fact, SEZs provide greatly improved conditions for firms to engage in innovation activities. The SEZs administration committees implemented a variety of policies to encourage innovation by reducing innovation costs, e.g. providing more favorable tax credit policies than the national standard for R&D, and strengthening innovation incentives, e.g. setting up innovation and development funds, venture capital funds and industrial investment funds to provide financial subsidies to support innovation in enterprises and providing support to the development of financial intermediaries and patent intermediaries, and provide enterprises with training about intellectual property (Wu et al. 2021). All these initiatives are conducive to higher innovation incentives and efficiency as well as an improved business environment for innovation and entrepreneurship.

It is worthwhile noting that next to provincial SEZs, China established national-level SEZs which can grant greater privileges to the resident firms (Alder et al. 2016). As those national-level SEZs are much less frequent and different in nature as the responsible committees enjoy more authority for managing the zones and their aim is to benefit the entire economy, we only focus on provincial SEZs following Lu et al. (2019). It is important to note that provincial- and state-level SEZs cannot overlap (Lu et al., 2019).

Another important fact is that, while the first SEZ regions were chosen based on favorable geographical locations, industrial conditions, and human capital (Wang 2013), in later years, the program became more representative of the spatial distribution and less subject to selection biases (Lu et al. 2019). This less selective allocation of SEZs is important for our empirical analysis which would be otherwise affected by selection biases (Lu et al. 2019). In response, we only focus on SEZs established in later years following Lu et al. (2019).[5]

Methodology, Data and Variables

Methodology

The market value model

R&D activities undertaken by firms represent investments yielding intangible assets often referred to as "knowledge stock" (Bloom 2007). When these assets are recognized to positively affect a firm's expected future cash flows, they should be positively reflected in the firm's market

[5] We address this potential issue further with our control group of geographically close firms as discussed in the methodology section. We would also like to emphasize that potential regional efforts to improve the local infrastructure in order to qualify for the SEZ program are not reflected in the firm variables of interest for this study (see Figure 4).

value (Griliches 1981). Hence, a firm's investment in R&D should be reflected in its market value, meaning that not only innovation outputs, such as patents and new products, affect the market value of a firm, but also innovation inputs which turn into profits in the future years (Hall et al. 2005). Following this intuition, Griliches' (1981) formulated the so-called "market value model" which allows quantifying the contribution of innovative assets to the market value of a firm (Hall 1993a). Since the market value itself is a forward-looking measure that incorporates future expected returns, Griliches' (1981) approach has the advantage of avoiding timing issues stemming from the time distance of R&D costs and revenues which usually occur years after the investment (Hall 2000; Czarnitzki et al. 2006). The timing aspect is especially important in the case of innovative assets where the timeline of the innovative process from the idea to the product launch is not known to the corporate researcher and corporate insider (Ahuja, Coff and Lee 2005).

A further advantage is that Griliches' market value model allows to empirically identify the value of specific assets separately. Drawing from the hedonic pricing model, the market value model views firms as bundles of assets and capabilities whose value is defined as the present discounted value of the expected future cash flows (Czarnitzki et al. 2006). The value of a firm (V_{it}) is therefore described as a function of its physical (A_{it}) and knowledge (K_{it}) assets[6]:

$$V_{it} = q_t \left(A_{it} + \gamma K_{it}\right)^{\sigma} \tag{1}$$

Under the assumption of constant returns to scale ($\sigma = 1$), Equation (1) can be written as a market value equation where Q_{it} represents the market value of the firm defined as the assets value over their replacement costs:

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[6] q_t is the market valuation coefficient of the firm's total assets; γ is the relative shadow value of knowledge capital to tangible assets.

$$logQ_{it} = log\frac{V_{it}}{A_{it}} = logq_t + log\left(1+\gamma\frac{K_{it}}{A_{it}}\right) \tag{2}$$

Equation (2) can be estimated directly using nonlinear least squares (NLLS) (e.g. Czarnitzki et al. 2020). Alternatively, ordinary least squares (OLS) regression models can be applied using a linear approximation of the model if the approximation *log(1 + x) ~ x* is valid (e.g. Griliches 1981; Jaffe 1986; Cockburn and Griliches 1988; Hall 1993a 1993b; Czarnitzki et al. 20006; Simeth and Cincera 2016; Hussinger and Pacher 2019). The linear approximation has the advantage to allow for an easy inclusion of firm fixed effects and interaction terms which we need to test our hypothesis. We check the difference between *log(1 + x)* and *x* for our innovative assets' variables and find that the approximation holds for our sample.[7] Hence, we estimate the following equation:

$$logQ_{it} \approx \gamma\,\frac{K_{it}}{A_{it}} \tag{3}$$

To test our hypothesis, we use firms' R&D investment scaled by the assets' book value to capture the knowledge assets K_{it} of a firm.

The market value model developed by Griliches (1981) requires that stock markets are efficient enough to reflect the future expected return of investments. Carpenter, Lu, and Whitelaw (2021) show that, since the reforms of the early 2000s, stock prices in China have become as informative about firm future profits as they are in the U.S. and they have become much more efficient since (Chong, Lam, and Yan 2012). Adding to these general findings, recent evidence shows a positive

[7] As shown in Table A1, the measure for R&D investment over assets in our sample has a mean of 0.019 and a maximum value of 0.1. The approximation is, whenever appropriate, standard practice (see for example Simeth and Cincera 2016).

association between the market value of Chinese firms and patents (Hsu, Wang, and Wu 2013; Hsu, Hsu, and Zhao 2021).

Estimation methods

To estimate the market value model, we use a BD approach and show robustness for a coarsened exact matching and random sampling approach. We always distinguish between "treated" firms, i.e. those firms located in a geographical region targeted by the SEZs program, and "untreated" firms located in non-SEZ regions. For the BD approach, we select a control group of untreated firms that are geographically close to regions that were turned into SEZs (Holmes 1998). From the pool of untreated firms, we select firms located between five and seven kilometres[8] away from the treated firms at the time of the treatment, but are not included in the SEZ region.[9] The BD approach is based on the assumption that economic conditions alter abruptly at the borders of an SEZ due to differences in policies, regulations, or infrastructure, while at the same time, the firms themselves are very similar on both sides.

Since the SEZs were established in different years, we use stacked linear fixed effects regressions on an unbalanced, stacked panel dataset for the estimation following e.g. Baker, Larcker, and Wang (2022) and Cengiz et al. (2019).

As mentioned above, we employ two alternative methods for which we define different control groups of untreated firms. For the coarsened exact matching (CEM) approach, we define a control group of one "identical" untreated firm for each treated firm based on observable characteristics, i.e. industry sector, province, and firm size, as of the pre-treatment year. This approach shows the robustness of our results accounting for potential differences in the

[8] In Table A4 in the Appendix, we report the same results when the control group includes firms between (1) 5 and 10 kilometres, (2) 5 and 15 kilometres, (3) 0.5 and 4 kilometres, and (4) 0.5 and 7 kilometres away from the treated firms.

[9] The control group can even include firms from the same administrative district since SEZs do not necessarily overlap with administrative districts (Lu et al. 2019).

observable characteristics between treated and control firms. For the random sampling approach, we use 500 randomly selected groups of three untreated firms per treated firm. This approach improves the analysis by providing a more representative estimate of the entire population, as it draws samples from the full pool of untreated firms. This enhances the generalizability of the findings to the broader population.

Specification and estimation

Since SEZs are established in different years, we combine a staggered difference-in-differences (DiD) setup with Griliches' market value model resulting in the following empirical specification:

$$logQ_{it} = \beta_1 post_{it} + \beta_2 treat_i \times post_{it} + \beta_3 \frac{R\&D_{it}}{total\ assets_{it}} + \beta_4 \frac{R\&D_{it}}{total\ assets_{it}} \times post_{it} + \beta_5 \frac{R\&D_{it}}{total\ assets_{it}} \times treat_i + \beta_6 \frac{R\&D_{it}}{total\ assets_{it}} \times treat_i \times post_{it} + X_{it} + \delta_t + \lambda_i + \varepsilon_{it} \quad (4)$$

which includes time (δ_t) and firm (λ_i) fixed effects as well as a dummy $post_{it}$ which takes a value of 1 after a treated firm is in a SEZ and 0 otherwise; the respective control firm takes the same values in the same years. In addition, we include a dummy $treat_i$ which takes value 1 for firms located in a SEZ and 0 otherwise, and a set of control variables (X_{it}). Note that the dummy $treat_i$ is time-invariant and, as such, is included in the firm-specific fixed effects λ_i.

Since we are interested in a change in the contribution of R&D to the market value of the firm due to the treatment, we interact the treatment effect, $treat_i$ x $post_{it}$, with our measure for R&D investment ($R\&D_{it}$ / $Total\ Assets_{it}$). The estimated coefficient shows if and how the contribution of R&D to the firm's market value changed after an SEZ was established relative to the control group.

All our results are based on linear regressions with firm- and year-level fixed effects. Driscoll-Kraay standard errors are used for all estimations. These standard errors have the advantage to (1) be heteroscedasticity consistent, (2) produce estimates robust to very general forms of cross-sectional and temporal dependence, and (3) have significantly better small sample properties than alternative options (Hoechle 2007).

Data

Yearly data for publicly traded Chinese firms on both Shanghai and Shenzhen Stock Exchanges is gathered from the China Stock Market and Accounting Research (CSMAR) database, one of the leading financial and accounting databases on Chinese firms, and includes R&D investment, total assets, shares distribution, and firms' headquarters location, on top of many other financial and accounting indicators.

The dataset is supplemented with information on SEZs from the China Association of Development Zones which provides information on each SEZ's date of establishment, size, and whether it is a national or provincial-level SEZ.[10] To determine the location of the SEZs we use the Google Maps API. Once we have the geographical coordinates of the SEZs and their sizes, we are able to determine which firms are located in a region that becomes a SEZ during our time window.

Of our initial sample, which comprises the complete set of listed firms in the Chinese market from 1999 to 2021, 483 firms (out of 4,981) became part of an SEZ. Since in China firms are required to disclose their R&D investment only since 2007, CSMAR is unable to provide information on R&D at the firm level before 2007. 384 treated firms remain in our sample. In addition, since the first SEZs were established in regions characterized by favourable

[10] https://www.cadz.org.cn/index.php/Develop/index.html

geographical locations, industrial conditions, and human capital (Wang 2013), and only in later years the program tended to be more representative of the spatial distribution and less subject to selection biases (Lu et al. 2019), we restrict our analysis to SEZs established between 2008 and 2020. This approach restricts the number of treated firms to 226. In order to conduct meaningful DiD analyses, we only include firms observed at least once before and after the establishment of a SEZ in their location so that we can compare the same firm before and after.[11] This leaves us with 179 treated firms in our period of observation. After discarding the top 1% percentile of the main variable of interest ($R\&D_{it} / Total\ Assets_{it} < 0.103$), 177 treated firms are left in our sample. Those firms are located in 49 different SEZs (see Figure 1 below for the firms' geographical locations).

The final sample size varies due to the different control group's selection strategies. For the random sampling, we chose three control firms per treated firm leading to a sample size of 708 firms (note that this random draw is repeated 500 times). For the CEM control group, we chose one control firm per treated firm. Lastly, for the BD design, i.e. our main sample of analysis, we find 305 firms in the neighboring regions of 109 treated firms. In terms of observations, our final main sample for the BD analysis consists of 836 treated and 7,877 control firm-year observations between 2008 and 2021.[12]

Figure 1 about here

Variables

Our dependent variable is the natural logarithm of Tobin's Q defined as the ratio of the firm's market value, i.e. the total number of shares outstanding multiplied by the price per share, over

[11] Note that the time window is between 8 years before and after the SEZ establishment across all our analysis. Our results are robust to different time windows.

[12] Note that some control firms are associated with more than one treated firm.

the book value of the firm's tangible assets (Dowell, Hart and Yeung 2000; Morck and Yeung 1991). Tobin's Q is a forward-looking measure that incorporates future expected profits, i.e. the aggregate market expectations on the returns to current investments (e.g. Griliches 1981; Hall 2000; Hall et al. 2005).

The key independent variable of interest, R&D investment, is measured as the sum of both capitalized and expensed R&D divided by the book value of the assets (Hall et al. 2005; Pindado et al. 2010).

A set of control variables is used, including total assets, operating income scaled by total assets, total liabilities over total assets[13], percentage of state-owned shares, and the number of shares held by the top ten shareholders. These variables are chosen to control for potential firm-specific differences such as firm size, financial health and risks, performances, and corporate governance, among others, and to avoid omitted variables' bias.

To account for the regional institutional environment in which the firm is located, we also include the five main dimensions of the NERI index of marketization (Wang, Fan and Zhu 2007) as regressors. The NERI index is divided into five broad fields (government and market relations, development of the nonstate enterprise sectors, development of the commodity market, credit market development, and development of legal environment) composed of a total of 23 basic indicators. The index takes values between zero and ten where ten corresponds to the best score. We use the ranks of the provinces for our analysis since the scores increase over time. Ranks take values between one and thirty-one, i.e. the total number of provinces, cities, and independent regions, with thirty-one being the region with the lowest level of institutional development. Table

[13] More specifically, we consider the book value of interest-bearing liabilities over book value of tangible assets.

A2 in the Appendix provides the variable definitions. Lastly, we control for time effects using a set of time dummies. Industry dummies are absorbed by the firm-specific effects.

Results

Descriptive Statistics

Table 1 shows descriptive statistics for our main sample of treated and their geographically close control firms. Tabel A1 in the Appendix shows descriptive statistics for the full sample which are quite comparable.

Table 1 about here

Small, insignificant differences in the means suggest that the treated and control firms are similar. Figure 2 shows t-tests for the mean differences between the treated group and the control group which are insignificant.

The mean R&D investment over total assets is about 0.02 for both groups.[14] The average percentage of state-owned shares is about 4.9% with a maximum of about 87.2%. Controlling for state ownership is especially relevant in the case of China because these firms have been shown to differ systematically from other publicly listed firms (e.g. Phi et al. 2021; Shleifer and Vishny 1994; Tong, Junarsin, and Li 2015).

Figure 2 about here

We show the correlation matrix in Table 2 and the industry frequency by treated and control groups in Figure 3.

[14] Figure A2 shows the distribution of $R\&D_{it} / Total\ Assets_{it}$ by firm size where large firms and small firms are defined as above and below the sample mean of the book value of their total assets.

Table 2 about here

Figure 3 about here

Empirical results

Parallel trends

Although we are not interested in the direct effect of the treatment on the dependent variable, i.e. the market value of firms, we conduct a parallel trends analysis to address the concerns that (1) there could have been regional efforts in terms of infrastructure investment to qualify for the SEZs program which would be reflected in the variables of interest at the firm level and (2) idiosyncratic changes in Tobin's Q or R&D investment due to the establishment of the SEZs which might drive our results.

Figure 4 shows that there is a parallel trend of the dependent variable, the market value of the firms, for the treated and control group before the establishment of the SEZs. Also, after the establishment of a SEZ, the trend is similar for treated and control firms and not significantly different from each other. While in a standard DiD setting, where we are interested in a change in the dependent variable due to an event, we would expect a significant deviation of the trends after the treatment, an insignificant effect is helpful in our specific context because it suggests that an increase in the contribution of R&D to the market value of the firm due to the SEZs program is not driven by an overall increase of the market value of the firm after the establishment of the SEZ.

Figure 4 further shows that the R&D over assets variable shows a parallel trend for the treated and control groups before and after the establishment of a SEZ. This is also important for our analysis since it suggests that the contribution of R&D to the market value of the firm in the post-SEZ period is not impacted by an increase (or decrease) in R&D investment.

Lastly, this analysis shows that potential regional efforts to qualify for an SEZ program are not reflected in our firm level key variables. This in line with Lu et al. (2019) who argues that while the first SEZs were subject to selection, the later SEZ regions, which define our sample, were rather randomly selected.[15]

Figure 4 about here

Main results

Table 3 presents the main results for the BD approach.

Table 3 about here

Model (1) shows a lean specification which only includes the post-SEZ dummy and its interaction with the treatment dummy. The treatment dummy is time-invariant hence it is included in the firm specific fixed effects λ_i. All specifications include firm fixed effects as well as time fixed effects. The results show a positive market value effect for the treated firms after the SEZ was established.

Model (2) adds the measures for $R\&D_{it}$[16] as well as the control variables. As expected, we find a positive, significant effect of $R\&D_{it}$ on Tobin's Q.

[15] Table A3 in the Appendix provides further suggestive evidence supporting the parallel trend assumption.
[16] We refer to our main variable of interest ($R\&D_{it}$ / $Total\ Assets_{it}$) simply as $R\&D_{it}$.

Model (3) provides the first test of our hypothesis. The triple interaction term of $R\&D_{it}$, $treat_i$, and $post_{it}$ measures the difference in how $R\&D_{it}$ contributed to the market value of treated firms as opposed to control firms after the SEZ is established. The positive, significant coefficient suggests that after the SEZ's establishment, $R\&D_{it}$ contributed more to the market value of a firm located within its boundaries. Considering that Figure 4 shows no increase in $R\&D_{it}$ for treated firms after the SEZ, this effect is not driven by a potential direct effect of the SEZ on the level of R&D investments. Model (4) shows support for our hypothesis when our list of control variables is included.[17]

Since we use a triple interaction term, the interpretation of the model is not straightforward because the estimated treatment effect on the treated depends on R&D investment over assets which occurs several times in our model specification. To illustrate the size of the effect, we plot the linear prediction of the model against $R\&D_{it}$ for the treated and the control groups before and after the establishment of the SEZs. Figure 5 shows that, for the treated group, we see a large increase in the predicted contribution of $R\&D_{it}$ to the market value of the firms from before to after the establishment of the SEZ only for larger levels of $R\&D_{it}$ indicating that the effect of the SEZ is stronger for R&D intensive firms. For less R&D intensive firms, the difference appears to be negligible.

Figure 5 about here

Model (5) shows that our results are robust if a different clustering method for the standard errors is used. Considering that some treated firms are associated with disproportionally more control firms given their geographical proximity to a larger number of firms, we cluster the standard

[17] The results are robust for different sets of control variables.

errors at the group level.[18] In Model (6) and (7), we provide further evidence that our results are not driven by the above-mentioned imbalances. In Model (6), we allow each treated firm to have a maximum of three control firms. To do so, we randomly pick three control firms in the pool of firms that are geographically close to the treated firm. In Model (7), we repeat this exercise and allow a maximum of five control firms per treated firm. As all the models report stable and significant coefficient for the triple interaction term of $R\&D_{it}$, $treat_i$, and $post_{it}$, we interpret this as evidence that SEZs increase the market valuation of the R&D investments of the firms located in the SEZs territories therefore providing incentives for the firms to invest more in innovation.[19,20]

Placebo test

We run a placebo check in which we move the SEZ establishment date three years earlier. As expected, there is no effect of the placebo treatment on the market value of $R\&D_{it}$.

Table 4 about here

Robustness test - Coarsened exact matching

Table 5 presents the results for a matched sample. We match 113 treated firms to a comparable control firm using coarsened exact matching (CEM) in the pre-treatment year. Matching criteria include the 3-digit industry code, the province, and three size classes defined along the firms'

[18] When we cluster the standard errors at the firm level, results also hold.
[19] Table A4 in the Appendix shows that our results are robust when control firms are selected in an area between (1) 5 and 10 kilometres, (2) 5 and 15 kilometres, (3) 0.5 and 4 kilometres, and (4) 0.5 and 7 kilometres away from the treated firms.
[20] Due to the unbalanced nature of our panel dataset Table A5 in the Appendix shows several robustness tests in which we include (1) only firms that are present in the dataset for at least three years, (2) only those firms that are observed always between and including periods -2 and +2, and (3) only in the manufacturing sector, which hosts the largest R&D spenders. Results hold.

total assets distribution.[21] Our results, as shown in Table 5, are qualitatively unchanged and provide further support for our hypothesis.

Table 5 about here

Robustness test – Random sampling

Table 6 shows robustness for a random sampling approach. We draw 500 random samples of three control firms for each treated firm and run 500 regressions. Standard errors are bootstrapped.

Table 6 about here

Robustness test – Subsidiaries

A potential issue of our analysis is that we rely on headquarter information and do not take into account whether a firm has a subsidiary, a joint venture, or any other type of associated enterprise in a SEZ.[22] To overcome this issue, we extracted the list of subsidiaries from CSMAR and geolocated them using the Google Maps API. Overall, we find 5,119 subsidiaries (out of 27,140) which are located in a SEZ and have a business scope related to R&D. For this robustness check, we added the firms with subsidiaries in a SEZ to our treatment group which leads to a larger treatment group of 606 publicly listed firms that have either a subsidiary or their headquarters in a SEZ.[23]

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[21] The small number of treated firms does not allow conducting an exact matching for more matching criteria.
[22] Hereafter, for clarity, we refer to all subsidiaries, joint ventures, and any other type of enterprises closely associated with the listed firms as 'subsidiaries'.
[23] A caveat of the CSMAR data is that the subsidiaries' exact locations are not traced over time. We manually checked whether our subsidiaries changed city in the past and found that 78.3% of the subsidiaries did not change city over time.

Table 7 shows the results for the CEM approach and random control samples.[24] They are in line with the main results.

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Table 7 about here

Heterogeneity analysis

We further attempt to disentangle the effect of the different types of SEZs. To do so, we divide the SEZs in our sample into tech and non-tech related SEZs. More precisely, we identify all provincial-level SEZ defined as 'High-tech Industrial Park', 'High-tech Industrial Development Zone', 'Science and Technology Park', 'Science and Technology Innovation Industry Functional Zone', and 'High-tech Zone' as those with the main goal of fostering domestic firms' innovation. We find that 45% of our treated firms (49) are located within this SEZs group. We then run subsample analyses as reported in Table 8 below. As expected, the main effect is found in the subsample of tech-related SEZs (Model (1)); the main effect vanishes for firms located in non-high-related SEZs (Model (2)).

Table 8 about here

Furthermore, throughout the paper we argue that the higher level of institutional development generated by the SEZ drives our main results. If this is true, then we should observe an increase in the market valuation of R&D investment after the SEZ establishment especially in those regions that, ex-ante, i.e. before the SEZ establishment, show the lowest level of legal and

[24] Note that a robustness check for the subsidiary sample based on BD regressions would violate the key assumption of the BD approach which demands that the treated and control firms are located closely to the geographical border. We only have consolidated firm information, i.e. we do not have information on the level of the subsidiary. Since our subsidiary sample of treated firms includes subsidiaries located in a SEZ with a headquarter located far away, the main assumption of the BD design is, hence, violated.

financial institutional development. To test this, we further split the sample according to the mean of the NERI index before the SEZ establishment. We use the overall NERI index (Models (1) and (2) of Table 9) as well as the NERI subindices that measure the level of the development of the credit market (Models (3) and (4) of Table 9) and of the legal institutions (Models (5) and (6) of Table 9).

We find the triple interaction term to be significant only for firms located in SEZs established in provinces that before their establishment experienced the lowest levels of institutional development (Model (1)). We further find that SEZs are especially helpful in contexts where the credit market development is weak (Model (3)). Differently from the credit market development, we find that for any level of legal environment development, the establishment of an SEZ improves the firms' incentives to innovate (Models (5) and (6)). A possible explanation is that this occurs due to the overall low level of legal institutional development throughout China's national territory.

A last heterogeneity check concerns R&D intensive and less R&D intensive firms. We run a subsample analysis where we split the sample of firms around the mean of R&D intensity ($R\&D_{it}$ / $Total\ Assets_{it}$). We find that R&D intensive firms are the ones benefiting the most from the SEZs (Model (7)) providing further evidence of the possible unintended consequences of the SEZ program which might widen the gap between less and more R&D intensive innovators, potentially impacting competition and long-term growth.

Table 9 about here

Discussion

One of the main objectives of the SEZs program in China is to foster innovation in certain geographical regions by improving those regions' institutional environment (Alder et al. 2016). We investigate whether the SEZs program in China succeeded in its objective to incentivize innovation by analyzing the contribution of R&D to the market value of the firms located in the targeted geographical regions.

Our stacked difference-in-differences and boundary discontinuity results from a stacked sample around the establishment of the SEZs in different regions in China show that, when institutions become stronger through the SEZs program, the contribution of R&D to the market value of firms increases. This finding suggests that the SEZs program was successful at stimulating innovation. These results are robust when different estimation frameworks are used and towards several robustness checks.

Our results carry considerable implications for industrial policies in China as they establish a direct link between the SEZs program and firms' incentives to innovate. Differently from other studies that focus on the innovation inputs and outputs, i.e. R&D investment and patents, derived by such programs, we argue that analyzing the change in the contribution of R&D to the firm's value is a valuable contribution because the market value is a forward looking measure which is able to capture incentives to innovate rather than innovation input or innovation success.

One caveat that our analysis reveals, however, is that the effect of the SEZs program is greater for R&D intensive firms and weaker for firms with a smaller R&D intensity located in SEZ regions. This raises questions about the long-term effects of the SEZs program. Fostering innovation among small firms promotes economic diversity and improves the competitive landscape as small innovators often bring fresh ideas and disruptive technologies to the market, driving overall economic growth and dynamism (Schumpeter 1942; Gilbert and Newberry 1982). If, however, R&D intensive firms' innovation activity is stimulated by the SEZs program, the overall effect on innovation can be much smaller than what it could have been because R&D intensive firms have fewer incentives to innovate as new products cannibalize profits from existing ones (Reinganum 1983; Arrow 1962). In order to evaluate the long-term effect of the SEZs program, an analysis of the specific measures taken in each SEZ, i.e. the specific policy mix, would be required. Due to the limited number of publicly listed firms per SEZ, this would be rather a topic for a case study on the regional level.

Furthermore, the SEZs program aimed to reach its goals of business growth and innovation by providing better institutions and by reducing inefficiencies in the institutional environment (Alder et al. 2016; Lu et al. 2019). By showing that firms located within SEZs observe a larger contribution of their R&D efforts to their market value, we also add to the literature on the market value of firms in developing economies and how more developed institutions can increase the market assessment of innovative assets by decreasing institutional uncertainties. The majority of studies in this field have, in fact, focused on developed countries (see Czarnitzki, Hall, and Oriani 2006, for a survey), while we, together with Chadha and Oriani (2010) and Kanwar and Hall (2015) which focus on India, are the first to study the contribution of R&D to the market value of firms for a developing economy. Still, we argue that our study benefits from at least two methodological advantages: differently from these two studies, (1) we draw conclusions from a within-country analysis, exploiting sub-regional variation in institutional development through the SEZs program in China, and (2) we draw conclusions based on arguably exogenous shocks (see the arguments above related to the exogeneity of the SEZ program implementation especially in later years).

A further limitation of our study is that China is an economy that experiences a variety of national, provincial, and local policies, the implementation of which typically varies across different geographical regions. This makes it virtually impossible to control for all of these changes in a regression analysis. Our empirical approach, however, to some extent, handles confounding factors. First, the BD design alleviates the concern of confounding policy changes by focusing on units near the regional border where the SEZ is implemented. What is crucial in our setting is that the SEZ borders do not coincide with administrative borders (Lu et al. 2019) so it is unlikely that a treatment and control firm are not affected equally by potentially confounding policies. Second, the random sampling and coarsened exact matching approach also handle confounding factors to some extent by leveraging variation in the timing of implementation and across regions. These approaches minimize the influence of confounding national events because such events do not align with each treated region's establishment date of an SEZ. Since all these approaches, although relying on completely different assumptions, lead to very similar results, we are confident that our results are reflective of an actual effect of SEZs.

Data availability statement:

The data used for this study is available from the China Stock Market and Accounting Research (CSMAR): https://data.csmar.com/. CSMAR is a commercial data provider and the authors do not have permission to share the data.

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Appendix

Table A1 below provides the descriptive statistics for the full sample included in the boundary discontinuity analysis.

Table A1 about here

Table A2 below provides a description of all the variables used in the paper.

Table A2 about here

Table A3 provides further evidence in support of the parallel trend assumption. Models (1) and (2) show the market value model only for the years before and only for the years after the SEZ, respectively. The interaction term of $R\&D_{it}$ and $treat_i$ indicates whether the market values R&D differently between treated and control groups before (Model (1)) and after the treatment (Model (2)). Model (1) shows an insignificant coefficient of the interaction terms suggesting that there is no difference in the contribution of R&D to the market value of treated firms and firms in the control group before the treatment. Model (2) shows a significant and positive difference in the years after the treatment indicating that the contribution of R&D to the market value of treated firms is larger compared to control firms after the SEZ.

Model (3) shows the market value regressions for the treated group only, while Model (4) shows the regressions only for the control group. The coefficient of interest is the interaction of $R\&D_{it}$ and $post_{it}$. Model (3) shows that the establishment of the SEZs changes the contribution of $R\&D_{it}$ to the market values of the firm only for the treated firms, while there is no effect for the control firms (Model (4)). We interpret this as further suggestive evidence that the parallel trend assumption holds.

Table A3 about here

In Table A4 below, we run several robustness checks where we select the control group of geographically proxime firms between (1) 5 and 10 kilometres, (2) 5 and 15 kilometres[25], (3) 0.5 and 4 kilometres, and (4) 0.5 and 7 kilometres. The results are robust.

Table A4 about here

Table A5 shows various specifications addressing the unbalanced nature of the sample. Model (1) shows a robustness test in which we include only firms that are present in the dataset for at least three years. Similarly, Model (2) shows results for only those firms that are observed always between and including periods -2 and +2. In addition, in Model (3), we show robustness of our results for firms only in the manufacturing sector.

Table A5 about here

Figure A1, Panel A, below provides an overview of the location of all the existing SEZs in China. Panel B and C show the spatial distribution of national and provincial SEZs, respectively.

[25] To avoid strong imbalances in our analysis due to the fact that some treated firms are associated with a large number of control firms, we randomly pick between three and maximum five control firms per treated firm.

Despite the fact that there seems to be overlap between national and provincial SEZs in the Figure, Lu, Wang, and Zhu (2019, pp. 329) clarify that "geographically, national and provincial SEZs are mutually exclusive—a location cannot be both a provincial and a national SEZ at the same time".

Figure A1 about here

Figure A2 below provides the distribution of R&D investment, i.e. R&D investment over total assets, by firm size. We define large and small firms by splitting the BD sample at the mean of the book value of the total assets of the firms. Treated and control firms' information are provided on the right and left panels, respectively.

Figure A2 about here

Tables

Table 1 Descriptive Statistics (BD sample)

	Treated group								Control group							
Variables	Mean	SD	Min	25 perc	Median	75 perc	90 perc	Max	Mean	SD	Min	25 perc	Median	75 perc	90 perc	Max
Log Tobin's Q	0.073	0.957	-3.572	-0.53	0.108	0.752	1.248	2.536	-0.085	1.042	-4.554	-0.729	0.026	0.652	1.124	3.457
R&D investment/ Total Assets	0.022	0.018	0	0.009	0.019	0.031	0.046	0.099	0.019	0.019	0	0.005	0.014	0.027	0.043	0.101
Liabilities/ Assets	0.199	0.172	0	0.041	0.175	0.311	0.421	1.056	0.217	0.183	0	0.061	0.182	0.33	0.481	1.05
Income/ Total Assets	0.036	0.076	-0.68	0.018	0.038	0.066	0.105	0.271	0.034	0.072	-0.677	0.013	0.031	0.062	0.096	0.384
% of State-Owned Shares	0.043	0.13	0	0	0	0	0.136	0.75	0.05	0.14	0	0	0	0.001	0.141	0.872
% Shares of Top 10 Shareholders	58.443	15.267	15.617	46.769	59.074	70.819	76.918	91.454	58.795	16.588	11.2	46.594	59.329	71.636	79.797	97.499
NERI Index 1 (rank)	6.923	6.409	1	2	4	11	17	31	7.596	5.443	1	2	9	11	14	28
NERI Index 2 (rank)	10.129	6.066	1	4	11	13	19	31	13.895	5.55	1	11	13	19	20	31
NERI Index 3 (rank)	11.327	7.48	1	6	11	14	22	31	18.257	9.069	1	11	19	28	30	30
NERI Index 4 (rank)	7.135	6.633	1	2	5	10	18	31	3.697	5.065	1	1	2	3	11	30
NERI Index 5 (rank)	7.457	6.415	1	3	5	11	18	30	4.954	4.357	1	2	4	5	10	30
Post Dummy	0.544	0.498	0	0	1	1	1	1	0.467	0.499	0	0	0	1	1	1
Total Assets	1199.063	2991.917	22.079	137.066	316.323	808.712	2149.244	27075.017	7209.667	21643.625	13.446	207.159	504.976	2112.726	20087.61	290001.4
R&D investment	18.578	63.947	0	1.987	4.611	10.83	31.872	829.409	75.163	267.462	0.001	2.204	6.189	19.117	103.9	3992.738

Notes: R&D investment and total assets are in units of 10,000,000 CNY. Total number of firms: 414. Number of treated firms: 109. Number of control firms: 305. Total number of observations: 8,713. Number of observations in the treated group: 836. Number of observations in the control group: 7,877.

Table 2 Correlation Table (BD sample)

	Log Tobin's Q	R&D investment/ Total Assets	Liabilities/ Assets	Income/ Total Assets	% of State-Owned Shares	% Shares of Top 10 Shareholders	NERI Index 1	NERI Index 2	NERI Index 3	NERI Index 4	NERI Index 5	Total Assets
R&D investment/ Total Assets	0.34****											
Liabilities/ Assets	-0.39****	-0.40****										
Income/ Total Assets	0.20****	0.17****	-0.28****									
% of State-Owned Shares	-0.33****	-0.06****	0.05****	0.01								
% Shares of Top 10 Shareholders	-0.36****	-0.06****	0.04****	0.15****	0.29****							
NERI Index 1	-0.02	0.07****	0.06****	0.01	0.08****	0.01						
NERI Index 2	-0.04***	0.08****	0.01	-0.02	0.02	0.03*	0.60****					
NERI Index 3	-0.08****	0.08****	0.03**	0.03**	0.11****	0.07****	0.53****	0.70****				
NERI Index 4	0.06****	-0.06****	0.02	0.02	0.00	-0.07****	0.34****	-0.20****	-0.36****			
NERI Index 5	0.02*	-0.03**	0.05****	-0.02	0.00	-0.07****	0.50****	0.07****	-0.20****	0.79****		
Total Assets	-0.52****	-0.15****	0.13****	-0.05****	0.05****	0.31****	0.10****	0.18****	0.18****	-0.14****	-0.06****	
R&D investment	-0.39****	0.02*	0.04***	-0.03*	0.01	0.26****	0.11****	0.17****	0.16****	-0.12****	-0.05****	0.77****

Notes: Signif. codes:****: 0.001, ***: 0.01, **: 0.05, *: 0.1.

Table 3 Main results from a BD approach

Dependent Var.:	Log Tobin's Q						
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Sample and cluster:	(full sample)	(full sample)	(full sample)	(full sample)	(full sample – clustered s.e. at group-ID level)	(max 3 controls)	(max 5 controls)
Variables							
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
Post	0.0646***	0.0478***	0.0494*	0.0542	0.0542***	0.1574**	0.1278**
	(0.0148)	(0.0138)	(0.0266)	(0.0323)	(0.0201)	(0.0524)	(0.0504)
Treat x Post	0.0844**	0.1219***	-0.0971	-0.0371	-0.0371	-0.1354	-0.1031
	(0.0297)	(0.0282)	(0.0924)	(0.0917)	(0.1027)	(0.0887)	(0.0987)
R&D/Assets		4.911***	2.857***	4.772***	4.772***	7.794***	7.195***
		(1.059)	(0.9328)	(1.099)	(0.7690)	(1.737)	(1.152)
R&D/Assets x Treat			0.5475	-1.218	-1.218	-3.823	-3.706
			(5.127)	(3.368)	(3.813)	(3.784)	(3.678)
R&D/Assets x Post			0.7796	-0.3524	-0.3524	-1.442	-1.616
			(1.175)	(1.253)	(0.6196)	(1.794)	(1.082)
R&D/Assets x Treat x Post			7.723**	7.164**	7.164*	7.280**	7.671**
			(3.356)	(3.231)	(3.672)	(2.966)	(3.110)
Controls	No	Yes	No	Yes	Yes	Yes	Yes
Fixed-Effects:							
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit Statistics							
S.E. type	Drisco.-Kra. (L=1)	Drisco.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Group-ID	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)
Observations	8,713	8,713	8,713	8,713	8,713	2,507	2,976
R^2	0.78773	0.83602	0.78909	0.83629	0.83629	0.77754	0.80268
Within R^2	0.00283	0.22969	0.00923	0.23094	0.23094	0.23132	0.22016

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms: 109. Number of control firms: 305. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are shown in parentheses. *Full sample* indicates we use *all* the control firms located in the neighbouring regions (between 5 and 7 kilometres) of the treated firms. In Models 6 and 7, out of all the control firms associated with each treated firm, we randomly select up to 3 and 5 control firms, respectively. Model 5 shows robustness of our results for different clustering of the standard errors. As some treated firms are associated to a disproportionally larger number of control firms, we cluster the standard errors at the overall group level (a group is identified as the treated firm and all associated control firms).

Table 4 Placebo test based on the BD

Dependent Var.:	Log Tobin's Q			
Model	(1)	(2)	(3)	(4)
Variables				
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
Post	-0.0114	-0.0107	-0.0326	-0.0055
	(0.0213)	(0.0178)	(0.0404)	(0.0359)
Treat x Post	0.0837	0.0773	0.0366	0.0458
	(0.0618)	(0.0455)	(0.1171)	(0.0921)
R&D/Assets		5.462***	3.178**	4.865***
		(1.288)	(1.418)	(1.485)
R&D/Assets x Treat			7.948**	5.071*
			(3.051)	(2.358)
R&D/Assets x Post			1.186	-0.2266
			(1.276)	(1.244)
R&D/Assets x Treat x Post			1.518	1.132
			(3.015)	(2.349)
Controls	No	Yes	No	Yes
Fixed-Effects:				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Fit Statistics				
S.E. type	Dris.-Kra. (L=1)	Driscoll-Kra. (L=1)	Dris.-Kra. (L=1)	Driscoll-Kra. (L=1)
Observations	7,924	7,924	7,924	7,924
R^2	0.79768	0.84384	0.79933	0.84402
Within R^2	0.00041	0.22846	0.00854	0.22934

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms: 109. Number of control firms: 305. The placebo treatment is set to happen three years before the actual treatment. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are shown in parentheses.

Table 5 Robustness test – Coarsened exact matching

Dependent Var.:	Log Tobin's Q			
Model:	(1)	(2)	(3)	(4)
Variables				
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
Post	0.0013	-0.0563	0.1012	0.0371
	(0.0584)	(0.0491)	(0.0836)	(0.0754)
Treat x Post	0.1753***	0.2054***	-0.0804	0.0046
	(0.0364)	(0.0263)	(0.0869)	(0.0419)
R&D/Assets		7.444***	11.61***	8.103***
		(1.187)	(2.646)	(2.188)
R&D/Assets x Treat			-5.666	-0.6483
			(3.502)	(2.457)
R&D/Assets x Post			-5.173**	-3.957*
			(1.957)	(2.155)
R&D/Assets x Treat x Post			11.92***	8.396***
			(3.139)	(1.810)
Controls	No	Yes	No	Yes
Fixed-Effects:				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Fit Statistics				
S.E. type	Drisco.-Kra. (L=1)	Drisco.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)
Observations	1,983	1,978	1,983	1,978
R^2	0.69571	0.76387	0.70463	0.76545
Within R^2	0.00843	0.22906	0.03751	0.23420

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms: 113. Number of control firms: 113. Matching criteria: province, industry sector, three firm size classes (as measured by total assets), and year. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are presented in parentheses.

Table 6 Robustness test - 500 random control groups

Dependent Var.:	Log Tobin's Q			
Model:	(1)	(2)	(3)	(4)
Variables				
	coef.	coef.	coef.	coef.
	(s.e.)	(s.e.)	(s.e.)	(s.e.)
Post	0.001	0.001	0.001	0.001
	(0.003)	(0.003)	(0.003)	(0.003)
Treat x Post	0.120***	0.134***	-0.032	0.030
	(0.027)	(0.023)	(0.029)	(0.031)
R&D/Assets		6.158***	17.849	7.956
		(1.260)	(14.215)	(11.959)
R&D/Assets x Treat			-9.128	-2.146
			(14.291)	(12.136)
R&D/Assets x Post			-8.890***	-5.175***
			(0.523)	(0.540)
R&D/Assets x Treat x Post			10.040***	6.521***
			(0.384)	(0.546)
Controls	No	Yes	No	Yes
Fixed-Effects:				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms: 177. Number of control firms: 531. Standard errors are based on 500 random draws for the control group. Results are based on stacked OLS estimations with year- and firm-level fixed effects.

Table 7 Robustness test - Subsidiaries

Dependent Var.:				Log Tobin's Q				
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	(CEM)	(CEM)	(CEM)	(CEM)	(Random)	(Random)	(Random)	(Random)
Variables								
	coef.	coef.	coef.	coef.	coef.	coef.	coef.	coef.
	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)
Post	0.0785**	0.0853**	0.0953**	0.1541***	-0.005	-0.004	-0.003	-0.000
	(0.0277)	(0.0298)	(0.0372)	(0.0467)	(0.004)	(0.004)	(0.007)	(0.022)
Treat x Post	-0.0003	-0.0142	-0.1017	-0.1473**	0.094***	0.092***	0.008	0.014
	(0.0312)	(0.0338)	(0.0622)	(0.0678)	(0.023)	(0.019)	(0.026)	(0.022)
R&D/Assets		6.410***	10.32***	10.17***		3.279***	18.873**	8.689*
		(0.5566)	(1.421)	(1.833)		(0.390)	(9.424)	(4.795)
R&D/Assets x Treat			-6.645***	-6.924**			-14.476	-7.859
			(2.171)	(2.652)			(9.482)	(4.894)
R&D/Assets x Post			-1.212	-3.249*			-0.192	-0.237
			(1.202)	(1.814)			(0.281)	(0.274)
R&D/Assets x Treat x Post			4.582**	6.014**			3.447***	3.596***
			(2.132)	(2.506)			(0.361)	(0.299)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Fixed-Effects:								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit Statistics								
S.E. type	Dris.-Kra. (L=1)	Drisc.-Kra. (L=1)	Dris.-Kra. (L=1)	Drisc.-Kra. (L=1)				
Observations	6,092	6,067	6,092	6,067				
R^2	0.68662	0.73012	0.69349	0.73102				
Within R^2	0.00248	0.13562	0.02436	0.13851				

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms in the CEM sample: 355. Number of control firms in the CEM sample: 355. Matching criteria: province, industry sector, three firm size classes (as measured by total assets), and year. Number of treated firms in the repeated random sampling: 606. Number of control firms in the repeated random sampling: 1818. Standard errors for the random sample are based on 500 random draws for the control group. Results are based on stacked OLS estimations with year- and firm-level fixed effects.

Table 8 Heterogeneity analysis: Tech SEZs versus non-tech SEZs

Dependent Var.:	Log Tobin's Q	
Model:	(1)	(2)
Sample:	Tech	No tech
Variables		
	coef.	coef.
	(s.e.)	(s.e.)
R&D/Assets	4.744*	3.659*
	(2.510)	(1.812)
Post	0.0887**	0.0140
	(0.0354)	(0.0331)
R&D/Assets x Treat	3.071	-0.3838
	(3.651)	(5.743)
R&D/Assets x Post	-0.4819	-0.2346
	(1.540)	(1.557)
Treat x Post	-0.1559	0.1654
	(0.0885)	(0.1577)
R&D/Assets x Treat x Post	5.952**	3.180
	(2.394)	(5.906)
Controls	Yes	Yes
Fixed-Effects:		
Firm	Yes	Yes
Year	Yes	Yes
Fit Statistics		
S.E. type	Dris.-Kra. (L=1)	Dri.-Kra. (L=1)
Observations	3,515	4,991
R^2	0.80267	0.82509
Within R^2	0.20047	0.19265

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms (Model 1): 49. Number of control firms (Model 1): 133. Number of treated firms (Model 2): 60. Number of control firms (Model 2): 172. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are presented in parentheses.

Table 9 Heterogeneity analysis: Institutional development and R&D intensity

Dependent Var.:	Log Tobin's Q							
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	Low pre-SEZ institutional development	High pre-SEZ institutional development	Low pre-SEZ credit market institutional development	High pre-SEZ credit market institutional development	Low pre-SEZ legal institutional development	High pre-SEZ legal institutional development	R&D intensive firms	Less R&D intensive firms
Variables								
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
R&D/Assets	0.2385	5.306***	4.522	4.725***	4.097*	5.268***	2.926	15.92***
	(3.581)	(1.201)	(3.404)	(0.9670)	(2.313)	(1.143)	(1.979)	(2.617)
Post	0.0353	0.0464	0.0362	0.0517	-0.0107	0.0676*	-0.0369	0.0477***
	(0.0809)	(0.0286)	(0.0768)	(0.0325)	(0.0489)	(0.0360)	(0.0461)	(0.0148)
R&D/Assets x Treat	2.841	2.304	-2.634	4.755	0.0192	1.535	0.2027	-17.09***
	(6.915)	(3.869)	(6.215)	(3.776)	(5.118)	(2.212)	(3.825)	(4.566)
R&D/Assets x Post	0.9026	-0.0140	0.1490	-0.2473	-0.2434	0.0838	2.865**	-2.247
	(2.189)	(1.095)	(2.311)	(1.183)	(1.408)	(1.201)	(1.179)	(2.167)
Treat x Post	-0.1371	0.1179	-0.1348	0.1508	-0.2214***	0.2391**	-0.1222	-0.0150
	(0.1192)	(0.1323)	(0.1482)	(0.1533)	(0.0672)	(0.0968)	(0.1332)	(0.1085)
R&D/Assets x Treat x Post	10.89**	2.660	11.48**	0.9018	7.375**	4.301*	8.185**	6.833
	(4.582)	(3.782)	(5.000)	(4.404)	(3.000)	(2.196)	(3.374)	(6.887)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-Effects:								
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit Statistics								
S.E. type	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Drisc.-Kra. (L=1)	Drisco.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Drisc.-Kra. (L=1)
Observations	1,644	6,765	1,954	6,582	3,149	5,260	3,803	4,753
R^2	0.78911	0.83112	0.78067	0.85180	0.81142	0.82922	0.73596	0.82599
Within R^2	0.23165	0.19157	0.23235	0.24101	0.21255	0.18765	0.21160	0.20476

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms overall: 109. Number of control firms overall: 305. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are presented in parentheses.

Figures

Figure 1 Main analysis – Treated and control firms' geographical locations (BD sample)

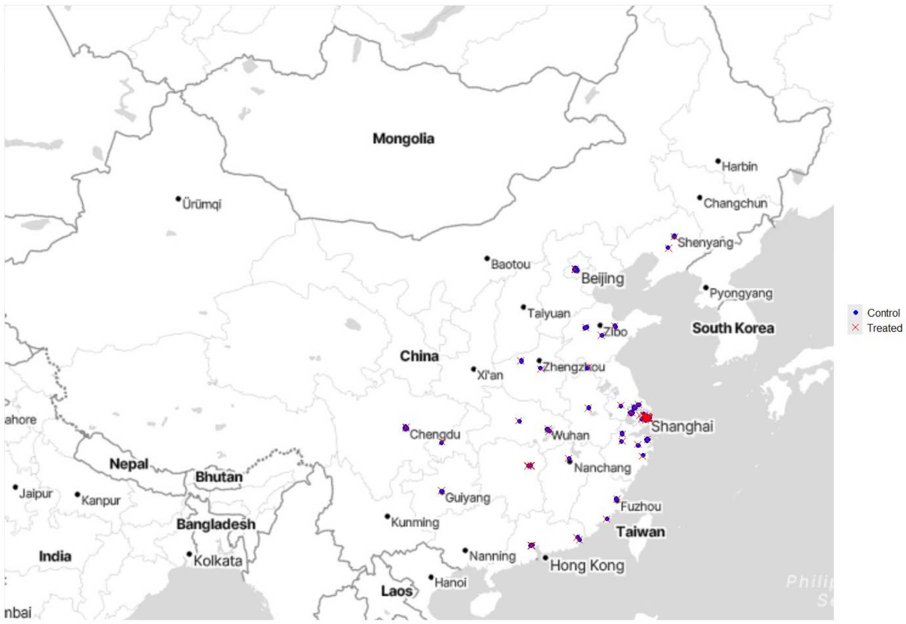


Figure 2 T-tests for main variables: Treated versus control firms (BD sample)

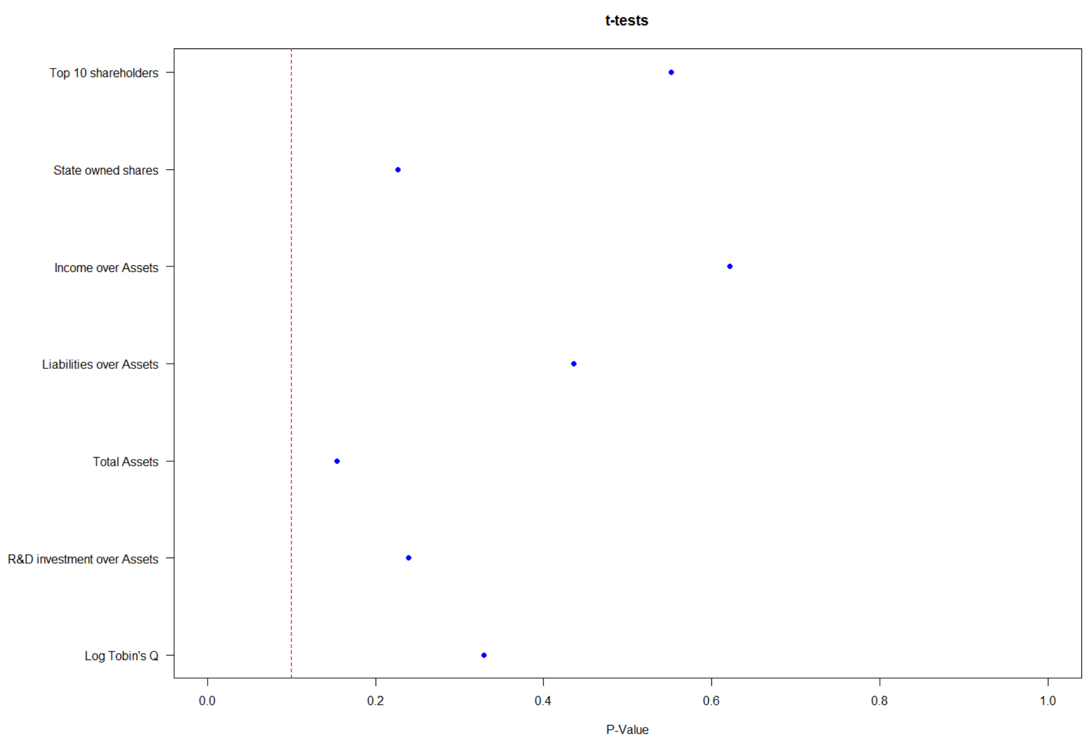


Figure 3 Industry frequency (BD sample)

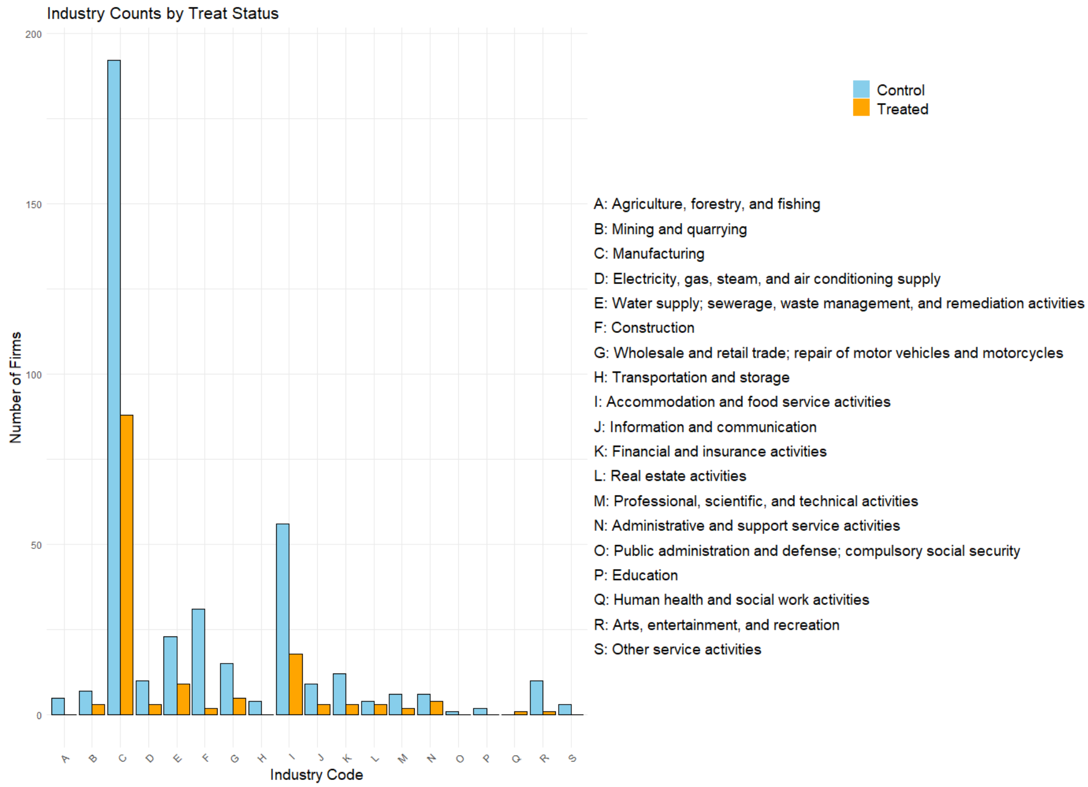
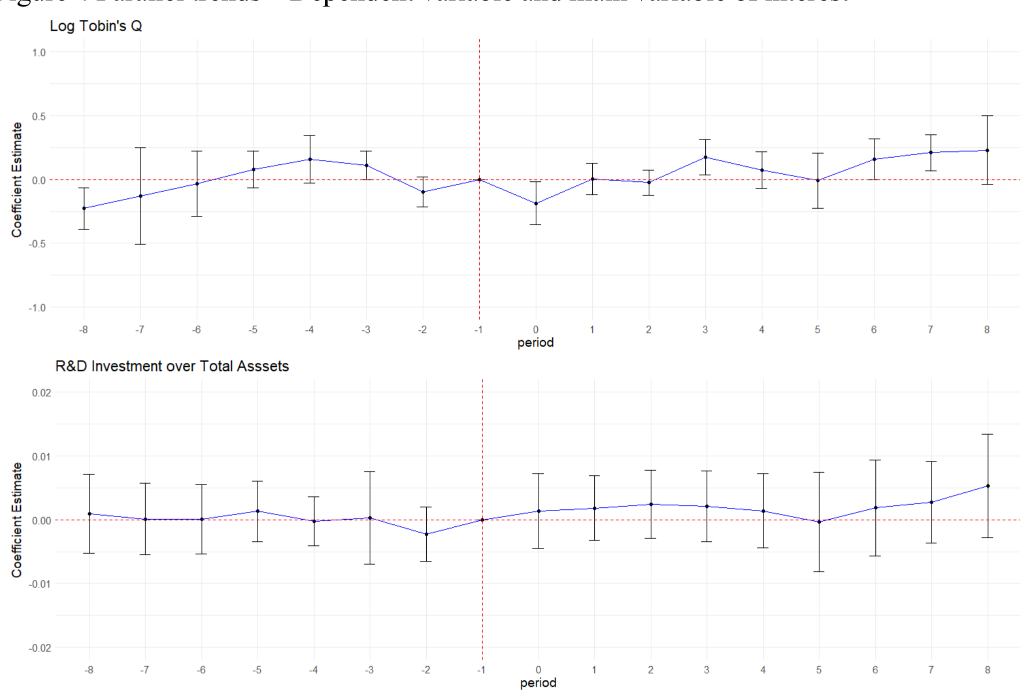


Figure 4 Parallel trends – Dependent variable and main variable of interest



Notes: The parallel trends are obtained by regressing the two variables of interest (log Tobin's Q and R&D investment over total assets) on the interaction of $treat_i$ and a set of dummy variables indicating the temporal distance to the SEZ establishment year. The reference period is $t = -1$. The same set of control variables as in the main regressions is used.

Figure 5 Linear predictions

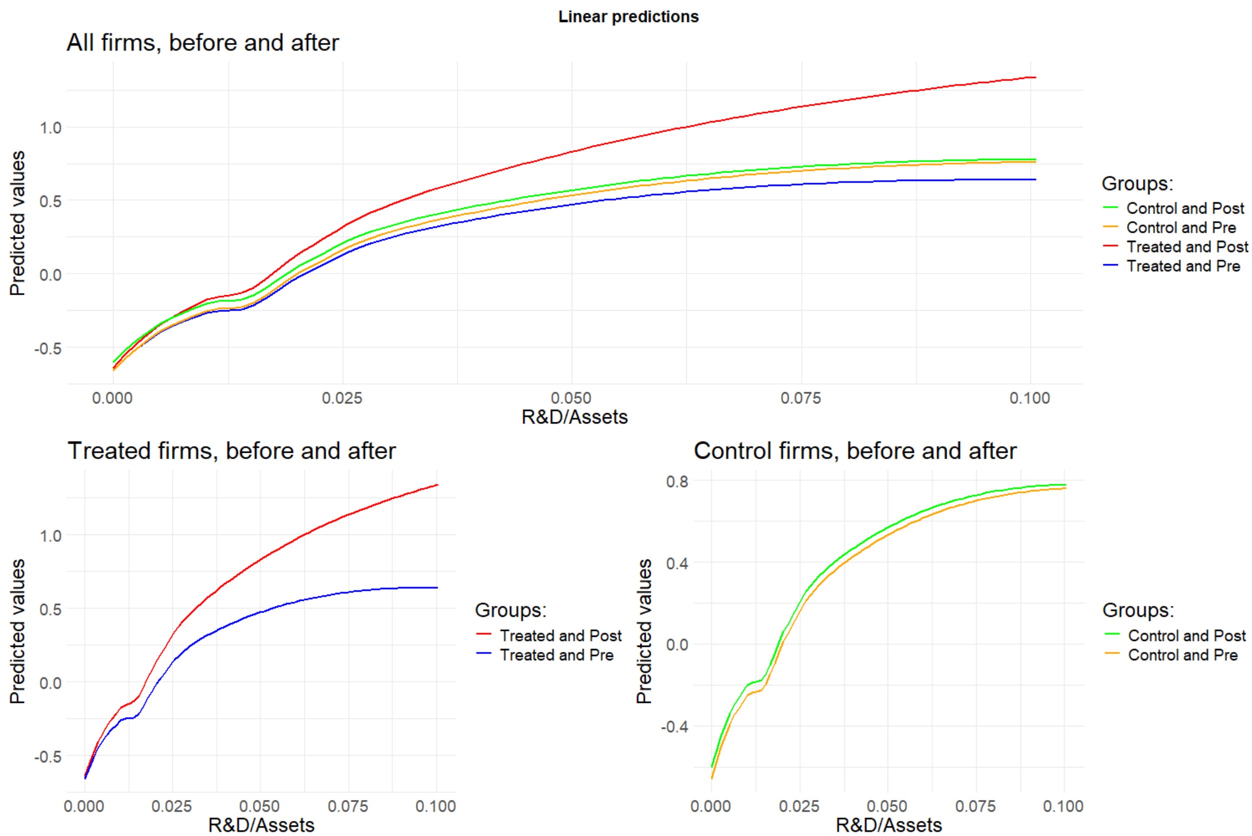


Table A1 Descriptive statistics (Full BD sample)

Variables	Mean	SD	Min	25 perc	Median	75 perc	90 perc	Max
Log Tobin's Q	-0.07	1.035	-4.554	-0.715	0.032	0.666	1.13	3.457
R&D investment/ Total Assets	0.019	0.019	0	0.005	0.015	0.027	0.043	0.101
Liabilities/ Assets	0.215	0.182	0	0.06	0.181	0.328	0.476	1.056
Income/ Total Assets	0.034	0.072	-0.68	0.014	0.032	0.062	0.097	0.384
% of State-Owned Shares	0.049	0.139	0	0	0	0	0.141	0.872
% Shares of Top 10 Shareholders	58.761	16.465	11.2	46.594	59.283	71.562	79.241	97.499
NERI Index 1 (rank)	7.532	5.547	1	2	9	11	15	31
NERI Index 2 (rank)	13.533	5.71	1	11	13	19	20	31
NERI Index 3 (rank)	17.592	9.159	1	10	19	28	30	31
NERI Index 4 (rank)	4.027	5.333	1	1	2	3	12	31
NERI Index 5 (rank)	5.194	4.653	1	2	4	5	11	30
Treat Dummy	0.096	0.295	0	0	0	0	0	1
Post Dummy	0.474	0.499	0	0	0	1	1	1
Total Assets	6632.958	20675.75	13.446	198.046	473.494	1825.045	18926.93	290001.4
R&D investment	69.734	255.619	0	2.191	5.974	18.353	90.177	3992.738

Notes: R&D investment and total assets are in units of 10,000,000 CNY. Total number of firms: 414. Number of treated firms: 109. Number of control firms: 305. Total number of observations: 8,713. Number of observations in the treated group: 836. Number of observations in the control group: 7,877.

Table A2 Variable definitions

Variable	**Definition**
Log Tobin's Q	Number of A shares multiplied by the year-end price per share divided by total assets' book value (log-transformed)
Total assets	Total book value of assets is divided by 10,000,000 CNY
R&D investment	*Capitalized* and *expensed* R&D divided by 10,000,000 CNY
State Owned shares	% of state-owned shares
R&D investment/ Total Assets	R&D Investment divided by Total Assets
Liabilities/ Assets	Book value of interest-bearing liabilities over book value of tangible assets
Top 10 shareholders	Shares held by the top 10 shareholders
Income over Assets	Net Income divided by Total Assets
Treat	Dummy taking value of 1 if a firm is located in a SEZ; 0 otherwise
Post	Dummy taking the value of 1 after the treated firm or the corresponding control firm is located in a SEZ; 0 otherwise
NERI Index 1 (rank)	Degree to which a region is regulated by the market and not by the central party (from 1 to 31)
NERI Index 2 (rank)	Degree of development of non-state-owned sector (from 1 to 31)
NERI Index 3 (rank)	Degree of market freedom (for example, whether prices are determined by the market or by the government) (from 1 to 31)
NERI Index 4 (rank)	Degree of development of the credit market (from 1 to 31)
NERI Index 5 (rank)	Degree of development of the legal environment (from 1 to 31)
Industry code	3 digits industry codes grouped into 10 categories

Table A3 Further tests for parallel trends (BD sample)

Dependent Variable:	Log Tobin's Q			
Model:	(1)	(2)	(3)	(4)
Subsamples:	Only before	Only after	Only treated	Only control
Variables				
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
R&D/Assets	6.637***	1.868**	3.518	4.558***
	(0.8256)	(0.8413)	(2.838)	(1.141)
R&D/Assets x Treat	-2.457	9.722***		
	(3.616)	(1.755)		
Post			0.0683	0.0505
			(0.0801)	(0.0306)
R&D/Assets x Post			4.972*	-0.1500
			(2.663)	(1.228)
Controls	Yes	Yes	Yes	Yes
Fixed-Effects:				
Firm	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	4,582	4,131	836	7,877
R^2	0.85957	0.90899	0.80853	0.84071
Within R^2	0.25479	0.23758	0.34505	0.22544

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms overall: 109. Number of control firms overall: 305. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are shown in parentheses.

Table A4 BD analysis with different distance gaps (BD sample)

Dependent Var.:	Log Tobin's Q					
Model:	(1)	(2)	(3)	(4)	(5)	(6)
Sample:	Between 5 and 10 kms max 3 controls	Between 5 and 10 kms max 5 controls	Between 5 and 15 kms max 3 controls	Between 5 and 15 kms max 5 controls	Between 0.5 and 4 kms no max	Between 0.5 and 7 kms no max
Variables						
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
R&D/Assets	6.622***	6.266***	7.284***	5.665***	10.34***	6.564***
	(1.503)	(1.915)	(1.265)	(1.838)	(1.132)	(0.8692)
post	0.1016**	0.0550	0.1011**	0.0266	0.0558***	0.0534**
	(0.0359)	(0.0511)	(0.0445)	(0.0577)	(0.0167)	(0.0232)
R&D/Assets x treat	-0.8131	-0.5657	-1.266	0.5409	-6.459*	-1.951
	(2.954)	(2.916)	(3.317)	(3.150)	(3.156)	(3.260)
R&D/Assets x post	-0.4930	-0.1371	0.0142	0.4583	-1.023	-0.5593
	(1.822)	(1.473)	(1.212)	(1.498)	(0.7864)	(0.7409)
treat x post	-0.0871	-0.0358	-0.0483	-0.0361	0.0912	0.0261
	(0.0632)	(0.0816)	(0.0767)	(0.0717)	(0.0657)	(0.0702)
R&D/Assets x treat x post	4.251*	4.073*	4.389**	4.236**	6.347**	7.065**
	(2.088)	(2.177)	(1.912)	(1.924)	(2.567)	(2.864)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed-Effects:						
Firm	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
Fit Statistics						
S.E. type	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)	Dris.-Kra. (L=1)
Observations	3,463	4,299	4,027	5,033	6,531	17,655
R^2	0.79747	0.78888	0.76435	0.76215	0.83099	0.83264
Within R^2	0.21684	0.20775	0.21669	0.17202	0.28574	0.22658

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms between 5 and 10 kms: 132. Number of control firms between 5 and 10 kms (max 3 controls): 310. Number of control firms between 5 and 10 kms (max 5 controls): 407. Number of treated firms between 5 and 15 kms: 144. Number of control firms between 5 and 15 kms (max 3 controls): 365. Number of control firms between 5 and 15 kms (max 5 controls): 494. Number of treated firms between 0.5 and 4 kms: 105. Number of control firms between 0.5 and 4 kms: 245. Number of treated firms between 0.5 and 7 kms: 135. Number of control firms between 0.5 and 7 kms: 496. Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are presented in parentheses.

Table A5 Further robustness tests: Different subsamples

Dependent Var.:		Log Tobin's Q	
Model:	(1)	(2)	(3)
Sample	(firms observed at least for three years)	(firms observed from period -2 to period +2 around the SEZ establishment)	(manufacturing)
Variables			
	coef. (s.e.)	coef. (s.e.)	coef. (s.e.)
R&D/Assets	4.773***	4.617***	8.230***
	(1.098)	(1.143)	(1.008)
Post	0.0544	0.0670	0.0737*
	(0.0323)	(0.0423)	(0.0406)
R&D/Assets x Treat	-1.249	-2.672	-5.239
	(3.340)	(3.575)	(3.651)
R&D/Assets x Post	-0.3642	-2.044	-0.9121
	(1.263)	(1.558)	(1.477)
Treat x Post	-0.0478	-0.2081**	-0.1897*
	(0.0985)	(0.0950)	(0.0968)
R&D/Assets x Treat x Post	7.326**	11.19**	13.63***
	(3.347)	(3.988)	(3.988)
Controls	Yes	Yes	Yes
Fixed effects			
Firm	Yes	Yes	Yes
Year	Yes	Yes	Yes
Fit Statistics			
S.E. type	Driscoll-Kra. (L=1)	Driscoll-Kra. (L=1)	Driscoll-Kra. (L=1)
Observations	8,686	5,852	4,465
R^2	0.83571	0.83360	0.77350
Within R^2	0.23066	0.21968	0.23188

Notes: Signif. codes: ***: 0.01, **: 0.05, *: 0.1. Number of treated firms (Model 1): 103. Number of control firms (Model 1): 283. Number of treated firms (Model 2): 44. Number of control firms (Model 2): 178. Number of treated firms (Model 3): 74. Number of control firms (Model 3): 165.Results are based on OLS estimations with year- and firm-level fixed effects. Driscoll-Kraay standard-errors are presented in parentheses.

Figure A1 Geographical distribution of all SEZs

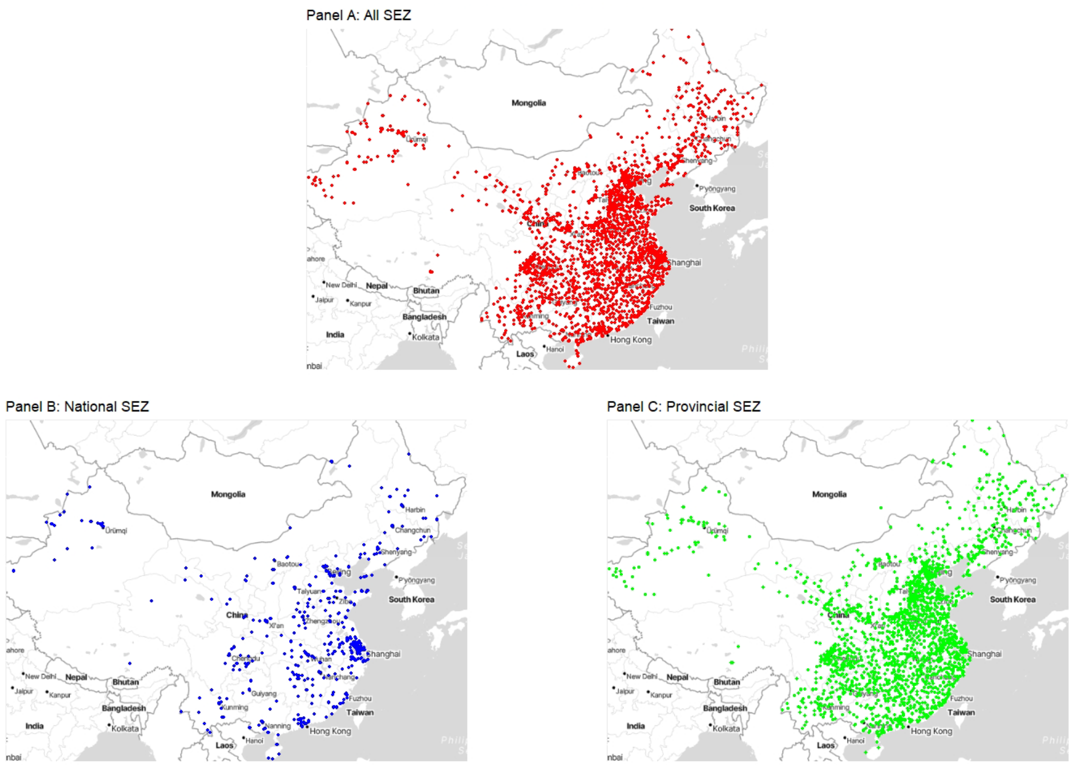


Figure A2 Distribution of R&D investment by firm size (BD sample)