

Do Free Trade Zones Stimulate Entrepreneurship? New Evidence from China¹

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ABSTRACT

Taking advantage of China's 2017 free trade zone (FTZ) program introduced in 15 cities, we adopt the difference-in-difference techniques to evaluate the effectiveness of FTZ policies in encouraging entrepreneurship. Our econometric analysis suggests that they have moderately motivated start-up businesses, evidenced by higher growth of company registrations. The impact was only seen in 2017 but not in any subsequent years. Moreover, the policies haven't had a clear positive impact on individual firms' business sizes. The Chinese government hasn't released any estimation for the costs of FTZ programs, but we expect their economic return to be meager. Therefore, we would suggest not expanding the program further; instead, the government should address the pressing issues that suppress business activities.

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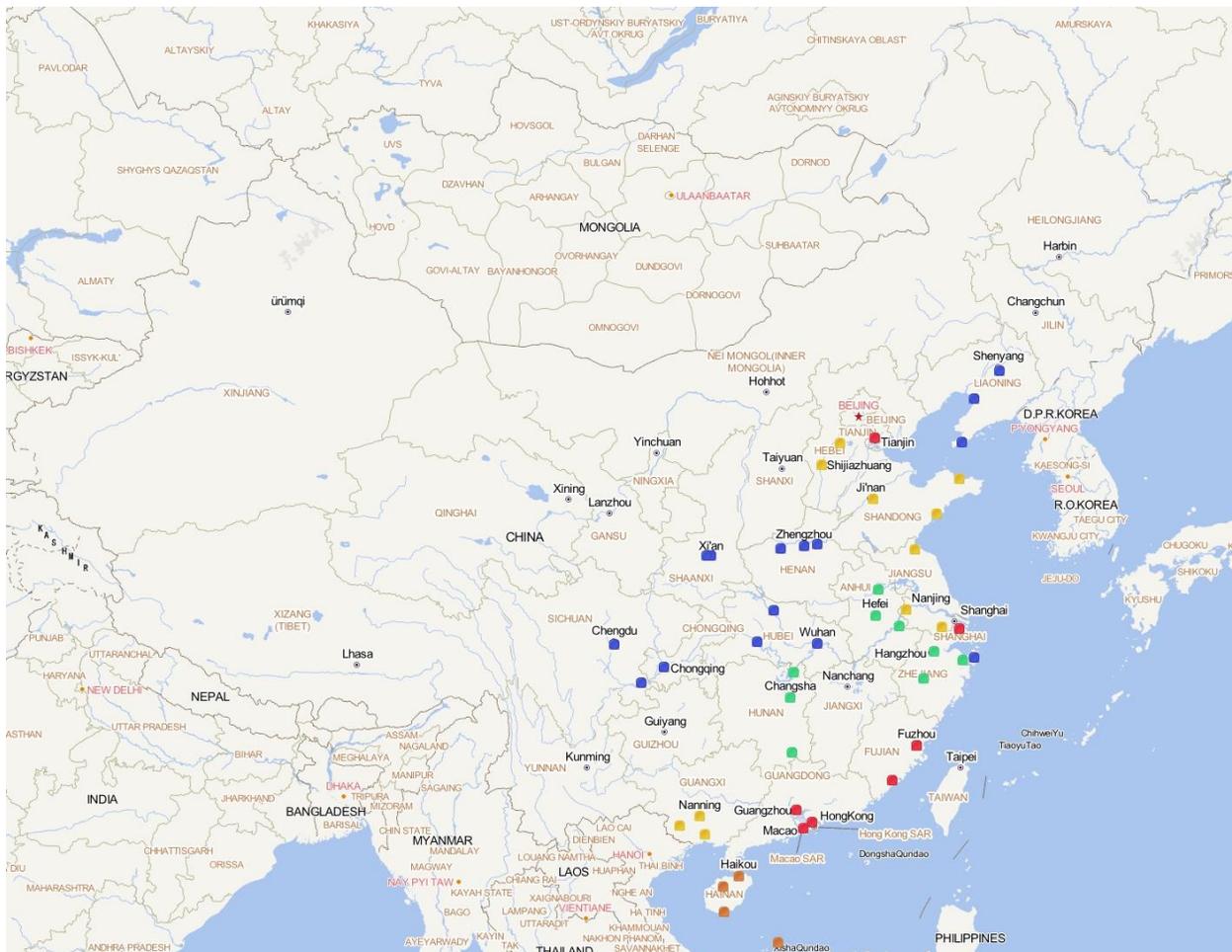
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1. Introduction

1.1 Why Is This Topic Important?

During the 17th National Congress in 2007, the Communist Party of China (CPC) put forward a “national strategy” of building free trade zones (FTZs). The Chinese government has introduced six FTZ pilot programs since 2013. The first two batches in 2013 and 2015 concentrated on developed coastal cities and provinces such as Shanghai, Tianjin, Guangdong, and Fujian. Since 2017, the initiatives have been spread to smaller or less developed regions across the central and coastal regions of the country (Figure 1 and Appendix A1). As of 2021, 53 cities have participated, creating nearly 100 FTZs in total.

Figure 1: FTZ pilot cities are scattered all over the central and coastal regions of China



Notes: Red—2013 and 2015 programs; blue—2017 program; orange—2018 program; yellowish brown—2019 program; green—2020 program.

Source: Baidu Encyclopedia and Oxbridge Economics

The definition of an FTZ in China largely corresponds to that followed by the World Bank: fenced-in, duty-free areas that offer warehousing, storage, and distribution facilities for trade, transshipment, and re-export operations⁵. However, China's FTZs are also used for political ends: according to the Ministry of Commerce (MOFCOM), FTZ programs should play their part in the formation of a new global trade network that facilitates China's foreign trade and investments in the long run⁶. In fact, it is apparent that the purpose of building FTZs goes far beyond simply facilitating trade—the Chinese government uses them to try out new rounds of reforms, such as investment and financial liberalization and tax reforms.

It is a widely held belief of Chinese experts and scholars that FTZ initiatives aim to encourage entrepreneurship, through which channel economic growth will be lifted⁷. Such a belief is deeply rooted in the story—sometimes touted as a miracle—of Shenzhen. The city, which is adjacent to Hong Kong, was set up as a special economic zone (SEZ)⁸ in 1980 and has developed from an impoverished fishing village into one of the richest cities in the world in merely three decades. Entrepreneurship has been seen as the key to this miracle: the slew of liberalization policies attracted enormous talent to the region and gave birth to innovators and entrepreneurs, leading to a business boom, in both traditional and modern industries.

Nevertheless, stimulating entrepreneurship is omitted as an explicit objective of FTZs in official documentations. In our view, this is consistent with the CPC's common practice of avoiding acknowledging entrepreneurial spirit as being a primary contributor to China's economic and social development. As some economists (e.g., Barry Naughton and Richard Cooper) have iterated in their speeches, such a tendency deeply roots in CPC doctrine, where entrepreneurship is synonymous with capitalism, an ideology that it opposes.

As far as can be ascertained, no solid empirical work has been carried out to examine whether FTZ or SEZ policies have stimulated entrepreneurship. This is possibly due to the lack of available data, particularly for earlier decades. This project aims to fill the research gap using event study methods. By drawing on China's large-scale 2017 FTZ program, which was introduced in 15 cities, and the significant amount of business registration information generated over the past decade, we are able to evaluate the effectiveness of FTZ initiatives. Precisely speaking, we will use the difference-in-

⁵ See *Special Economic Zones: Performance, Lessons Learned, and Implications for Zone Development* by the Facility for Investment Climate Advisory Services (FIAS) of World Bank in April 2008, available at <https://documents1.worldbank.org/curated/en/343901468330977533/pdf/458690WP0Box331s0April200801PUBLIC1.pdf>

⁶ See *The Representative from the Department of Foreign Trade of the MOFCOM Interprets <The Opinions of the State Council on the Facilitation of FTZ Strategy>* (in Chinese) released on December 18, 2015, available at http://www.gov.cn/zhengce/2015-12/18/content_5025564.htm

⁷ See for example, *Why are FTZs Fertile Grounds for Entrepreneurship to Take Root, Flourish and Bear Fruit* by Huaishui Zhang published on National Business Daily on October 16, 2017, available at <http://www.nbd.com.cn/articles/2017-10-16/1154382.html> and *The Free Trade Zone Enables Entrepreneurs to Proceed with Confidence* published on Henan Business Daily on October 21, 2017, available at http://newspaper.dahe.cn/hnsb/html/2017-10/21/content_192619.htm

⁸ The Chinese government introduced four SEZs--Shenzhen, Zhuhai, Shantou, and Xiamen--in the 1980s. Similar to today's FTZ initiatives, the SEZs were established as “experimental fields” where a significant quantity of economic reform policies was tested. Deng Xiaoping provided the blueprint: “the SEZs may get rich first; they can drive the development of other cities in the future, which will ultimately lead to a prosperity of the whole country”.

difference (DID) approach in the modeling section. If the FTZ and non-FTZ areas⁹ had similar economic conditions before the program was introduced, the DID models would allow us to estimate its impact by comparing the two groups' differences in entrepreneurial indicators before and after the introduction of FTZs.

1.2 Detailed Information about the 2017 FTZ Pilot Program

Our study focuses on the 2017 program since it covers a relatively large set of cities that provide sufficient pre- and post-program data to test its effectiveness. In 2017, the FTZ pilot programs were introduced in 15 municipalities characterized by differing levels of economic development. The cities' GDP per capita ranged from RMB 34,411 to RMB 127,524 in 2016, the equivalent of USD 5,182 and USD 19,205, respectively. In comparison, the national average was USD 8,148 that year.

The establishment of an FTZ involved three major steps. The preparation stage was implemented in 2016. Responding to hints from the central government, a batch of municipalities delimited a district for the FTZ experiment and commenced infrastructural investments. Then, the cities submitted formal applications to the central government sometime between the end of 2016 and the beginning of 2017. Finally, most FTZ proposals were approved in late March 2017, and became effective on April 1, 2017.

FTZs are expected to pioneer further reform and open up. With this in mind, both central and local governments proposed a series of policies. As summarized in Table 1, the policies can be classified into four areas: foreign trade, foreign direct investment (FDI), finance, and administration (Table 1). A number of cities also rolled out some short-term stimulus policies such as borrowing incentives and financial rewards for new firms. As discussed above, FTZ policies have not mentioned entrepreneurship whatsoever due to the CPC's evasive attitude toward it. However, most of the policies—if fully implemented—may result in a rising entrepreneurial spirit. For example, encouraging FDI would bring more capital and technology to FTZs, leading to expansion of production and innovation. In the meantime, reducing red tape can remove some of the biggest business obstacles faced by firms operating in China.

Table 1: The proposed policies for FTZs have covered various aspects

Foreign trade	<ul style="list-style-type: none"> - Establish bonded transaction display platforms where tariffs are collected only after the successful transactions of imported goods. - Enhance customs' cooperation to streamline clearance processes. - Promote international communication and collaboration in quarantine, inspection, and certification. - Establish an intellectual property transactions platform and an agile response mechanism to address violations/breaches of intellectual property rights.
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⁹ FTZ and non-FTZ regions can be understood as experiment and control/comparison groups, respectively.

FDI	<ul style="list-style-type: none"> - Adopt a registration system for foreign direct investment projects and establishment of foreign-funded enterprises. - Grant pre-establishment national treatment: foreign investors are granted treatment no lower than that of their domestic counterparts in the founding stage of the enterprises. - Permit the unrestricted transfer of eligible foreign investor investment gains. - Adopt the negative list system.
Finance	<ul style="list-style-type: none"> - Further open up the economy; lift the pending account mandate for eligible enterprises. - Encourage domestic and foreign investors to establish financial leasing companies. - Loosen the entry criteria for capital originating from multinational enterprises; streamline fund pool management and current-account forex receipt and payment procedures. - Permit foreign-funded institutions to launch joint-venture securities companies and RMB investment funds.
Administration	<ul style="list-style-type: none"> - Adopt the charge list policy; prohibit any charges on items outside the scope of the list. - Expedite entry and exit procedures, visas, and applications for residence from both domestic and foreign personnel. - Digitize registration processes, so as to streamline registration, investment reporting and application and cancellation procedures.

Source: Various official documents (see a full list in Appendix A2); translated by Oxbridge Economics.

2. Preparations for Modeling

To prepare for econometric modeling in the next section, we will do two things. First, we pinpoint each FTZ in an administrative district as data is only available at the district level. Based on this, we are able to divide the whole sample into experimental (i.e., FTZ) and control (i.e., non-FTZ) groups, which is the foundation of DID analysis. Second, we construct entrepreneurship indices which will be used as the dependent variables in the regressions.

2.1 Delimiting FTZ and non-FTZ districts

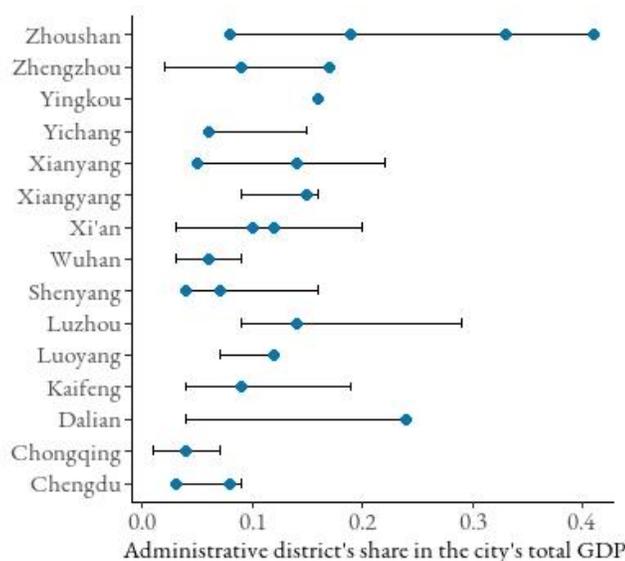
All 118 administrative districts in the 15 pilot cities were partitioned into 24 FTZ districts and 94 non-FTZ districts. This was achieved by overlaying contours of FTZs as described in official documents of administrative districts for all cities¹⁰. A full list of FTZ and non-FTZ districts are exhibited in Appendix A3.

The economic size of FTZ districts varies considerably as shown in Figure 2. For example, in Yichang, the FTZ district is the smallest among the city's all districts; in Dalian, the FTZ district is the largest; and in Wuhan, the FTZ district ranks in the middle. Such a variation suggests that the choices of FTZs

¹⁰ Technical notes available upon request.

are random, to a certain extent, as there is no observed pattern that FTZs are introduced in the most developed or under-developed districts, which validates our event study approaches in the next section.

Figure 2: The economic sizes of FTZ districts vary substantially



Notes: This chart shows the administrative districts' share of their cities' total GDP. **Blue dots** represent FTZ districts; the left and right endpoints indicate the minimum and maximum share of total GDP an administrative district may account for in each city.

Source: WIND and Oxbridge Economics

2.2 Constructing Databases and Measuring Entrepreneurship

We examine entrepreneurship from two aspects. From the macro perspective, we focus on the number of enterprises in a certain area. Specifically, we construct a regional entrepreneurship index by computing the growth rate of all existing firms¹¹ with raw data from the WIND Data Government (DGOV) Platform. This index is comparable across different districts or cities, and a bigger number indicates higher entrepreneurship. In all administrative districts we have covered, the index average is 0.1247 during 2011-2020 (see more summary statistics in Appendix A4), meaning their annual growth of firm numbers has been around 12%. A horizontal comparison suggests that, among the 15 FTZ pilot cities, Kaifeng and Zhengzhou, two cities in the inland Henan province, had the highest regional entrepreneurship in 2016, with the number of companies expanding 20%. In the meantime, Shenyang, Dalian, and Yingkou, three cities in the Northeast province Liaoning, ranked at the bottom, with firm numbers increasing around 10%.

¹¹ The net change of firm numbers equals the difference of entry and exit of firms during a certain period of time. We have counted all 10 types of firms, including limited liability companies, incorporated companies, state-owned enterprises, collectively owned enterprises, foreign-invested enterprises, Hong Kong, Macao, and Taiwan invested enterprises, individual businesses, joint venture, limited partnership, and general partnership.

From the micro perspective, we use each private firm’s registered capital and the number of employees as proxies of its founder’s entrepreneurship. The two pieces of information are self-reported without official verification (at least in the short run), which may reflect the founders’ plan for business sizes, their willingness to take risks, as well as their ability to create jobs. Since there is no such database readily available for overseas researchers, we constructed our own sets of granular data, combining information from the WIND DGOV platform and National Enterprise Credit Information Publicity System¹² (see details in Appendix A5 and A6). Further, we did some mathematical transformations to obtain the final registered capital and employment indices (see details in Appendix A7).

3. Empirical Studies

We construct two distinct sets of models, based on the regional and founder’s entrepreneurship indices. In both sets of models, we use the DID method, which can shed light on causality¹³, to evaluate the impacts of introducing FTZ; the modeling procedure and some technical explanations are included in Appendix A8.

3.1 The Macro Model

In the macro model, we pool the 117 districts¹⁴ of the 15 pilot cities and divide them into two categories: FTZ group (the experimental group) and non-FTZ group (the comparison/control group). Since we examine eight years—2013-2016 is the pre-program period and 2017-2020 the post-program period--using annual data, the total number of observations is 936.

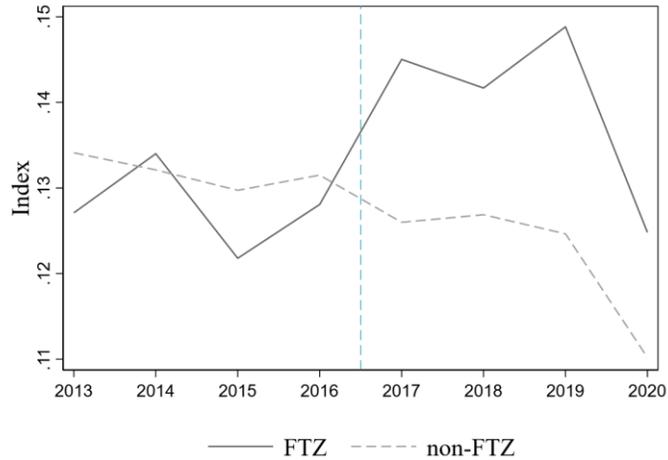
The average of regional entrepreneurship indices as illustrated in Figure 3 seems to suggest that the FTZ policies have boosted regional entrepreneurship. Explicitly speaking, before the pilot programs were introduced, FTZ and non-FTZ regions had similar levels of entrepreneurship, evidenced by the overlapping solid line and dotted line. After that, while the index for the non-FTZ districts declined continuously over the past years, the index for FTZs increased before the outbreak of COVID-19 pandemics.

Figure 3: Entrepreneurship index for FTZ and non-FTZ diverged after the experiment

¹² Technical notes about database construction available upon request.

¹³ The widely used linear regressions only indicate the relationship between variables, failing to examine whether a policy/program has caused a certain change.

¹⁴ Yangling District of Xianyang is excluded in the model due to data abnormality.

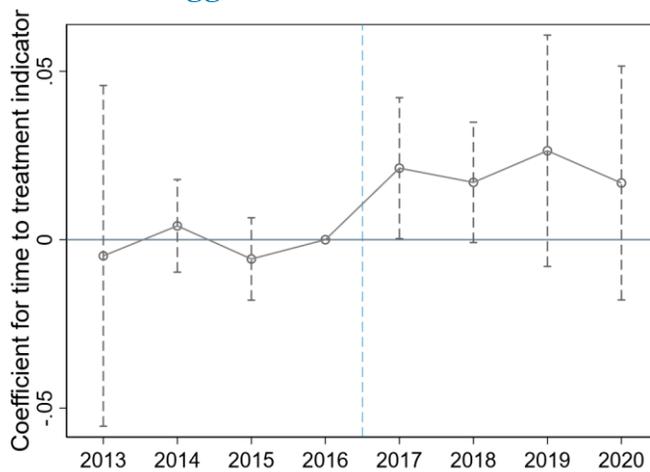


Notes: The lines show the simple average of the district-level entrepreneurship index for FTZ group (24 districts in total) and non-FTZ group (94 districts). The vertical dashed line separates the eight years (2013-2020) into pre- and post-program periods.

The above observation can be verified by the common/parallel trend test, a more standard approach of comparing trends of the experimental and control groups (see technical notes in Appendix A8). As illustrated in Figure 4, we have two key takeaways from the test:

- The two groups had common trends in the pre-program period, i.e., FTZ and non-FTZ regions had the same tendency of entrepreneurship over the years. This means the two groups were comparable before the pilot program was administered, and therefore, the precondition of DID analysis as discussed in Section 1.2 is satisfied.
- The program increased regional entrepreneurship in 2017 when FTZs were introduced; the effect faded in the following years.

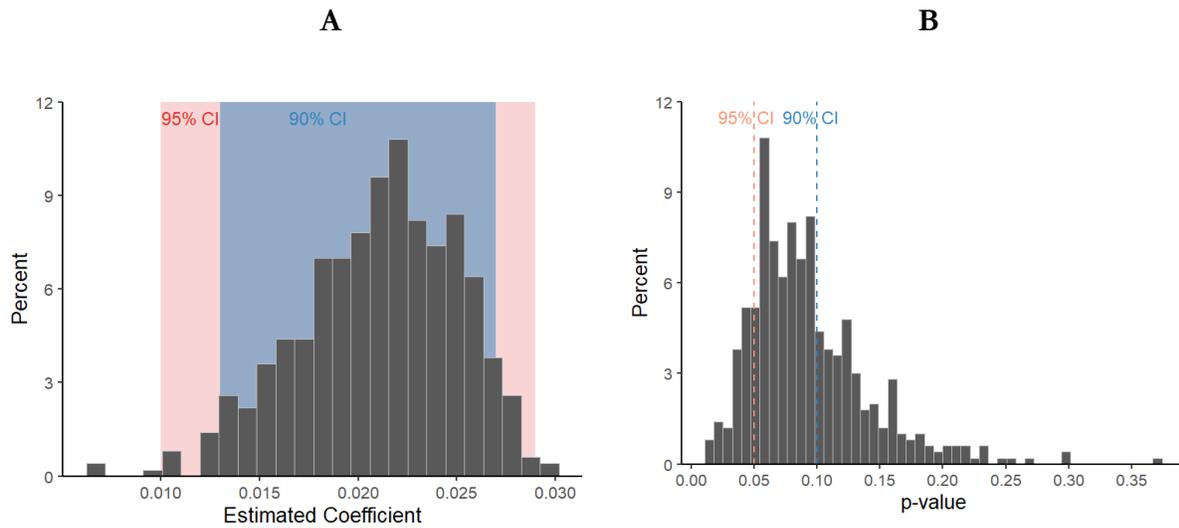
Figure 4: Common trend test suggests some weak effectiveness of 2017 FTZ program



Notes: The blue dashed line separates the eight years (2013-2020) into pre- and post-program periods. If grey vertical dashed lines cross the zero line, the FTZ and non-FTZ groups have the same tendency of entrepreneurship in that year. If it lies above the zero line, we conclude that FTZ regions witnessed higher growth in entrepreneurship than non-FTZ regions.

The DID regression provides us with an estimation of the impact magnitude. Specifically, we are 90% confident that the FTZ initiatives have led to an expansion of regional entrepreneurship, as shown by a 2.1 percentage points increase in the growth of firm numbers. We expect the increase came primarily from a growing number of new company registrations. However, it is also worth noting that the impact is not that strong since we are not able to increase the level of confidence from 90% to 95% for the existence of a positive impact. Moreover, our results are robust, i.e., the estimation of FTZs' impact doesn't change significantly with different modeling approaches. For example, if we randomly draw 700 observations from the full dataset to redo the DID analysis as shown above, and repeat it 500 times, we can still conclude that the FTZ program can push up the growth of firm numbers by 2-2.3 percentage points. Also, we are 90% confident with such a positive impact, and the level of confidence cannot be raised to 95%.

Figures 5: Repeated tests suggest the baseline regression results are robust



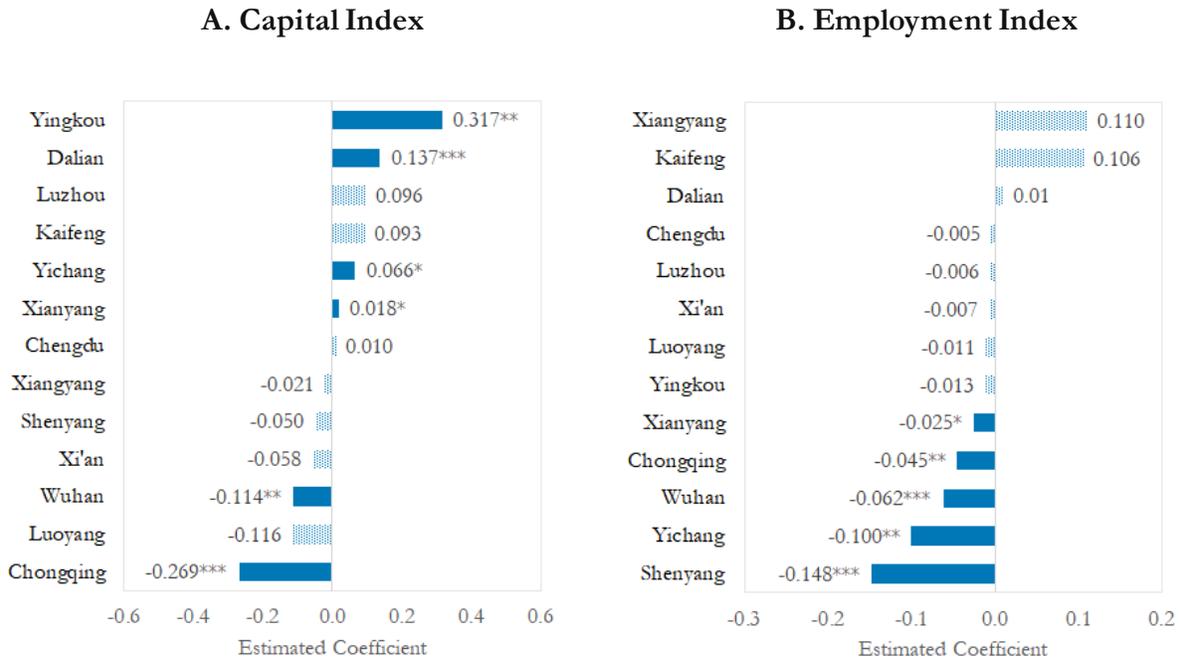
Notes: The two figures show the frequency distribution for the estimated coefficients for the interaction term and their corresponding p-values. Chart A suggests that, among the 500 repeated estimations, 0.02-0.023 are the results appearing most frequently. In other words, in a large majority of cases, the FTZ program increases the growth of firm numbers by 2-2.3 percentage points. Besides, Chart B indicates, in most cases, we are 90% confident to draw a conclusion that FTZs are effective in stimulating entrepreneurship, as evidenced by the large area to the left of the 90% confidence interval, CI, line. But we are 95% confident with FTZs' positive impact in only a few cases, as the area to the left of the 95% CI line is small.

3.2 The Micro Model

The micro models zoom in on the 24 months from April 2016 to March 2018, whose first and second half covers a full year before and after the program, respectively. Based on monthly firm-level data, we examine the impacts of FTZ programs on new private companies' registered capital and the number of employees in each city, excluding Zhengzhou and Zhoushan¹⁵. Therefore, we will run 26 DID regressions in total. The analysis in this section constrains the comparison between FTZ and non-FTZ districts within a city, which were geographically, politically, socially, and economically similar before the implementation of FTZ programs.

If FTZ policies are effective in stimulating entrepreneurship, we expect the firms newly registered in the FTZ districts after the introduction of the pilot programs to have different characteristics (e.g., a higher level of registered capital and a larger number of employees) than those in non-FTZ districts. However, the results are against our hypothesis. We find that, in 15 of the 26 regressions, the estimated effects are not significant (see the light blue bars in Figures 6). In other words, in many pilot cities, the FTZ programs had no impact on new firms.

Figures 6: The impacts of FTZ programs are mixed for different cities



Notes: The bars show the estimated impact of FTZ programs on the reported registered capital and the number of employees of new firms. Dark blue means we are 90% confident that the effect is positive, and light blue suggests FTZ programs had no significant effect. Three, two, and one asterisk(s) mean that we are 99%, 95%,

¹⁵ We have analyzed 13 cities instead of 15. Zhoushan is disregarded in this model because all administrative districts in Zhoushan are FTZ districts and there is no comparison group. Zhengzhou is also not included as the granular data for the city provided by WIND is not complete.

and 90% confident, respectively, with a positive impact. The labeled at the end of each bar represents the percentage change of registered capital or the number of employees due to FTZ programs.

Among cities that have witnessed significant impacts on capital, the influence is mixed. In Yingkou, Dalian, Yichang, and Xiangyang, FTZ policies pushed up new firms' level of registered capital; in Yingkou, the increase is as large as 32.7 percent (Figure 6A). This suggests that the FTZ policies have resulted in bigger business ambitions of entrepreneurs in the four cities. On the contrary, the impacts are negative for Wuhan and Chongqing, lowering new firms' registered capital by 11.4 percent and 26.9 percent, respectively.

In terms of FTZs' impacts on the employment index, the conclusion seems to be simpler: five cities saw a decline in new firms' reported number of employees (Figure 6B). The magnitude varies from 2.5 percent in Xianyang to 14.8 percent in Shenyang. This may suggest that the FTZ policies have discouraged people's entrepreneurship, resulting in the creation of smaller firms that supply fewer employment opportunities. It is worth noting that entrepreneurs in Wuhan and Chongqing, two big Tier-2 cities, had particular negative responses: both capital and employment indices decreased due to FTZ programs.

4. Conclusions and Discussions

4.1 Comments on the Key Findings

We can conclude from the modeling section that FTZ programs have some qualified impacts on entrepreneurship: at the regional level, they have led to a 2.1 pp increase in the growth of firm numbers at the 90% confidence interval; at the firm level, FTZ policies have not led to significant increases in business size. In fact, in some cities, the impact in terms of job creation in newly-registered private firms appears to be negative.

There is a remote chance that the impact of FTZs on individual entrepreneurship has been underestimated since each firm was examined rather than each entrepreneur despite the fact that some entrepreneurs ran multiple companies. However, our model cannot be improved by consolidating company information for individuals because the ID information for entrepreneurs, which identifies each citizen, is not available to researchers.

The surprising results from the regressions on the employment index bring about another conjecture: the significantly negative impact in Xianyang, Chongqing, Wuhan, Yichang, and Shenyang has arisen as a result of the fact that many newly registered companies in the FTZs are zombie firms created to obtain subsidies or avoid taxes but do not participate in business operations and create no job opportunities. In fact, a closer look at the five cities reveals that four of the cities in question

experienced a surge in registrations of companies with either zero or only one employee¹⁶. It is particularly astounding that, in Shenyang, the share of no-employee firms out of newly registered companies more than doubled in April 2017 when the FTZ program was introduced.

Such findings provide a caveat to the interpretation of our macro model. Although many Chinese scholars use the number of company registration as an indicator of entrepreneurship, faster growth of firm numbers in the FTZs may have exaggerated the rise in entrepreneurship and business activity. This is because some companies are registered without any plan to produce goods or provide services. In fact, some local governments have since been alerted to this issue and have introduced new policies to crack down on FTZ zombie firms¹⁷.

4.2 Why Are China's FTZs Not So Effective in Stimulating Entrepreneurship?

There are a number of explanations—some of which are structural problems—for this question. First, the proposed policies, as listed in Table 1, are not fully implemented. There are no publicly available progress reports, either at the local or central government level, about which policies have been rolled out and to what degree they have been executed.

Second, some policy changes are so marginal that they cannot bring substantial changes to the business sector. For example, the two major changes to the latest FDI regulation for FTZs (2020 version)¹⁸ were allowing access to the agricultural industry and investment in Chinese herb medicine. However, agriculture has never been a focal point of FTZs as they are small delimited areas in cities, and there is no space to develop the agricultural sector. Meanwhile, foreign pharmaceutical companies do not have any comparative advantage in Chinese herb medicine, so few of them would be interested in investing in it.

Third, China's overall business environment has deteriorated over the past years, which overwhelms the marginal benefits offered by FTZ policies. The apparent evidence includes but is not limited to stricter capital control, stronger power of state-owned enterprises, and more frequent slap on industries and private firms (e.g., the recent crackdown on the for-profit education industry and tech companies such as Alibaba and Meituan). These are detrimental to entrepreneurship, deterring people from starting up or expanding businesses.

¹⁶ A company with no employees is highly likely a zombie; that with one employee can be either a zombie or a normal small-sized firm.

¹⁷ See for example, *Shanghai FTZ Authorities Made Inquiries with Financial Leasing Company Executives: Shell Companies May be Subject to License Revocation* (in Chinese) by 21st Century Business Herald on May 5, 2015, available at <http://finance.eastmoney.com/a/2015050503356573.html> and Hainan Provincial Governor: Hainan Free Trade Port Shall Never be A Tax Haven And Shell Companies Are Forbidden (in Chinese) by Beijing Youth Daily on June 21, 2021, available at http://k.sina.com.cn/article_1749990115_684ebae3020013vqd.html

¹⁸ See *Special Administrative Measures for Foreign Investment Access in Pilot Free Trade Zones (the Negative List) (2020 version)*, available at <http://www.gov.cn/zhengce/zhengceku/2020-06/24/5521523/files/ce68ccaa3ab445b0abb9f6ddf1b445ba.pdf>

Last, a couple of systematic issues have remained unaddressed. As China's property rights protection is still not strong enough and complete judicial independence is yet to be achieved, some foreign investors are reluctant to enter the Chinese market, including FTZs with some preferable policies.

4.3 Economic Impact Through the Entrepreneurship Channel

Another concern about FTZ initiatives is that the entrepreneurship channel which contributed tremendously to China's economic growth is becoming less effective.

The impact of entrepreneurship on the macroeconomy may be understood with the aid of the production possibility frontier (PPF), a curve illustrating the varying amounts of products that an economy can produce given some finite resources. China was impoverished when the SEZ programs (e.g., Shenzhen and Xiamen) were introduced in the late 1970s and early 1980s. At that time, China's economic development was located deep inside the world PPF, where the allocation of resources was overwhelmingly inefficient. The profit-seeking nature of entrepreneurs pushed up the efficiency of the whole economy, moving the country toward the PPF curve. During this period, the *imitative spirit* of entrepreneurs contributed significantly. The flourishing foreign trade and inward FDI created vast opportunities, and the Chinese firms seized the opportunity to learn from overseas companies and improve their technologies. However, as the country advances, it is required to push the boundary of the PPF to achieve higher growth. In this process, *innovative spirit* plays an even more critical role. Therefore, the Shenzhen story, or Shenzhen speed, is not likely to repeat if there is no continuous innovation across all types of business sectors.

Although neither the local nor central governments of China have released any estimation about the costs of FTZ programs, we expect their overall economic returns to be small over the past few years. The immediate policy implication is that promoting current FTZ initiatives in more cities is probably not worthwhile; instead, the government should consider exploring more fundamental reforms that could address the imperative issues in business sectors.

Appendix

A1. The List of Six FTZ Programs

Program	Tier-1 cities	Tier-2 cities	Tier-3 cities	Tier-4 cities	Tier-5 cities
2013	Shanghai				
2015	Guangzhou, Shenzhen	Fuzhou Tianjin Xiamen Zhuhai			
2017		Chengdu Chongqing Dalian Shenyang Wuhan Xi'an Zhengzhou	Luoyang Xiangyang Xiangyang Yichang Zhoushan	Kaifeng Luzhou Yingkou	
2018			Haikou Sanya		Danzhou Sansha
2019	Beijing Shanghai	Baoding Harbin Jinan Kunming Nanjing Nanning Qingdao Shijiazhuang Suzhou Yantai	Lianyungang Tangshan	Honghe	Chongzuo Dehong Heihe Qinzhou Mudanjiang
2020	Beijing	Changsha Hangzhou Hefei Jinhua Ningbo	Bengbu Wuhu Yueyang	Chenzhou	

Notes: Yicai categorizes Chinese cities into six groups: Tier 1-5 and “New Tier-1”. In line with market practices, we combined Yicai’s “New Tier-1” and “Tier-2” as “Tier-2”.

Source: Yicai and Oxbridge Economics

A2. Policy Documents for the 2017 FTZ Program

- (1) Administrative Measures for the China (Shaanxi) Pilot Free Trade Zone
http://www.shaanxi.gov.cn/xw/sxyw/202104/t20210420_2160383_wap.html
- (2) Administrative Measures for Dalian Area of the China (Liaoning) Pilot Free Trade Zone
http://www.moj.gov.cn/Department/content/2017-12/25/595_210645.html
- (3) Implementation Plan of Shenyang Area of the China (Liaoning) Pilot Free Trade Zone
<http://www.shenyang.gov.cn/html/SY/154700103606935/154700103606955/157362983743086/0360693598886325.html>
- (4) Overall Plan for the China (Zhejiang) Pilot FTZ
http://www.gov.cn/zhengce/content/2017-03/31/content_5182288.htm
- (5) Circular of the State Council on Printing and Issuing the Overall Plan for the China (Hubei) Pilot Free Trade Zone
http://www.gov.cn/zhengce/content/2017-03/31/content_5182299.htm
- (6) Circular of the State Council on Printing and Issuing the Overall Plan for the China (Henan) Pilot Free Trade Zone
http://www.gov.cn/zhengce/content/2017-03/31/content_5182296.htm
- (7) Circular of the State Council on Printing and Issuing the Overall Plan for the China (Chongqing) Pilot Free Trade Zone
http://www.gov.cn/zhengce/content/2017-03/31/content_5182300.htm
- (8) Circular of the State Council on Printing and Issuing the Overall Plan for the China (Sichuan) Pilot Free Trade Zone
http://www.gov.cn/zhengce/content/2017-03/31/content_5182304.htm
- (9) Overall Plan for the China (Liaoning) Pilot FTZ
http://www.gov.cn/zhengce/content/2017-03/31/content_5182284.htm

A3. FTZ and Non-FTZ District in the 2017 Program

Pilot City	FTZ Region	Non-FTZ Region
Chengdu	Qingbaijiang, Shuangliu	Jinjiang, Qingyang, Jinniu, Wuhou, Chenghua, Pidu, Xinjin, Longquanyi, Xindu, Wenjiang
Chongqing	Jiangbei, Shapingba	Yuzhong, Wanzhou, Fuling, Dadukou, Jiulongpo, Nan'an, Qianjiang, Changshou, Jiangjin, Hechuan, Yongchuan, Nanchuan, Beibei, Qijiang, Dazu, Banan, Liangping, Yubei, Bishan, Tongliang, Tongnan, Rongchang, Kaizhou
Dalian	Jinzhou	Zhongshan, Xigang, Shahekou, Ganjingzi, Lvshunkou, Pulandian
Kaifeng	Longting	Gulou, Shunhe, Yuwangtai, Xiangfu
Luoyang	Jianxi	Xigong, Laocheng, Hanhe, Luolong, Yanshi, Mengjin
Luzhou	Longmatan	Jiangyang, Naxi
Shenyang	Sujiatun, Hunnan	Heping, Dadong, Shenhe, Huanggu, Tiexi, Shenbei, Yuhong, Liaozhong
Wuhan	Jiangxia	Jiang'an, Jianghan, Qiaokou, Hanyang, Wuchang, Qingshan, Hannan, Caidian, Huangpi, Xinzhou, Hongshan, Dongxihu
Xi'an	Weiyang, Chang'an	Xinchengqu, Beilin, Lianhu, Baqiao, Yanta, Yanliang, Lintong, Gaoling, Huiyi
Xiangyang	Fancheng	Xiangcheng, Xiangzhou
Xianyang	Weicheng, Yangling	Qindu
Yichang	Wujiagang	Xiling, Dianjun, Xiaoting, Yiling
Yingkou	Xishi	Bayuquan, Zhanqian, Laobian
Zhengzhou	Guancheng, Jinshui	Zhongyuan, Erqi, Jinshui, Shangjie, Huiji
Zhoushan	Dinghai, Putuo, Daishan, Shengsi	

A4. Summary Statistics of the Regional Entrepreneurship Index

		Obs	Mean	S.D.	Min	Max
All districts	Whole period	1,180	0.1247	0.0576	0.0000	0.6440
	Pre-program	708	0.1247	0.0634	0.0295	0.6440
	Post-program	472	0.1248	0.0476	0.0000	0.4938
FTZ districts	Whole period	240	0.1240	0.0645	0.0000	0.6440
	Pre-program	144	0.1160	0.0617	0.0455	0.6440
	Post-program	96	0.1359	0.0670	0.0000	0.4938
Non-FTZ districts	Whole period	940	0.1249	0.0557	0.0000	0.5693
	Pre-program	564	0.1269	0.0637	0.0295	0.5693
	Post-program	376	0.1219	0.0408	0.0000	0.3310

A5. Our Firm-level Database

Our dataset consists of over 1.3 million records¹⁹ of firms registered during 2000-2020 in the pilot cities, with features including (1) company name, (2) legal representative, (3) registration date, (4) registered capital²⁰, (5) number of employees²¹, (6) type of firms (i.e., state-owned enterprises or private firms), (7) industry, (8) city, and (9) administrative district. An excerpt of the database is shown in Appendix A5, and the summary statistics of registered capital and number of employees are listed in Appendix A6. Below is an excerpt of the database.

	comp_name	legal_rep	date	city	district	industry	type	capital	employee
1	咸阳吴轩房地产信息咨询有...	王艺霖	2016/4/27	Xianyang	Weicheng	Business Service Industry	Private	300	3
2	咸阳荣发房地产开发有限公...	杨玉荣	2003/1/13	Xianyang	Weicheng	Real estate industry	Private	1000	13
3	陕西博源管理运营有限公司	鲍远兆	2014/5/7	Xianyang	Qindu	Road transport industry	Private	300	2
4	陕西鑫义荣建筑劳务有限公...	徐黔芬	2017/10/16	Xianyang	Qindu	Business Service Industry	Private	800	2
5	咸阳宏达化工有限公司	李玉文	2009/2/15	Xianyang	Qindu	Wholesale industry	Private	500	6
6	咸阳都卫星网络信息产业有...	杜卫星	2008/6/12	Xianyang	Qindu	Retail	Private	300	5
7	咸阳德胜宝家具有限公司	张彪	2018/8/28	Xianyang	Qindu	Furniture manufacturing	Private	200	2
8	咸阳方圆实业有限公司	刘勇	2007-10-22	Xianyang	Qindu	Real estate industry	SOE	579	72
9	陕西晟伟盈建筑工程有限公司...	王伟	2020/11/16	Xianyang	Weicheng	Civil Engineering Constr...	Private	1000	2
10	陕西一坤博业工贸有限公司	王倩倩	2018/1/31	Xianyang	Weicheng	Retail	Private	500	1
11	咸阳陈良苑园林有限公司	李昭现	2011/7/11	Xianyang	Qindu	forestry	Private	10	3
12	咸阳泰科森出租汽车服务有...	孙媛	2016/11/23	Xianyang	Weicheng	Business Service Industry	Private	300	2
13	咸阳东升物资有限公司	杜腾	2001/6/7	Xianyang	Weicheng	Metal products industry	Private	200	4
14	咸阳市特邦机电设备有限公司...	陈丽霞	2017/7/26	Xianyang	Qindu	General equipment manufa...	Private	30	3
15	咸阳际华投资发展有限公司	梁秦龙	2010-03-23	Xianyang	Weicheng	Resident Service Industry	SOE	200	8
16	咸阳玛戈商贸有限公司	吕伟平	2015/7/6	Xianyang	Weicheng		Private	100	1
17	咸阳市源邦安防工程有限公司	丁巧艳	2013/8/4	Xianyang	Qindu	Wholesale industry	Private	200	5
18	咸阳东美建材有限公司	孙连珠	2014/2/10	Xianyang	Qindu	Building decoration and ...	Private	2000	2
19	咸阳盛通商贸有限公司	李培军	2006/6/21	Xianyang	Qindu	Retail	Private	100	2
20	咸阳恒友广告装饰工程有限...	李恒	2006/5/24	Xianyang	Qindu	Building decoration and ...	Private	300	2
21	陕西秦渭全建设工程有限公司...	杜娟	2020/1/5	Xianyang	Weicheng	Civil Engineering Constr...	Private	1000	7
22	陕西润朗实业有限公司	董博	2016/9/28	Xianyang	Qindu	Professional technical s...	Private	1000	1
23	咸阳亮兴隆商贸有限公司	魏亮	2019/4/10	Xianyang	Qindu	Retail	Private	200	1
24	咸阳八旗商贸有限公司	尹斌	2011/11/3	Xianyang	Qindu	Wholesale industry	Private	1000	10

¹⁹ The database construction needed a considerable amount of manual work. We introduced a few strategies (details available upon request) to make our workload manageable. The approaches saved us more than a month by sacrificing only ~1% of the data.

²⁰ It is subscribed capital instead of paid-up capital.

²¹ The number of employees is self-reported numbers instead of actual.

A6. Summary Statistics of Registered Capital and Number of Employees

		Obs	Mean	S.D.	Min	Max
Registered Capital (10,000 RMB)						
All districts	Whole period	1,344,904	772.7	88,586	0.01	1.00E+08
	Pre-program	621,097	747.7	11,335	0.01	5.00E+06
	Post-program	723,807	794.2	120,296	0.01	1.00E+08
FTZ districts	Whole period	308,026	1148.1	184,309	0.01	1.00E+08
	Pre-program	121,826	844.8	11,029	0.01	2.00E+06
	Post-program	186,200	1,346.6	236,888	0.01	1.00E+08
Non-FTZ districts	Whole period	1,036,878	661.2	9,339	0.01	5.00E+06
	Pre-program	499,271	724.0	11,409	0.01	5.00E+06
	Post-program	537,607	602.8	6,880	0.01	1.68E+06
Number of Employees						
All districts	Whole period	1,064,980	7.6	973	0	1,000,000
	Pre-program	602,572	8.2	113	0	57,580
	Post-program	462,408	6.8	1,471	0	1,000,000
FTZ districts	Whole period	241,416	6.2	70	0	19,236
	Pre-program	118,798	8.4	97	0	19,236
	Post-program	122,618	4.1	21	0	3,575
Non-FTZ districts	Whole period	823,564	8.0	1,106	0	1,000,000
	Pre-program	483,774	8.1	116	0	57,580
	Post-program	339,790	7.8	1,716	0	1,000,000

Source: WIND and Oxbridge Economics

A7. Transformation of Registered Capital and Number of Employees

Registered capital and number of employees are not normally distributed, with very large skewness (see the table below). Since the high outliers are likely to affect the empirical analysis in the next chapter, we take natural logarithms for all numbers. The log transformation has reduced the skewness of the two indicators to nearly zero. Hereafter, the processed indices will be named as the capital index and employment index, respectively. The former ranges from -4.61 to 18.42, with a mean of 4.81, and the latter spans from 0 to 13.82, with a mean of 1.00.

	Registered Capital (10,000 RMB)	Number of Employees	Log of Registered Capital	Log of Number of Employee
1%	3	0	1.10	0
5%	10	1	2.30	0
10%	10	1	2.30	0
25%	50	1	3.91	0
50%	100	2	4.61	0.69
75%	500	5	6.21	1.61
90%	1,000	10	6.91	2.30
95%	2,000	19	7.60	3.00
99%	7,801	71	8.96	4.32
Min	0.01	0	-4.61	0
Max	1.00E+08	1,000,000	18.42	13.82
Obs	1,344,904	1,064,980	1,344,904	1,015,881
Mean	773	7.58	4.81	1.00
S.D.	88,586	973	1.75	1.01
Skewness	1,076	1,020	-0.02	1.36
Kurtosis	1,208,224	1,047,876	3.06	5.63

A8. Modeling Procedure

In our study, the DID modeling process generally follows three steps. In practice, Steps 1 and 2 are sometimes reversed.

Step 1: Common/parallel trend test

It is used to examine whether the experimental and control groups have characteristics of similar trends before the experiment. If yes, we conclude that the two groups are comparable, and therefore, it is valid to use DID regressions to estimate the causal effect of the experiment. The common trend test follows the specification below:

$$Y_{i,t} = \alpha + \sum_{\tau=-k}^h \beta_{\tau} FTZ_{\tau} + v_i + u_t + \epsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is a vector representing entrepreneurship of city/district i at time t . v_i are city/district fixed effects and u_t are time fixed effects. There are k and h periods before and after the experiment, respectively. FTZ_{τ} are relative time to treatment indicators, which are set to 1 for the treatment group if time t is τ years from treatment. The omitted period is $\tau = -1$. The coefficients of interest β_{τ} represent the average change between time τ and the last period before treatment among FTZ group relative to that same change over time among non-FTZ group. Standard errors are clustered at city/district level.

Step 2: Baseline regression

We run the baseline regression to estimate the magnitude of FTZs' impact on entrepreneurship. It follows the specification below:

$$Y_{i,t} = \alpha + \beta Treat_i \times Post_t + v_i + u_t + \epsilon_{i,t} \quad (2)$$

where $Treat_i = 1$ for cities/districts with FTZs and $Post_t = 1$ for post-program periods.

Step 3: Robustness check

Robustness checks may be conducted using alternative samples, alternative specifications, and/or permutation tests.

A9. Estimation Results for the Macro Model

	Coefficient	Robust S.E.	t-stats	p-value
treat*post	0.0205*	0.0114	1.80	0.075

Notes: The regression is based on Equation 2 with city and year fixed effects. The number of observations is 936. The estimated coefficient of the interaction term treat*post is significant at the 90% confidence interval. Standard errors are clustered at the city level.

A10. Estimation Results for the Micro Model

	<u>Registered Capital</u>			<u>Number of Employees</u>		
	Coef	t-stats	Obs	Coef	t-stats	Obs
Chengdu	0.01	(0.15)	23,035	-0.005	(-0.17)	21,860
Chongqing	-0.269***	(-3.91)	68,863	-0.045**	(-2.36)	63,699
Dalian	0.137***	(7.45)	17,217	0.01	(0.88)	14,991
Kaifeng	0.093	(1.61)	2,815	0.106	(1.86)	2,506
Luoyang	-0.116	(-1.61)	12,240	-0.011	(-0.57)	11,990
Luzhou	0.096	(1.40)	5,345	0.096	(1.40)	5,345
Shenyang	-0.05	(-0.44)	40,577	-0.148***	(-4.92)	36,227
Wuhan	-0.114**	(-2.53)	30,976	-0.062***	(-4.04)	28,710
Xi'an	-0.058	(-1.67)	41,599	-0.007	(-0.66)	39,385
Xiangyang	-0.021	(-1.54)	6,766	0.11	(2.52)	6,130
Xianyang	0.018*	(3.45)	3,485	-0.025*	(-3.59)	3,373
Yichang	0.066*	(2.36)	7,651	-0.100**	(-3.70)	6,892
Yingkou	0.317**	(5.14)	4,013	-0.013	(-0.63)	3,423

Notes: All regressions follow Equation 2, with district and month fixed effects. Standard errors are clustered at the city level. Three, two, and one asterisk(s) mean the estimation is significant at 99%, 95%, and 90% confidence levels, respectively.