Industrial Policy and Serial Entrepreneur*

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[Preliminary and incomplete. Please do not circulate.]

Abstract

This paper examines the impact and distortions of industrial policy through the lens of serial entrepreneurship. We find that large-scale industrial policies in China lead to prevalent cross-industry expansion in entrepreneurial activities. Using firm-level data from 1995 to 2020 and a two-period model of serial entrepreneurs' entry, exit, investment, and production, we document two major distortions of industrial policies: First, industrial policies induce inefficient entry of low-ability entrepreneurs; Second, expecting policy changes in the second period, low-ability entrepreneurs do not invest in R&D in the first period. Instead, they simply change industry following policy directions and become consistent policy followers in the second period. On the other hand, high-ability entrepreneurs invest in long-term growth regardless of policy support. This lead to enlarging differences between the two and persistence of entrepreneur type. The theoretical predictions are born out in the data. Our results highlight the critical role of industrial policies in understanding the dynamics of entrepreneurial activities in China. Finally, we find that governments' dynamic screening in the allocation of subsidies is insufficient to correct the distortions, while the competitive procurement contracts are more efficient in achieving the desired outcomes.

Keywords: Industrial Policy, Serial Entrepreneur, Dynamics

JEL Codes:

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1 Introduction

Despite the absence of consensus among academic studies, industrial policies are extensively implemented worldwide and has recently seen a resurfacing in popularity.[1] Among this global upward trend, China stands out due to the significant amount it spends on industrial policy. Even with a cautious approach, China's expenditure on industrial policy is estimated to be amounted to at least 1.73 percent of its GDP in 2019 (DiPippo et al., 2022). Therefore, it is crucial to understand the impact of these large-scale policies while carefully taking into account the potential distortions they may create.

The baby infant argument in support of industrial policies asserts that the new industries need initial fiscal support to emerge and protection against competitive pressures until they mature. However, there is no guarantee that the firms attracted to these industries will thrive, leading to the long-term growth of the industry. The large scale subsidies may create sufficient room for rent seekers to game the market. With the expectation that industrial policies are large-scale yet short lasting, rent seekers have the incentive to enter the market, grab the benefit, exit upon the end of the policy support, and follow the changes in industrial policies to establish new business— a typical kind of serial entrepreneur, or "serial policy follower," widely observed in China's entrepreneurial market. To make the case more concrete and illustrate the potential distortions caused by industrial policies, an entrepreneur named Xueyan Li comes into the stage. Xueyan Li was the founder and owner of Wuhan Hongxin Semiconductor (HSMC), a firm that was found to be a complete fraudulent of government subsidies in the chip industry. Xueyan had no prior experience in the high-tech industry before establishing HSMC. She started her first business in 2004 in the biotechnology industry, and has later operated firms in Chinese medicine, restaurant, investment, alcohol, all followed the directions of industrial policies during those periods of time, but none of those firms succeeded and realized long-term growth. However, upon entering into the chip industry, HSMC obtained huge amount of government support until finally found to be a shell company with no real production capacity of chips. The final failure of Wuhan xxx is not a single case. Actually, hunders firms of the chip industry was found to be shell companies that are unproductive, but they obtained hundreds of billions of fiscal subsidies and government equity injections under the large-scale industrial policies supporting the industry. The failure of Xueyan Li exemplifies the failure of the large scale industrial policies in fostering low-quality serial entrepreneurship: the policies may lack the selection mechanism and attract too many low-quality firms who fail to achieve long-term growth. However, the entrepreneurs of the firms can always chase the direction of new policies and expand business scope accordingly.

[1] See Juhász et al. (2022) for an overview of the global implementation of industrial policy

Studies on entrepreneurship document the advantages of serial entrepreneurs through self-selection in the initial stage and the learning-by-doing mechanism in their subsequent growth. However, both mechanisms may be distorted by the prevalent practice of industrial policies. First of all, the large-scale subsidies may attract entrepreneurs with low entrepreneurial abilities into the market inefficiently. More importantly, expecting policy changes in the subsequent periods, low-ability entrepreneurs do not invest in R&D upon entering the market. However, these R&D investment is essential in promoting long-term productivity growth, especially in the infant industries. Instead, they simply change industry following policy directions and become consistent policy followers in the second period. Policy-induced cross-industry expansions of business scope also disrupts the entrepreneurs' learning-by-doing, which is more effective when the entrepreneurs accumulate experience in the same or closely related industries (Lafontaine and Shaw, 2016). This distortion of serial entrepreneurial activities highlights the dynamic inefficiencies of industrial policies in distorting the entrepreneurs' entry and investment decisions and in eliciting the entrepreneurs' strategic behavior in business expansion. However, the mechanism has been largely overlooked in the literature as exiting studies mostly focus on the policy-targeted sectors alone.

In this paper, we aim to understand the impact of industrial policy on market outcomes through the lens of serial entrepreneurship. This paper addresses two sets of questions. First, how does industrial policy affect the potential entrepreneur's entry, investment, and business expansion decisions? Second, from a dynamic perspective, what are the distortions induced by industrial policies in the entrepreneur's long-term growth?

We leverage three unique data sources for Chinese firms. First, the State Administration for Industry and Commerce (SAIC) maintains the firm registration database which covers the universe of *all* registered firms established in China since 1949. The database contains information on the firm's year of establishment, exit date (if applicable), 4-digit industry classification code, registered capital, equity investment history, annual financial performance, as well as the basic demographic information of the legal representative and main initial shareholders, such as the age, the birthplace, and their shares in the company. Importantly, the database assigns a unique identifier for each entrepreneur so that we can track the entrepreneurial history for each individual and zoom in our empirical analysis to the within-entrepreneur variations in investment and sectoral choices. The availability of such detailed entrepreneur and firm registration data allows us to develop a more comprehensive understanding on the effect of industrial policies on entrepreneurial decisions. Second, the firm annual inspection data provide annual information on firms' assets, liabilities, total sales, profits, and taxes paid. Third, the administrative tax records, which run from 2008 to 2016, provide more detailed firm performance measures, such as TFP, R&D expenditure, perk expenditure, etc. We link these data sources to examine the effect of industrial policies

on firm performances and entrepreneurial activities.

We first document several motivating facts about serial entrepreneurs in China. In principle, serial entrepreneurs could be highly able individuals who successfully accumulates experience and resources, and are thus able to expand the business and achieve long term growth; alternatively, their "advantage" may lie in policies that reduces the barrier to operate multiple firms. If the former, we expect them to be better and, more importantly, grow faster than average; if the latter, we expect the opposite. A prominent feature is the prevalent cross-industry expansion— more than 60% of the serial entrepreneurs establish their second firms in a different industry and the pattern persists when these entrepreneurs expand their business furthermore. Interestingly, we find that these prevalent cross-industry expansion is highly correlated with the changes in industrial policies. Motivated by the finding, we distinguish the firms by policy followers—those established following the directions of industrial policies, and policy leader— those entered market prior to the industry being supported by policies. At entrepreneur level, we define policy followers as the ones who constantly change industries to follow the industrial policies, and leaders who enter and remain in a sector regardless of policies. We further define inconsistent policy followers (leaders) as the ones who only occasionally follow (lead) the policies.

In order to understand the mechanism and consequences of these policy-induced serial entrepreneurship, we then develop a theoretical model of serial entrepreneurship. The model features the dynamic trade-offs for serial entrepreneurs in the scenarios with and without industrial policies. The entrepreneurs are heterogeneous in their abilities, and make entry, investment, R&D decisions in the first period, and business expansion and sectoral choice decisions in the second period. Investing in R&D in the first period is costly but can boost long-run productivity if the entrepreneur stays in the same sector. On the other hand, industrial policies are short lasting and do not support the same sector twice. The model yields several testable hypothesis on the entrepreneurs' behaviors, especially their entry decisions and *heterogeneous* responses to industrial policies. First, industrial policies induce inefficient entry of entrepreneurs with lower productivity, and these low-productivity entrepreneurs do not invest in R&D in the first period. Instead, they simply change industry following policy directions and become consistent policy followers in the second period. On the other hand, the high ability entrepreneurs make long term investment, expand business in the same sector to keep the momentum, and achieve higher growths in TFP over time. This different investment decisions and sectoral choices further intensifies the initial differences in the productivities between the followers and leaders, and lead to persistent differences between the two groups.

We use firm registration and performance data sets to test the model predictions. We observe a stark difference in productivities among firms and entrepreneurs of different types—

policy follower firms and entrepreneurs have lower productivity compared to policy leaders. This difference can be decomposed into two forces: First, policy follower entrepreneurs on average have lower productivity because industrial policies lowered the entry threshold. Second, policy followers and leaders respond differently to industrial policies— followers do not invest in R&D which boosts long-term productivity— and thus endogenously intensifies the difference in productivities between the two types. We provide empirical evidence for both channels.

We first provide supportive evidence that firms in the policy-targeted industries indeed obtain more government subsidies and supports. The empirical analysis start by documenting the differences between policy follower firms and leader firms— the followers have significantly lower productivity compared to the leaders. We then show that the policy follower entrepreneurs induced by the industrial policies are of lower ability by comparing the non-policy relevant firms in the same industrial established by the follower and leader entrepreneurs. Firms established by the follower entrepreneurs still have lower productivities and spend less on long term R&D investment.

Beyond the initial difference in entrepreneurial ability, the model also predicts differences in investment decisions that enlarges the differences, and we further provide empirical evidence for the model prediction. We find that while both followers and leaders obtained more subsidy, followers increase perk expenditure but not R&D investment, while leaders increase R&D investment but not perk expenditure. The differences in investment decision leads to long term differences in the productivities. As R&D investment mainly increase productivity within the same industry, we find that leaders are more likely to expand business in the same industry regardless of policy support, while followers follow the changes in industrial policies to whichever sector that get more government support. The different investment decisions and sectoral choices further enlarges the productivity difference between the two groups and lead to persistent differences in their choices— policy followers are more and more likely to follow the policies while leaders grow in the same sector. In response to the challenges in causal identification, it is worth noting that we do not focus on the correlation between industrial policy and firm/industry performance. The major inefficiency in our study does not come from the fact that subsidies do not boost TFP (although that is part of our findings), but from the inefficient cross-industry expansions that are prominent among the serial entrepreneurs.

Lastly, we extend beyond the scope of the theoretical model and discuss the policy implications of our findings. We investigate the government's response to firm performances in the allocation of subsidies, and examine alternative policy choices. We find that the government is not entirely passive in the allocation of subsidies under industrial policies. However, even with the adjustment of allocation of subsidies based on the entrepreneurs' past performance,

our findings still suggest the distortions are of large magnitude, and policy followers are prevalent among the serial entrepreneurs. These followers lack the motivation to invest in long-term growth and instead become serial policy followers. Consequently, potential policy alternatives should focus on selecting firms of higher quality, which may pose a challenge for the government to directly observe. One potential alternative that stands out is government procurement contracts. This mechanism is selective in nature, relying on self-revelation, and provides higher-quality firms with a greater probability of winning through the competitive auction process. Indeed, we find that policy leaders are more likely to win the contracts, while followers are less likely to do so, and winning the procurement contract leads to higher productivity, more R&D investment and no significant increase in perk expenditure.

Related literature. Our paper primarily contributes to the growing literature and debates on industrial policy. In addition, it also contributes to the literature on serial entrepreneurship and the studies of firm dynamics in China using the registration database.

First, we contribute to the growing literature on industrial policy.[2] There is a large theoretical literature on industrial policy (Baldwin, 1969; Krueger, 1990; Krugman, 1992; Harrison and Rodríguez-Clare, 2010; Itskhoki and Moll, 2019; Lin et al., 2013). The earlier empirical literature on industrial policy mostly focuses on describing what happens to the policy-targeted industries, and most of which find industrial policies had been generally ineffective or counter-productive (Baldwin and Krugman, 1986; Head, 1994; Luzio and Greenstein, 1995; Irwin, 2000; Hansen et al., 2003). More recent literature zoom in to specific settings with a careful identification design to evaluate whether industrial policy elicited the desired behavioral response. These studies produce results that are much more favorable to industrial policy.

Industrial policy in China has been of large scale while evidence for its effectiveness has been mixed at best.[3] Aghion et al. (2015) use firm-level data and find that subsidies and tax holidays promote productivity when directed at more competitive industries; tariffs and loans do not. Barwick et al. (2021), with a dynamic structural model, evaluate different tools of industrial policies in the setting of China's shipbuilding industry and highlight the nuances in policy designs. Branstetter et al. (2023) document negative impact of government subsidies on firms' ex-post productivity growth.[4]

Much of the existing literature focuses on the impact of industrial policy on the target industry. Recent studies recognize the importance of cross-sector linkages, but only study the spillover effect through supply chain networks (Aghion et al., 2015; Lane, 2022; Liu, 2019; Manelici and Pantea, 2021; Juhász et al., 2022; Choi and Levchenko, 2021). Our analysis is

[2]See Juhász et al. (2023) for a comprehensive review.
[3]See estimates of Chinese industrial policy for 2019 by DiPippo et al. (2022).
[4]See Branstetter and Li (2023) for a comprehensive review on studies of China's industrial policies.

complementary to the literature on two fronts: First, we do not focus on a specific industry, but instead aim to provide a holistic view of the policies and analyze their impact across sectors. Secondly, our focus is on the distortions in entrepreneurial activities from a dynamic perspective. We offer a theoretical foundation and present systematic empirical evidence that demonstrates how large-scale industrial policies distort entrepreneurial activities by encouraging low-ability entrepreneurs to expand their businesses across different sectors. These policies not only encourage inefficient entry of low-ability entrepreneurs, but also incentivize these low-ability entrepreneurs to expand business by always following the directions of industrial policies and discourage them from investing in long-term growth within a specific sector.

Second, this paper is also naturally linked to the growing literature on serial entrepreneurship. Existing literature documents the prevalence and importance of serial entrepreneurs in the countries' economy. These studies find that serial entrepreneurs are larger and more productive than non-serials for varying reasons. For example, Rocha et al. (2015); Lafontaine and Shaw (2016) both find that serial entrepreneurial experience facilitates the entrepreneurs' learning by doing and explains a large proportion of their better perormance; (Brandt et al., 2022), using Chinese data, find that serial entrepreneurs are able to overcome financial constraints with internal financing; (Feliz et al., 2021) finds that the entrepreneurs' innate ability explains the serial entrepreneurs' better performance and faster growth.[5] We are the first to examine the influence of industrial policy on the dynamics of serial entrepreneurship using the universe of business registration and performance data. While previous studies have primarily emphasized the significance of serial entrepreneurs in the economy, our focus is on investigating the inefficiencies arising from policy distortions in entrepreneurial activities. In terms of related literature, our work aligns closely with the study by Brandt et al. (2022) on serial entrepreneurs in China. However, there are several key differences. First, they concentrate on distinguishing between serial entrepreneurs and non-serial entrepreneurs, whereas our main focus is on analyzing the dynamics and variations within the group of serial entrepreneurs. Second, our research examines distinct market frictions. According to Brandt et al. (2022), serial entrepreneurs can overcome financing constraints that may hinder entrepreneurial activities in China by using earnings from previous ventures to finance subsequent firms. In contrast, we specifically investigate the impact and distortions of industrial policy on the behavior of serial entrepreneurs. Our analysis aims to understand how the entry, investment, sectoral choice, and long-term growth of serial entrepreneurs are affected by the onset of industrial policies and the expectations of policy changes. Additionally, we explore how these effects differ for entrepreneurs with varying abilities.

[5]See other studies as Westhead and Wright (1998) for the UK; Wagner (2002) for Germany; Hyytinen and Ilmakunnas (2007) for Finland; Amaral et al. (2011), Shaw and Sørensen (2019) for Denmark; Carbonara et al. (2020) for Vietnam.

Our paper also contributes to the broader literature on entrepreneurship. Existing literature focus on the factors that encourage or discourage entrepreneurship, both from individuals' perspective (Hamilton, 2000; Moskowitz and Vissing-Jørgensen, 2002; Jones and Pratap, 2020; Manso, 2016; Catherine, 2022; Bai et al., 2021), or institutional perspective (Holtz-Eakin et al., 1994; Blanchflower and Oswald, 1998; Klapper et al., 2006; Bruhn, 2011; Lee et al., 2011; Branstetter et al., 2014; Gentry and Hubbard, 2000; Barwick et al., 2022). We contribute to the literature in two ways. Firstly, previous studies predominantly argue that there is a lack of entrepreneurial activities and attempt to identify the reasons why individuals are deterred from engaging in entrepreneurship. In contrast, our study investigates the impact of industrial policy, which aims to promote entrepreneurship in specific sectors, and examines the distortions caused by these policies. This approach enables us to not only identify policies that encourage entrepreneurship, but also pinpoint the most effective policies that facilitate high-quality entrepreneurship. Secondly, in addition to examining factors that may stimulate initial entrepreneurship, we focus more on factors that either create or distort incentives for long-term growth of entrepreneurs. Industrial policies, which may attract more entrepreneurs into the market with subsidies, can also distort individuals' incentive in investing in R&D which is important for the entrepreneurs' growth.

Lastly, we add to the recent growing study of firm dynamics and entrepreneurship based on registration data in China (e.g. Brandt et al., 2020, 2022; Barwick et al., 2022; Allen et al., 2019; Fang et al., 2023). Leveraging on the unique entrepreneurial information and firm performance data, we document new empirical regularities of the data— the prevalent cross-industry expansions and its correlations with entrepreneur ability— and study the role of industrial policy in explaining the phenomenon.

The rest of this paper is organized as follows: Section 2 explains our data and the construction of key variables. Section 3 presents several stylized facts of serial entrepreneurs and their connections to industrial policies. Section 4 lays out the model of serial entrepreneurship and derives testable hypotheses. Section 5 examines the impacts of industrial policies on entrepreneurs' entry, investment, and business expansion decisions, which confronts the theoretical predictions. Section 6 extend beyond the scope of the theoretical model and discuss the policy implications of our findings. Section 7 concludes.

2 Datasets

2.1 Industrial Policy

Since its establishment in 1949, Mainland China has issued a total of thirteen national Five-Year Plans (FYP). These plans consist of a series of programs that outline specific de-

velopment guidelines for all regions within the country. Every five years, the central government initiates a national FYP, followed by provincial FYPs issued by provincial governments. These provincial FYPs provide more detailed information on regional developmental goals and industrial plans. While the national FYP provides guidance, the provincial FYPs exhibit variations in their industrial plans based on regional economic conditions. The FYPs are essential for formulating industry-specific five-year plans, which include investment schedules by the provincial government and projects by local leading enterprises. Consequently, the FYP is a crucial indicator of regional industrial policies, guiding the allocation of resources by local governments over the subsequent five-year period.

We obtain data on regional 3-digit industry-level policy support extracted from China's latest 10th to 13th provincial FYPs (covering 2001 to 2020). With a text-based approach, we exhaust manual search of key words to identify industries that receive preferable treatment in each provincial FYP. An industry is identified as a targeted industry if the FYP describe it as: 1) will gain significant support; 2) a leading industry; 3) a industry with strategic importance; 4) an emerging industry of strategic importance; or 5) a pillar industry. Table 1 Panel A shows the distribution of the keywords over the four waves— on average there are 25 out of 103 (or 19%–26%) of three-digit industries that were selected for special treatment by at least one province in the provincial FYPs. Among them, the pharmaceutical industry, the chemical raw materials & chemical products industry, the non- metallic mineral products industry, the food processing and manufacturing industry, the transportation equipment manufacturing industry, and the computer and communication equipment manufacturing industry rank the highest among all industries in terms of the total number of times mentioned. Table 1 Panel B shows the dynamics of policy change over time. We define an industry as new-in if the industry was not coded as preferable industry in the province in the previous wave, and as shift-out if the industry is not coded as preferable industry in the province in the next wave. In each wave and each province, on average, more than 50% of the industries shift in and out in each wave, and for the industries remaining being supported, most of them do not survive more than two waves— suggesting that most industrial policies are relatively short-lasting.

[Table 1 about here.]

The targeted industries receive favorable support from the provincial government in the next five years, including but not limited to discounted industrial land, tax exemption, R&D subsidy, financial support from special fiscal funds, better access to bank financing, fiscal subsidy, government procurement, preferential treatment for small firms, easy approval of patents, etc.[6] The scale of industrial policy is usually large and most of the policies are not

[6] Lee et al. (2014); Aghion et al. (2015); **?** also discuss various instruments to implement industrial policy.

selective. For example, as indicated in the tax data, which will be detailed in section 3, about 50% firms receives some kind of policy subsidy with an average number of 772 thousand RMB. Firms in the policy-targeted industries receive an average of 930 thousand RMB, equivalent to 27% of the total tax paid by these firms. Moreover, about 50% firms receives tax breaks (income or VAT). Firms in the policy-targeted industries receive an average of 291 thousand RMB, equivalent to 12% of the total tax paid by these firms.

2.2 Firm Registration and Entrepreneur Data

The SAIC releases the firm registration database which covers the universe of *all* registered firms—over 200 million in total—established in China since 1949. We focus on the over 30 million firms that were established after 2000, and track their performance until 2020. The firm registration data contains information on the firm's year of establishment, exit date (if applicable), 4-digit industry classification code, amount of registered capital, and the history of ownership changes (if any). Apart from firm registration information, it also provides basic demographic information of the initial main shareholders and legal representatives, such as age, birthplace, and their shares in the company. As each person has a unique identifier, serial entrepreneurs or shareholders in multiple firms can be identified. We define an *entrepreneur* as the largest shareholder of a firm. A burgeoning literature suggests that self-employed individuals may have distinct human capital characteristics than other entrepreneurs (see, e.g.,Schoar, 2010; Hurst and Pugsley, 2011; La Porta and Shleifer, 2014; Levine and Rubinstein, 2017).[7] As such, we follow the recent literature (e.g., Azoulay et al., 2020; Barwick et al., 2022; Brandt et al., 2022) and exclude the self-employed individuals from the sample of entrepreneurs in our baseline analysis. Furthermore, we define a serial entrepreneur as an investor that is or has been defined as the "entrepreneur" for more than one firm. In other words, a serial entrepreneur is an individual that is the largest shareholder, not necessarily concurrently, in at least two firms.

Firm inspection. According to the Chinese government regulation, local SAIC offices require all firms to report their financial information annually for the purposes of an inspection procedure to ensure that firms are operating normally and running businesses legally. Failure to report the information to SAIC for two consecutive years would result in the cancellation of the firm's license to operate. SAIC collected this information manually in the early years of the system, and the government began to collect the data digitally after 2010. The inspection information includes firm's assets, liabilities, total sales, total profit, net profit, and total taxes.

[7] See Levine and Rubinstein (2020) for a detailed discussion on the differences between self-employment and entrepreneurs.

Our SAIC dataset has two unique features. First, it tracks the firm registration and performance for a very long period; second, our firm registration data contains unique identifiers for the main shareholders and legal representatives of each firm, which allows us to trace the entrepreneurial history and extract basic demographic information.

2.3 Administrative Tax Records

To enrich our measure of firm performance, we also use the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT) for the years 2008-2016, covering a representative sample of over 1 million firms from stratified sampling.[8] For tax collection and audit purposes, SAT collects firm-level records of tax payments as well as other financial statement information used in tax-related calculations. The advantages of the tax data are twofold. First, it is representative with wide coverage. As administrative data, it is not subject to the potential measurement error problem of self-reported tax inspection data. As such, we also use this data set to cross-validate our findings from the SAIC inspection data. Second, it contains detailed historical information on a wide array of tax-related information about the firms, including their total production, sales, inputs, employment, etc. This allows us to examine the firms' performance in more dimensions.

2.4 Summary Statistics

Table 2 reports the summary statistics for firm level data. Panel A reports the summary statistics of our firm level registration data. We focus on the firms that are established after 2000. On average, 47% of firms are established by serial entrepreneurs who established at least two firms. Panel B corresponds to firm-level performance data from the administrative tax records. The sample period is 2008-2015.

[Table 2 about here]

3 Industrial Policy and Serial Entrepreneurs: Stylize Facts

In this section, we present several stylized facts of serial entrepreneurs and their connections to industrial policies, which motivate the theoretical model and inform the empirical analysis.

[8] China's SAT is the equivalent of the Internal Revenue Service (IRS) in the US.

3.1 Serial Entrepreneur and Cross-industry Expansion

Figure 6 presents the evolution of entrepreneurship and serial entrepreneurship over time. It highlights the fact that the role of SE firms has gradually increased over time. The fraction of new firms established by serial entrepreneurs increased from 30% in 1995 to 40% in 2020, and the share of new registered capital in SE firms increased from 40% in 1995 to 80% in 2020.

[Figure 6 about here.]

A prominent feature of serial entrepreneurs in China is the prevalent cross-industry expansion. Table 3 columns (1) and (2) present numbers on the evolution of serial entrepreneurs and highlight the importance of cross-industry expansions. Among the 40 million individual entrepreneurs who entered the market between 2000 to 2020, over 7.3 million became serial entrepreneurs and established a second firm[9], and among which 4.5 million (62%) established the second firm in a different 2-digit industry. Furthermore, among the 7.3 million serial entrepreneurs, 2.3 million established a third firm, and among which 1.4 million (62%) are in a new industry without prior experience. As the serial entrepreneurs expand their business by establishing more firms, they also greatly expand their business scope— the fraction of firms that enter a new industry with no prior experience remains high.

[Table 3 about here.]

3.2 Industrial Policy and Firm Dynamics

Why do serial entrepreneurs change industries so frequently? One potential explanation is that industrial policies are short-lasting, and the entrepreneurs closely follow the policy-targeted industries in their investment decisions. In this section, we establish some basic facts on the relationship between industrial policy and the serial entrepreneurs' dynamic response. We are interested in the impact of the industrial policy and new firm entry, especially the entry of new firms established by serial entrepreneurs and those migrating from other industrial sectors.

Our baseline specification employs a simple difference-in-difference (DID) method, and the unit of observation is province-industry-year. The identification relies on the heterogeneity across provinces in the change in industrial policies. The DID specification compares new entries in each province each industry, before versus after the release of each provincial FYP.

[9]This is a lower bound for serial entrepreneurship as we only count the firms where the same entrepreneur serves as the largest shareholder

The baseline specification is

$$Y_{ipt} = \beta Policy_{ipt} + \gamma_i + \delta_t + \eta_p + \epsilon_{ipt} \tag{1}$$

where i is for industry, p for province, and t for year. $Policy_{ipt}$ indicates whether industry i is a policy-targeted industry in province p in year t.

Table 4 reports the regression results estimating eq. (1), and the dependent variables are the number of new firm registrations and the average size of the new firms. The results show that industrial policies are effective in attracting more firms to enter the market. Column (2) shows that becoming a preferred industry in the provincial FYP is associated with an average increase of 6.6% in the number of new firms in each year, and the result is statistically significant at 1% level. Column (3) indicates that the result remains robust by controlling for province-by-year fixed effect. Columns (4)-(6), on the other hand, show that the onset of an industrial policy has no statistically significant effect on the average new firms' size.

[Table 4 about here.]

The key underlying "parallel trend" assumption for the validity of our DID strategy is that, in the absence of industrial policies, industries would have the same trend of new firm registrations. We now provide supporting evidence for this assumption, and also examine the dynamic effect of the industrial policy on firm registrations. We employ the event-study approach and estimate the following augmented regression equation:

$$Y_{ipt} = \beta_0 + \sum_{d=-10}^{10} \beta_{1d} Policy_{ip(t+d)} + \gamma_i + \delta_t + \eta_p + \epsilon_{ipt}, \tag{2}$$

where d represents event year (i.e. the year relative to the starting year of the industrial policy), and all other variables are as defined in Equation (1)

Figure 7 Panel A plots the estimated $\hat{\beta}_{1d}$ with 95% confidence intervals. It shows that, before the onset of industrial policies, industries in the treatment group and in the control group do not have statistically significant differences in the number of new entrances each year. The difference for new entries immediately emerges after the onset of the policy, and the effect is persistent over time, with a slight decrease in magnitude after 5 years.

We then perform the same regression analysis as described above, using policy exit as the treatment variable and the number of firm closures in each province-industry-year cell as the outcome variable. In other words, we compare the number of firm closures before and after the end of the industrial policy (first difference), as well as between targeted industries and other industries (second difference). The estimated $\hat{\beta}_{1d}$ with 95% confidence intervals are plotted in Panel B of Figure 7. The results indicate that the number of firm closures significantly increases after policy exits. This suggests that without the support of

industrial policies, firms in the industry are more likely to exit the market. Additionally, the coefficients before treatment are negative and statistically significant, indicating that the support of industrial policies significantly reduces the probability of firms in the industry exiting the market.

[Figure 7 about here.]

The analysis confirms that industrial policies attract more firm entries, and we then investigate the heterogeneities in the new firms that are responding to the industrial policies. More specifically, we examine whether industrial policies attract more serial entrepreneurs and whether they induce more cross-entry expansions of the serial entrepreneurs. The regression equation is thus specified as

$$Y_{ikpt} = \beta_1 Policy_{ipt} + \beta_2 Type_k + \beta_3 Policy_{ipt} Type_k + \gamma_i + \delta_t + \eta_p + \epsilon_{ikpt} \tag{3}$$

where k indicates the firm's type. Specifically, we consider two firm type indicators: whether the firm is established by a serial entrepreneur, and whether the firm is a "cross-industry expansion" which the entrepreneur has no prior experience in the industry of the firm.

Table 5 Panel A presents the findings of the regression analysis for serial entrepreneurship. It investigates the impact of industrial policy on the number of new firm registrations, distinguishing between those established by serial entrepreneurs and non-serial entrepreneurs. The results indicate that industrial policies encourage the entry of both types of entrepreneurs, with a stronger effect observed for serial entrepreneurs. Panel B focuses specifically on new firms established by serial entrepreneurs and examines the impact on expansion into different industries and within the same industry. The findings suggest that the positive effect on the entry of serial entrepreneurs is primarily driven by expansions into other industries. Specifically, according to Column (3), the number of new firms, on average, increases by 12.8% more annually in response to the industrial policies.

[Table 5 about here.]

3.3 Defining Policy Follower vs. Leader

The findings presented in Section 3.2 indicate that understanding the dynamics of serial entrepreneurs, particularly their inclination to expand into different industries, can be enhanced by examining industrial policies. In China, serial entrepreneurs often adhere to these policies and expand their ventures into industries that are targeted by the policies. However, it is important to note that not all firms in the policy-targeted industries are attracted to the sector solely because of industrial policies. Some of them entered the market

even before the policies were implemented. In this section, we will provide our definition of policy-related firms and entrepreneurs, and differentiate between those who are influenced by industrial policies (referred to as policy followers) and those who entered the market prior to the implementation of such policies (referred to as policy leaders). We will explain how we identify firms and entrepreneurs belonging to each category, and discuss the significance of these policy-related entrepreneurs in terms of their scale.

Policy follower and leader firms First, we define a firm as a policy follower firm, which refers to a firm operating in an industry targeted by a policy and being established *after* the provincial FYP announcement, while the policy is still in effect. On the other hand, a policy leader firm is defined as a firm operating in a policy-targeted industry that entered the market prior to the industry being acknowledged and supported in the provincial FYP. A policy leader firm entered the market without receiving any extra preferential treatment, while a policy follower firm was attracted to the policy-targeted industries with the certain expectation of industrial policy-related subsidies and benefits.

Figure 8 depicts the fraction of firms that operate in a sector where the entrepreneur has previous experience. The figure presents separate results for policy follower and policy leader firms. The findings confirm that policy followers are more inclined to be in an industry where the entrepreneur lacks prior experience. This is because they are attracted to the industry by the industrial policies. Conversely, policy leaders are more likely to remain in the same industry and may even establish multiple firms before the onset of an industrial policy.

[Figure 8 about here.]

Policy follower and leader entrepreneurs It is less obvious how to define policy follower and leader at the entrepreneur level because serial entrepreneurs own multiple firms and those firms can be of different types— they can be established before, or after the industry being chosen as the preferred industries in the FYPs, or they can be established when the policies already exceeded the 5-year support period, or they can be completely policy-irrelevant as well. The goal of the definition is to identify entrepreneurs who constantly follow industrial policies and distinguish them from those who only follow the industrial policies occasionally, as well as from those who constantly lead the policies. Our theoretical model in the next section will also highlight the importance of such distinction.

It is thus beneficial to first understand the evolution of serial entrepreneurs and their relationship to industrial policies. Table 6 tabulates the distribution of policy follower and leader firms by the order of firms for serial entrepreneurs. It describes the distribution of the sectors of the previous firms (row) and their next firms owned by the same entrepreneur (column). Among the 11 million firms owned by the serial entrepreneurs and are not the

last ones, 2.7 million are identified as policy followers and 0.7 million as policy leaders, with the remaining 7.9 million as policy irrelevant ones. The table shows several interesting facts: First, entrepreneurs that establish a policy follower firm are more inclined to change sectors in their next firms. Only 36% of the policy followers establish their next firm in the same sector with the remaining 64% migrate to other sectors, and the ratio is 44% for the leader firms, and 40% for the other ones. Second, policy followers and leaders show strong serial correlations. Among the 2.7 million policy follower firms, 1.27 million (46%) continues to operate another policy follower firm, and the ratio is twice as much as the 24% policy followers in the population of firms. Among the 1.27 million policy follower firms, 0.69 million establish the next firm in the same sector under policy support and 0.58 million migrate to other policy-targeted industries following the direction of the industrial policies, while only 0.28 million stay in the sector after the policies' 5-year effective period and expand the business without policy support. Among the 0.78 million policy leaders, 0.19 million (25%) continue to operate another policy leader firms following the current one, with 0.13 million in the same sector and 0.06 million in another sector. This ratio is 3 times higher than the 6.8% of policy leader firms as in the population average. On the other hand, transitions between followers and leaders are rare. Among the policy followers, only 1.42% become policy leaders in the next firm; and among the policy leaders only 10.88% migrate to other sectors following industrial policies— both ratios are around 1/3 of the population average.

[Table 6 about here.]

Summarizing the numbers into different categories of entrepreneurs, we begin by defining a policy follower (leader) entrepreneur as someone who enters the market by establishing a policy follower (leader) firm. We then differentiate within each type based on their persistence in these roles. Specifically, a consistent policy follower entrepreneur is one who enters the market as a policy follower, exits the sector when the policy support ends, and migrates to other sectors following new policies. On the other hand, an inconsistent policy follower entrepreneur is one who enters the market as a policy follower but remains in the sector regardless of policy support. It is noteworthy that the consistent policy followers always chase industrial policies, while the inconsistent policy followers are attracted to the entrepreneurial market but remain even when the policy exits. The former group represents the distortions of industrial policies while the latter may represent the upside— without the industrial policies, these entrepreneurs may not be able to enter the market and contribute to the flourish of the targeted industries in the long run. Similarly, a consistent policy leader entrepreneur is someone who enters the market as a policy leader and continues to operate and expand their business in the sector. Conversely, an inconsistent policy leader entrepreneur is one who enters the market as a policy leader but later migrates to other sectors.

4 Theoretical Framework

In order to understand the mechanism and consequences of these policy-induced serial entrepreneurship, we develop a simple model in the spirit of **?**Barwick, Chen, Li, and Zhang (2022); and Brandt, Dai, Kambourov, Storesletten, and Zhang (2022). The extant literature focuses on the impact of industrial policy on specific sector—e.g., shipbuilding industry (**?**)—while we aim to provide a holistic view of the policies and analyze their impact across sectors.

4.1 The Setup

In the first period, potential entrepreneurs with different ability θ make entry decisions, and, conditioning on entry, entrepreneurs make capital investment and R&D investment decisions; in the second period, they make decisions about whether to establish a new firm, and if so, which sector to enter. The discounting factor across the two periods is normalized to one and the timeline and details of the events are laid out as follows:

Period 1 An entrepreneur's first-period productivity θ is drawn from a cumulative distribution function (CDF) $G(\cdot)$.

After learning $\theta > 0$, the firm can incur a cost $c > 0$ to enter the sector. If the government announces an industrial policy in period 1, the entry cost reduces to $c_1 < c$. The games ends if an entrepreneur chooses not to enter in the first period.

The firm makes its first-period capital decision $k \geq 0$ and R&D investment decision $a \geq 0$ upon entry. The production function is $y := \theta^{1-\alpha}k^{\alpha}$, with $\alpha \in (0, 1)$. The entrepreneur earns flow profits $\pi := \theta^{1-\alpha}k^{\alpha} - r_1 k - h(a)$, where $r_1 > 0$ is the unit cost of capital in period 1 and $h(a)$ is a strictly increasing convex function with $h'(0) = 0$. We assume if there is an industrial policy, the cost function of R&D becomes $h_1(a)$, which is also a strictly increasing convex function with $h'(0) = 0$, but $h_1'(a) < h'(a)$ for all $a > 0$. The costly R&D investment $a \geq 0$ has no impact on the firm's period-1 productivity and will increase its period-2 productivity as described below.

Period 2 With an exogenous probability $\gamma \in (0, 1)$, the first firm, if established, goes bankrupt and yields zero payoff to the entrepreneur. With complementary probability $1-\gamma$, the first firm survives. For simplicity, we assume that firms in the second period make only capital decision but not R&D decision. Specifically, the firm's period-2 productivity is $\theta + a$ and it generates flow profits of $\pi' = (\theta + a)^{1-\alpha}(k')^{\alpha} - r_2 k'$, where k' is the entrepreneur's second-period capital investment on the first firm and r_2 is the unit cost of capital in period

2. We assume that government announces an industrial policy on a different sector in period 2.

Meanwhile, the entrepreneur draws second-period productivity θ_s and θ_d independently from CDF $F_s(\cdot;\theta)$ and $F_d(\cdot)$ for the same sector and the different sector received government subsidy respectively, and the joint distribution of (θ_s, θ_d) conditional on θ is $F(\theta_s, \theta_d; \theta)$. We assume $F_s(\cdot;\theta_1)$ first order stochastically dominates (FOSD) $F_s(\cdot;\theta_2)$ if $\theta_1 > \theta_2$. The entrepreneur decides to whether to establish a new firm, and if so, which sector to enter based on the information from (θ_s, θ_d). If he establishes a second firm in the *same* sector, he incurs an entry cost of c and the productivity of the second firm is $\rho_s(\theta + a) + \theta_s$, where $\rho_s > 0$ captures the technological *spillover* of the first firm. If he establishes a second firm in a *different* sector that receives subsidy, he incurs a entry cost of $c_2 < c$, and the productivity of the firm is $\rho_d\theta + \theta_d$, and $\rho_d < \rho_s$. The entrepreneur decides the capital investment of the second firm and it generates the same form of flow profits.

In what follows, we analyze how an entrepreneur's decisions—namely, decisions on firm establishment, R&D investment, and capital investment—depend on their first-period productivity θ.

4.2 Analysis

In this section, we begin our analysis at the case that there is no subsidy in period 1.

Entrepreneur's Optimal Investment Decisions Fixing Productivity Fixing firm's productivity as θ and the capital price as r, the firm chooses its capital investment k to solve the following maximizing problem

$$\max_{k\geq 0} \theta^{1-\alpha}(k)^{\alpha} - rk,$$

from which we solve for the firm's investment level as

$$k^*(\theta, a) = \left(\frac{\alpha}{r}\right)^{\frac{1}{1-\alpha}} \theta; \tag{4}$$

and the associated profits are given by

$$\pi^* = \tau\theta, \text{ where } \tau := \left(\frac{\alpha}{r}\right)^{\frac{\alpha}{1-\alpha}} - r\left(\frac{\alpha}{r}\right)^{\frac{1}{1-\alpha}}.$$

Therefore, the first firm's profit in period 1, which we denote by π_1, is $\pi_1(\theta) = \tau_1\theta$, where τ_i comes from inserting the capital price r_i of period i into the definition of τ. The first firm in period 2 generates profit $\pi_{12}(\theta, a) = \tau_2(\theta + a)$.

We claim some notations first. We denote $\pi_s(\theta, a; \theta_s) = \tau_2(\rho_s(\theta+a)+\theta_s)-c$ as the profits of the second firm in the same sector in period 2, and the profits from the second firm in the different sector is $\pi_d(\theta; \theta_d) = \tau_2(\rho_d\theta+\theta_d)-c_2$. $P(\theta, a)$ is the probability of establishing a new firm in period 2 if the entrepreneur with (θ, a) survives in period 2, and $P_s(\theta, a)$, $P_d(\theta, a)$ is the probability of entering the same sector and the different sector respectively, conditional on establishing a new firm, and $P_s(\theta, a) + P_d(\theta, a) = 1$.

We state some properties about π_s and π_d. $\pi_s(\theta, a; \theta_s)$ is increasing on $(\theta, a; \theta_s)$, and $\pi_d(\theta; \theta_d)$ is increasing on (θ, θ_d). $\pi_s(\theta, a; \theta_s)$ is supermodular on $(\theta, a; \theta_s)$ and $\pi_d(\theta; \theta_d)$ has increasing differences on $(\theta; \theta_d)$. $\pi_s(\theta, a; \theta_s) - \pi_d(\theta; \theta_d)$ is increasing on (θ, a).

Lemma 1 *Fixing $(\theta, a; \theta_d)$, if entrepreneurs with θ_{s0} chooses to establish a new firm in the same sector, any entrepreneur with $\theta_s > \theta_{s0}$ does so. Fixing (θ, a), if entrepreneurs with $(\theta_{s1}, \theta_{d1})$ chooses to establish a new firm, any entrepreneur with $\theta_s > \theta_{s1}, \theta_d > \theta_{d1}$ does so.*

The first result of Lemma 1 implies that there exists a function[10] $\theta_s^\dagger(\theta_d; \theta, a)$ that is increasing on θ_d, and any entrepreneur with (θ, a) would choose to establish a new firm in the same sector if and only if $\theta_s \geq \theta_s^\dagger(\theta_d; \theta, a)$. The second implies the existence of function $\underline{\theta_s}(\theta_d; \theta, a) \leq \theta_s^\dagger(\theta_d; \theta, a)$, which is decreasing on θ_d, and any entrepreneur with (θ, a) would choose to establish a new firm if and only if $\theta_s \geq \underline{\theta_s}(\theta_d; \theta, a)$, and establishes it in the different sector that receives subsidy if and only if $\underline{\theta_s}(\theta_d; \theta, a) \leq \theta_s < \theta_s^\dagger(\theta_d; \theta, a)$. The optimal period-2 decision is demonstrated in Figure 1 for some (θ, a).

By the definitions above, $P(\theta, a) = P(\theta_s \geq \underline{\theta_s}|\theta, a)$, and $P_s(\theta, a) = P(\theta_s \geq \theta_s^\dagger|\theta, a)/P(\theta, a)$ if $P(\theta, a) > 0$. For simplicity, we define that $P_s(\theta, a) = 0$ and $P_d(\theta, a) = 1$ if $P(\theta, a) = 0$.

[Figure 1 about here.]

Lemma 2 *$P(\theta, a)$ is increasing on (θ, a). $P_s(\theta, a)$ is increasing on a, and $P(\theta, a)P_s(\theta, a)$, which is the unconditional probability of staying in the same sector, is increasing on (θ, a). $P(\theta, a)P_d(\theta, a)$, the unconditional probability of entering the subsidized sector, is decreasing on a.*

Lemma 3 *If $f(x, y)$, $g(x, y) : \mathbb{R}^2 \to \mathbb{R}^2$ has increasing differences on (x, y), and $f(x, y)$, $g(x, y)$ and $f(x, y) - g(x, y)$ are increasing on (x, y), then $M(x, y) := \max\{f(x, y), g(x, y)\}$ has increasing differences on (x, y).*

Lemma 4 *Fixing (θ_s, θ_d), $\pi_2(\theta, a; \theta_s, \theta_d)$ has increasing differences on (θ, a), where $\pi_2(\theta, a; \theta_s, \theta_d) = \max\{0, \pi_s(\theta, a; \theta_s), \pi_d(\theta; \theta_d)\}$ denotes the maximized profit generated by the second firm es-*

[10] $\theta_s^\dagger(\theta_d; \theta, a)$ might be $+\infty$ in some circumstances.

tablishment decision if the entrepreneur with productivity θ and chooses R&D intensity a in period 1.

Corollary 5 *$\pi_2(\theta, a; \theta_s, \theta_d)$ is supermodular on $(\theta, a; \theta_s)$.*

Lemma 6 *$E\pi_2(\theta, a)$ has increasing difference on (θ, a).*

Proposition 7 *Conditional on entering in period 1, the optimal R&D level $a^*(\theta)$, $P(\theta, a^*(\theta))$ and $P(\theta, a^*(\theta))P_s(\theta, a^*(\theta))$ are increasing on θ,. There exists a threshold $\underline{\theta} \geq 0$, and for all $\theta \geq \underline{\theta}$, the entrepreneur enters in period 1, and keeps out if $\theta < \underline{\theta}$.*

For simplicity, we denote $P^*(\theta) = P(\theta, a^*(\theta))$, $P_s^*(\theta) = P_s(\theta, a^*(\theta))$, and $P_d^*(\theta) = P_d(\theta, a^*(\theta))$.

Assumption 1 $P_s^*(\theta)$ is increasing on θ, and $P_d^*(\theta) = 1 - P_s^*(\theta)$ is decreasing on θ, if $\theta > \underline{\theta}$.

For the simplicity for illustrating Assumption 1, we assume that $P_s(\theta, a)$ is differentiable at all (θ, a) and $a^*(\theta)$ is also differentiable at all θ. Taking derivative of $P_s^*(\theta)$ yields

$$\frac{\mathrm{d}P_s^*(\theta)}{\mathrm{d}\theta} = \frac{\partial P_s(\theta, a^*(\theta))}{\partial \theta} + \frac{\partial P_s(\theta, a^*(\theta))}{\partial a} \cdot \frac{\mathrm{d}a^*(\theta)}{\mathrm{d}\theta}.$$

There are two effects of an increase on θ. An increase on θ increases the entry probability in period 2, and the extra entry consists of entering the same sector and the different sector, which causes the ambiguity on the direction of changes on the conditional probability of entering the same sector. However, an increase on θ also causes an increase on R&D intensity, which leads to a higher conditional probability of entering the same sector by Lemma 2 and Proposition 7 for certain. The assumption requires that the second effect overwhelms the first when it is negative, which could be interpreted as that R&D is not too costly.

Proposition 8 *If Assumption 1 holds, entrepreneurs staying in the same sector have a higher average productivity θ in period 1, R&D intensity a, and capital investment k, than those enter the different sector that receives subsidy.*

Moving forwards, we analyze the equilibrium when there is subsidy in period 1.

We use subscript p to distinct the corresponding variables in the model in which there is an industrial policy in period 1.

Assumption 2 $P^*_{sp}(\theta)$ is increasing on θ, and $P^*_{dp}(\theta) = 1 - P^*_{sp}(\theta)$ is decreasing on θ, if $\theta > \underline{\theta}_p$.

It is worth noticing that the industrial policy only decreases the entry cost c in period 1 and the marginal cost of R&D investment $h'(a)$. Conditional on entering in period 1, the maximization problem is

$$\max_{a\geq 0} \Pi_p(\theta, a) = \max_{a\geq 0} \pi_1(\theta) - h_1(a) - c_1 + (1-\gamma)(\pi_{12}(\theta, a) + \mathrm{E}\pi_2(\theta, a)). \tag{5}$$

Therefore, when there is an industrial policy in period 1, the equilibrium have the same properties as in the model where there is no such a policy.

Proposition 9 *Industrial policy stimulates entry, R&D investment, capital investment in period 2, and causes more entrepreneurs staying in the same sector in period 2. Specifically, we have following inequalities*[11]*:*

$$\underline{\theta}_p \leq \underline{\theta},\ a^*_p(\theta) \geq a^*(\theta), k^*(\theta, a^*_p(\theta)) \geq k^*(\theta, a^*(\theta)),$$
$$P^*_p(\theta) \geq P^*(\theta),\ P^*_{sp}(\theta) \geq P^*_s(\theta), \text{and } P^*_p(\theta)P^*_{dp}(\theta) \leq P^*(\theta)P^*_d(\theta).$$

The following graphs illustrate the comparison of equilibrium R&D intensity, ex-ante profit, unconditional and conditional probability in period 2.[12]

[Figure 2-5 about here.]

Assumption 3 $n(\theta) = \frac{P^*_p(\theta)P^*_{dp}(\theta)}{P^*(\theta)}$ is decreasing on θ, if $\theta > \underline{\theta}$.

Intuitively, industrial policy do not affect the establishment decision by decreasing the entry cost in period 1. It encourages entrepreneurs to establish a new firm in the same sector by stimulates R&D investment, which only affects the firms in the same sector. Industrial policy shrinks the area in (θ_s, θ_d) of entering the different sector, for any given type θ. However, The increase of θ shifts the distribution of θ_s, which might cause the area that entering the different sector to have a higher probability. Assumption 3 assumes that the first effect of increase on θ, which shrinks the area, overwhelms the second effect that puts higher

[11] These results are independent to Assumption 1 and Assumption 2.

[12] $\alpha = 0.6, r_1 = r_2 = 0.5, \rho_s = 0.7, \rho_d = 0.4, c = 6, c_1 = c_2 = 3, \gamma = 0.2, h(a) = 0.01a^2, h_1(a) = 0.065a^2$ and $G(\cdot)$, $F_s(\cdot)$ and $F_d(\cdot)$ are all uniform distribution with support $[0, 10]$.

probability on this area. We point out that Assumption 3 holds if $F_s(\cdot;\theta)$ is independent to θ since the second effect vanishes in this circumstance.

Proposition 10 *If Assumption 1 to Assumption 3 hold, the equilibrium average productivity θ and the period-1 capital investment $k^*(\theta, 0)$ of entrepreneurs who stay in the same sector in period 2 when there is no subsidy in period 1, is higher than those who enter the subsidized sector in period 2 when there is subsidy in period 1.*

5 Empirical Results

In this section, we turn to the performance data for the period 2008-2016 and show that the key theoretical predictions of the model developed in Section 4 are consistent with the empirical facts in China.

5.1 Theoretical Predictions Summarized

It is convenient to first summarize the theoretical predictions of our model. The model yields testable predictions on the effect of industrial policies on entrepreneurs' entry and investment decisions, as well as their decisions for the sectoral choice of the second firm. Hence, We summarize these predictions as follows,

- *Theoretical Prediction A (Entry distortion):* Industrial policies induce the entry of entrepreneurs with lower productivity.
- *Theoretical Prediction B (Ability ranking):* The average productivities of the entrepreneurs are ranked by the following order: Consistent policy leader > inconsistent policy leader > inconsistent policy follower > consistent policy follower.
- *Theoretical Prediction C (First firm performance):* Industrial policy increases the investment of policy leaders and inconsistent policy followers, but has no effect on the investment of consistent policy followers.
- *Theoretical Prediction D (Cross-industry expansion):* Policy followers are more likely to change industry and become consistent policy followers, compared to policy leaders.
- *Theoretical Prediction E (Serial correlation):* Consistent policy leaders and inconsistent policy followers exhibit a greater serial correlation in their firms' productivity, compared to consistent policy followers.

5.2 Industrial Policy Tools

First, before testing theoretical predictions, we verify the validity of our industrial policy measure. There are two commonly used measures for industrial policy in the literature. The first measure is the targeted industries in the government documents such as the FYPs (Barwick et al., 2021; Wu et al., 2019), and the second is the de facto measure based on micro-level firm data— whether firms in an industry get more government subsidies or tax benefits (Aghion et al., 2015; Liu, 2019). As detailed in Section 2.1, we adopt the first approach and measure industry policies at the province-industry-year level from the provincial FYPs. In this subsection, we examine the correlation of the two measures.

To more carefully quantify the scale of subsidies under industrial policies, we run the following two sets of regressions:

$$Y_{ijpt} = Policy_{jpt} + X_{it} + \gamma_j + \delta_t + \eta_p + \epsilon_{ijpt} \tag{6}$$

where i is for firm, j for industry, p for province, and t for year. $Policy_{jpt}$ indicates whether industry j is the policy-targeted industry in province p in year t. We control for a set of firm characteristics and fixed effects. We start with the specification without controlling for firm FE because the policy-followers enter the market after the policy becomes effective, and thus have no variations in the policy indicator. Therefore, controlling for firm FE only captures the policy effects on the policy leader firms.

Table 7 shows that firms in the targeted industries indeed get more government subsidy and tax break, and enjoys lower interest rate and lower effective tax rate, affirming the validity of our measures of industrial policies based on the FYPs.

[Table 7 about here.]

5.3 Entry Distortion

The theoretical model predicts heterogeneities in productivities among firms and serial entrepreneurs of different types— policy follower firms and entrepreneurs have lower productivity compared to policy leaders. This difference can be decomposed into two forces: First, policy follower entrepreneurs on average have lower productivity because industrial policies lowered the entry threshold. Second, policy followers and leaders respond differently to industrial policies, and thus endogenously intensifies the difference in productivities between the two types. We provide empirical evidence for both channels.

The first model hypothesis on entry distortion predicts that industrial policy attracts entrepreneurs with low productivities to enter the market. The distortion is twofold: First, entry subsidy directly subsidize the low-productivity entrepreneurs who would otherwise

incur a net loss. Second, the option of changing sectors to follow the policies improves the profitability prospects of the entrepreneurs in the second period, also creating extra incentive for the entrepreneurs to enter the market even with low productivity draws.

Table 8 compares the performance of policy follower firms that entered the market after the policy announcement, and the leader firms that entered before. We control for a full set of firm characteristics— quadratic trend of firm age, firm size, the total numebr of firms owned by the entrepreneur and the order of the firm— that are documented to be correlated with firm TFP. We also control for province by industry by year fixed effects to absorb the unobserved aggregate shocks, especially the effect of industrial policies. The comparison is between follower and leader firms in the same industry, same province, and same year, thus the variation mainly comes from the entrepreneurs' entry decisions— the follower firms entered the market when the policies are effective and the leader firms entered the market without any policy support. Column (1) shows that policy follower firms on average have lower TFP by 1.1 percentage point and that leader firms have higher TFP by 1.1 percentage point, comparing to the policy irrelevant ones. The result confirms that industrial policies indeed boost the entry of firms of lower productivities. As for the other control variables, firms on average performs better when the entrepreneurs have more firms, confirming the advantage of serial entrepreneurs. Controlling for the number of firms held by an entrepreneur, TFP decreases as the order of the firm increases, suggesting that the initial entry into the market incurs significant cost and thus selects on the entrepreneurs at the right of the distribution. Moreover, firm TFP decreases with firm age and increases with firm size. We then examine other measures of firm performance. Previous analysis confirms that policy followers indeed get more government subsidy and enjoys lower effective tax rate. However, columns (2) and (3) indicate that the money is very likely wasted on perk expenditure instead of increasing R&D expenditure. Policy follower firms have higher fraction of perk expenditure by 3.6 percentage points and lower fraction of R&D expenditure by 3.9 percentage points. The contrary is true for policy leaders— they have lower fraction of perk expenditure by 8.7 percentage points and lower fraction of R&D expenditure by 3.5 percentage points.

[Table 8 about here.]

The second model hypothesis on ability ranking predicts that the entrepreneurs with the highest productivity enter the market, stay, and expand regardless of the industrial policies (consistent policy leader), followed by the ones who enter the market without policy support but area later on attract away (inconsistent policy leader), followed by the ones who enter the market following industrial policies but stay regardless of policy exit (inconsistent policy follower), and the lowest productivity group being the ones who enter the market following

industrial policies and migrate to other sectors following the changes in industrial policies (consistent policy follower).

We test model predictions on the *entrepreneurs'* ability ranking. The entrepreneurs' ability is the persistent component of the firms owned by the same entrepreneur. Thus, the comparison of entrepreneur ability is different from the comparison of firm productivity, which is affected by policies, the entrepreneurs' previous investment decisions, and sectoral choices. The average productivity of firms in the sector is determined by the entry threshold of firms' productivity which is a composite of entrepreneurs' ability and the sector-specific endogenous firm productivity distributions.

In order to tease out the policy effects and test the entrepreneurs' ability ranking, we only examine the subsample of firms in the non-policy targeted industries that are owned by different types of entrepreneurs. To capture the heterogeneities between consistent and inconsistent policy follower (leader) entrepreneurs, we use a continuous variable measuring the fraction of policy follower (leader) firms owned by the follower (leader) entrepreneurs— the higher the fraction, the more likely the entrepreneur is of the consistent type. Table 9 reports the regression results. Non-policy-targeted firms owned by policy-follower entrepreneurs have lower TFP, and spends more money on perk and less on R%D activities, while the contrary is true for non-policy-targeted firms owned by policy-leader entrepreneurs. The negative effect becomes stronger as the fraction of policy follower firms increases, i.e. when the entrepreneur is more of a consistent type rather than inconsistent type; and the positive effect is attenuated as the fraction of policy follower firms increases, i.e. when the entrepreneur is more of a consistent type rather than inconsistent type. This comparison confirms the theoretical predictions on the entrepreneurs' ability ranking, and suggests that entrepreneurs who constantly follow industrial policies have lower entrepreneurial ability compared to the ones who leads industrial policies, regardless of whether the firm is in the target industry or not.

[Table 9 about here.]

5.4 Heterogeneous Firm Performance Response

The second channel for the difference between followers and leaders asserts that policy followers and leaders respond differently to industrial policies, and thus endogenously intensifies the difference in productivity between the two types. Comparing the first firm of the policy followers and leaders, policy followers on average have lower initial productivities, thus more inclined to change sectors following the direction of industrial policies. The expectation of migrating to other sectors discourages the entrepreneur from investing in R&D in the first sector. Without investment in R&D, the low productivity persists, and the follower

entrepreneurs will continue to rely on the subsidy from industrial policies in their subsequent sectoral choices. This results in serial correlation in the relatively lower productivity and in the decision to establish policy-follower firms. On the other hand, policy leaders on average have higher initial productivity, therefore they are more inclined to invest in R&D, boost productivity, and stay in the same sector. This results in higher productivity of the second firm, and thus the second firm is also incentivized to invest in R&D and remain in the same sector.

In this subsection, we provide evidence for the heterogeneous response to industrial policies by policy followers and leaders. Table 10 reports the results regressing the firm performance measures on the policy indicator (taking value 1 when the industrial policy is effective for firms in the province-industry-year cell), the follower firm indicator, the interaction of the two, and a set of firm characteristics controlling for province-by-industry-by-year and county fixed effects. The results show that firms following the target industries on average have a lower TFP, spend more on perk expenditures, and less on R&D. Column (1) indicates that firms currently supported by industrial policies on average have a higher TFP, but the effect is reversed if the firm is established following an industrial policy. Column (2) indicates that firms currently supported by industrial policies on average have higher perk expenditures and this result is mainly driven by the firms that follow the policies. Column (3) indicates that firms currently supported by industrial policies on average spend more on R&D, however the effect is null for firms that follow the policies. Overall, the positive effect of industrial policies is mainly driven by the policy leader firms, and the effect turns null or even negative for the policy follower firms.

[Table 10 about here.]

All regressions above focus on the cross-firm and cross-entrepreneur variations. Table 11 employs a simple difference-in-difference approach to examine the effect of industrial policy on firm performance. The results suggest that most of our previous results remain robust after controlling for firm fixed effect.

[Table 11 about here.]

5.5 Sectoral Choice & persistence

As a result of distorted entry and investment decisions influenced by industrial policies, entrepreneurs' subsequent choices of sectors are also impacted. According to the fourth model hypothesis, it is more likely for policy followers, compared to policy leaders, to change sectors in their second firm. Specifically, policy followers are more inclined to align with changes in industrial policies and consistently follow them, while policy leaders are more

likely to remain in the same sector and consistently lead. Similarly, policy leaders have a higher likelihood of remaining in the same sector and being consistent leaders, compared to policy followers who may stay in the same sector after policy exits. This is because there is a stronger correlation in productivity within the same sector, as opposed to across different industries. Consequently, entrepreneurs with higher productivity are encouraged to stay in the sector in order to maintain their superior performance. Moreover, the difference in the investment decisions between followers and leaders further intensifies the productivity difference and reinforces the sectoral choice— followers do not invest in R&D and change sectors more often, while leaders invest more in R&D and are incentivized to stay in the same sector to enjoy the benefit of the R&D investment.

Table 13 provides suggestive evidence that remaining in the same sector is associated with higher productivity, more R&D investment, and less waste on perk expenditure. A firm performs better in TFP, spends less on perk expenditures, but more on R&D if it is in the same industry as the previous one held by the same entrepreneur.

[Table 13 about here.]

The result naturally extends to predictions on the persistence in the entrepreneurs' sectoral choice decisions. Comparing the first firm of the policy followers and leaders, policy followers on average have lower initial productivities, thus more inclined to change sectors following the direction of industrial policies. Without investment in R&D in neither sector, the low productivity persists, and the follower entrepreneurs will remain relying on the subsidy from industrial policies in their later on sectoral choices. This results in serial correlation in the decision to establish policy follower firms. On the other hand, policy leaders on average have higher initial productivities, thus more inclined to invest in R&D, boost the productivity, and stay in the same sector. This results in higher productivity of the second firm, and thus the second firm is also incentivized to invest in R&D and remain in the same sector.

Figure 9 plots the probability that the next firm is a policy follower/leader firm conditional on whether the current firm is a policy follower/leader firm. The graph indicates that the policy follower and the policy leader are very persistent. The next firm is more likely to be policy-follower if the current firm is policy-follower, and the next firm is more likely to be policy-leader if the current firm is policy-leader

[Figure 9 about here.]

In Table **??** columns (1) and (2), we report results from a simple linear probability model. In column (1), the dependent variable is a dummy variable indicating whether the firm was established before the industrial policy being announced, and in column (2) the dependent

variable indicates whether the firm was established following an industrial policy. The results show a stark difference between follower firms and leader firms. A firm is more likely to be a follower firm if its precedent is a follower, but less likely if its precedent is a leader. The converse is true for leader firms. To insure that the persistence of follower and leader firms is not driven mechanically by entrepreneurs establishing more firms in the same industry, we further restrict to the subsample of cross-industry expansions defined at both 1-digit industry level and 2-digit industry level. The finding of the serial correlation of firm type remains robust, though smaller in magnitude. Moreover, as for the other control variables, leader firms are more likely to be concurrent, i.e. the firm is more likely to be established when the previous firm held by the same entrepreneur is still in operation. Leader firms are more likely to be in the same industry as its predecessor, while follower firms are more likely to be in different industries. This is consistent with our previous finding that industrial policies attract more cross-industry expansions.

[**??** about here.]

6 Policy Implications and Further Discussions

The analysis so far has highlighted the distortions of industrial policies in shaping the serial entrepreneur's entry, investment, and sectoral choice decisions, abstracting away from the government's role in policy choices. In this section, we extend beyond the scope of the theoretical model and discuss the policy implications of our findings. We investigate the government's response to firm performances in the allocation of subsidies, and examine alternative policy choices.

6.1 Government Dynamic Screening

There is substantial evidence that industrial policies can lead to distortions in entrepreneurial activities. This raises the question of whether governments are taking any steps to address these distortions. If the government is capable of identifying and selecting high-performing entrepreneurs and if entrepreneurial abilities can be developed over time, we would expect to see a separating equilibrium emerge. In this equilibrium, it would become increasingly difficult for low-ability entrepreneurs to obtain subsidies by merely following the prescribed policies and switching between sectors.

We investigate the factors that influence government subsidies. Specifically, we regress the subsidy received by firms on a set of firm characteristics and entrepreneur characteristics. The results of the regression analysis are presented in Table 14. In column (1), we include province, industry, and year fixed effects to control for aggregate shocks. This allows us to

examine the average differences across firms. The results indicate that serial entrepreneurs tend to receive higher government subsidies. The subsidy amount increases with the number of firms owned by the entrepreneur and the order of the firm. Conversely, the subsidy decreases when the entrepreneur has closed previous firms. Specifically, each additional closed firm is associated with a 5.3% decrease in subsidies for the entrepreneur's other firms. These findings suggest that government subsidies may be allocated based on the quality of the entrepreneur, as entrepreneurs who have experienced more failures tend to receive fewer subsidies. In column (2), we include entrepreneur fixed effects to focus on within-entrepreneur variations. We also introduce an interaction term between the order of the firm and the entrepreneur's type (leader or follower). The results reveal interesting differences between leader and follower entrepreneurs. Policy leader entrepreneurs are more likely to receive government subsidies as they expand their business. This is indicated by the positive and statistically significant coefficient of the interaction term between the order of the firm and the indicator variable for leader entrepreneurs. On the other hand, the interaction term between the order of the firm and the indicator variable for follower entrepreneurs is negative and statistically significant, suggesting that policy follower entrepreneurs face increasing difficulty in obtaining subsidies as they progress in their business ventures.

In addition, column (3) exclusively focuses on the sample of leader entrepreneurs, while column (4) solely analyzes the sample of follower entrepreneurs. The findings indicate that the observed "order effect" is primarily influenced by the leader (follower) firms owned by these leader (follower) entrepreneurs. The results suggest that the greater number of policy leader firms established by an entrepreneur, the higher the likelihood of receiving government subsidies. Conversely, for policy followers, a higher number of follower firms is associated with lower subsidies.

[Table 14 about here.]

In summary, empirical evidence suggests that the government is not entirely passive in the allocation of subsidies under industrial policies. However, even with the adjustment of allocation of subsidies based on the entrepreneurs' past performance, our previous findings still suggest the distortions are of large magnitude, and policy followers are prevalent among the serial entrepreneurs.

6.2 Government Procurement as Alternative Policy Tool

Lastly, we examine whether alternative government tools can be more successful in achieving the objectives of industrial policy. Our findings so far indicate that industrial policies that offer the same benefits to all participants lead to inefficient entry of policy followers.

These followers lack the motivation to invest in long-term growth and instead become serial policy followers. Conversely, we demonstrate that industrial policies can be advantageous for "good" entrepreneurs (policy leaders in our context) as they encourage increased R&D investment and enhance productivity. However, general industrial policies are ineffective in identifying high-performing entrepreneurs, particularly in the early stages. Consequently, potential policy alternatives should focus on selecting firms of higher quality, which may pose a challenge for the government to directly observe. One potential alternative that stands out is government procurement contracts. This mechanism is selective in nature, relying on self-revelation, and provides higher-quality firms with a greater probability of winning through the competitive auction process.

Table 15 examines the determinants of the allocations of government procurement contracts. We regress the procurement contract dummy on the policy indicator (taking value 1 when the industrial policy is effective for firms in the province-industry-year cell), the leader firm indicator, the follower firm indicator, and a set of firm characteristics controlling for province-by-industry-by-year and county fixed effects. The results suggest that the government allocates procurement contracts to the policy-targeted industries by 0.17 percentage points more (around 0.5 standard deviation of the outcome variable). Moreover, policy leaders have higher chances of winning a procurement contract while policy followers are less likely to do so. The magnitude of the effect is around 1-2 standard deviation of the outcome variable.

[Table 15 about here.]

We further examine the impact of government procurement contracts on firm performance. We employ a simple difference-in-difference specification, with winning the contract being the treatment controlling for firm and province by industry by year fixed effects. The identification relies on the heterogeneity across firms in the same province and the same year in the probability of acquiring the contract, and compares the firm performance before and after acquiring the contract. Table 16 reports the regression results. It shows that, in contrast to the mixed results of industrial policies, winning a government procurement contract leads to significantly higher TFP (by 4.7 percentage points) and significantly higher R&D expenditure (by 24.6%), but insignificant increase in the firms' perk expenditure.

[Table 16 about here.]

7 Conclusion

In this paper, we aim to understand the impact of industrial policy on market outcomes through the lens of serial entrepreneurship. Leveraging on the unique entrepreneurial infor-

mation and firm performance data, we document new empirical regularities of the dynamics of entrepreneurship in China— serial entrepreneurship is characterized by prevalent cross-industry expansions and the expansion is highly correlated with the directions of industrial policies. We build a two-period model of serial entrepreneurs' entry, exit, investment, and production, The model highlights two major distortions of industrial policies: First, industrial policies induce inefficient entry of low-ability entrepreneurs; Second, expecting policy changes in the second period, low-ability entrepreneurs do not invest in R&D, which is essential in promoting long-term productivity growth, in the first period. Instead, they simply change industry following policy directions and become consistent policy followers in the second period. On the other hand, high-ability entrepreneurs invest in long-term growth regardless of policy support. The different investment decisions and sectoral choices further enlarges the productivity difference between the two groups and lead to persistent differences in their choices— policy followers are more and more likely to follow the policies while leaders grow in the same sector. The theoretical predictions are borne out by the data.

Extending beyond the scope of the theoretical model, we find that the government is not entirely passive in the allocation of subsidies under industrial policies. However, even with the adjustment of allocation of subsidies based on the entrepreneurs' past performance, our findings still suggest the distortions are of large magnitude, and serial policy followers are prevalent. Consequently, potential policy alternatives should focus on the more selective and competitive mechanisms that induces self-revelation.

Our study highlights the critical role of industrial policies in shaping the dynamics of entrepreneurial activities in China. In order to fully understand the benefit and costs of industrial policies, it is important to take a more holistic view and examine the dynamics of serial entrepreneurship across different industries.

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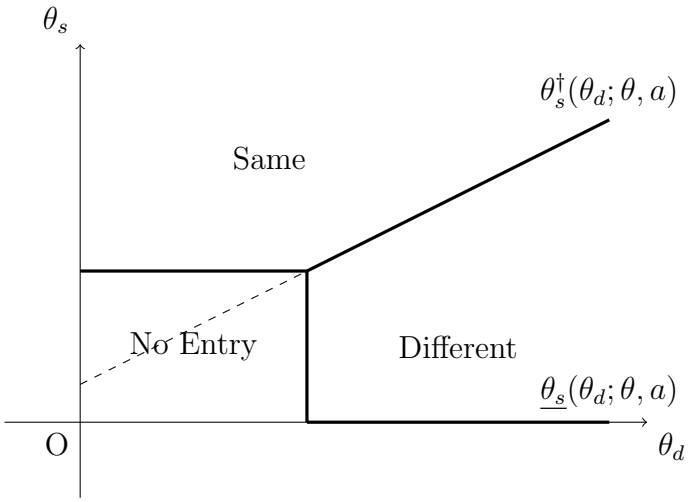


Figure 1: Period-2 Decision for some (θ, a)

Figure 2: R&D Intensity

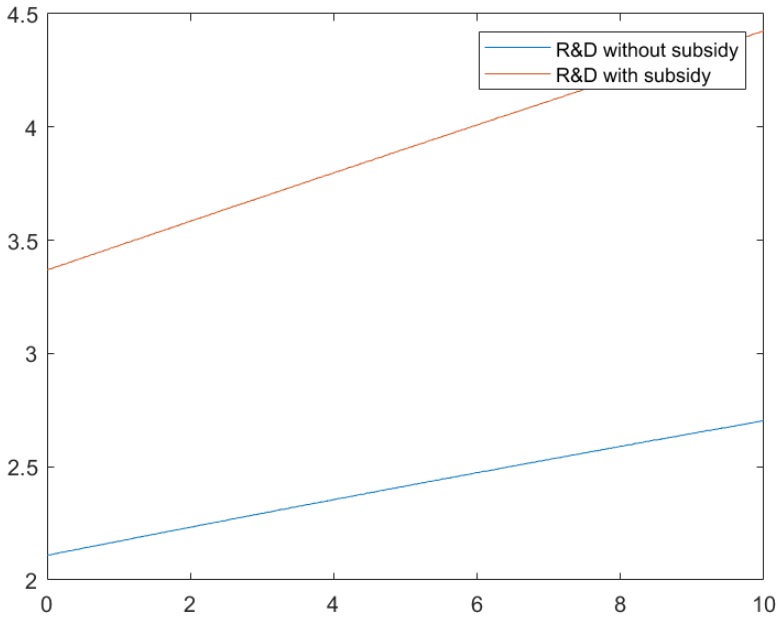


Figure 3: Ex-ante Profit and Entry Threshold

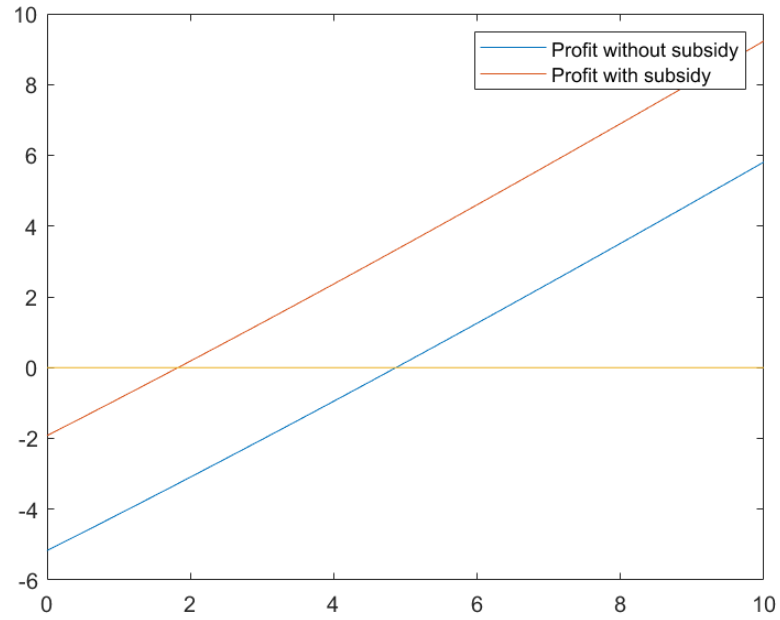


Figure 4: Unconditional Probability

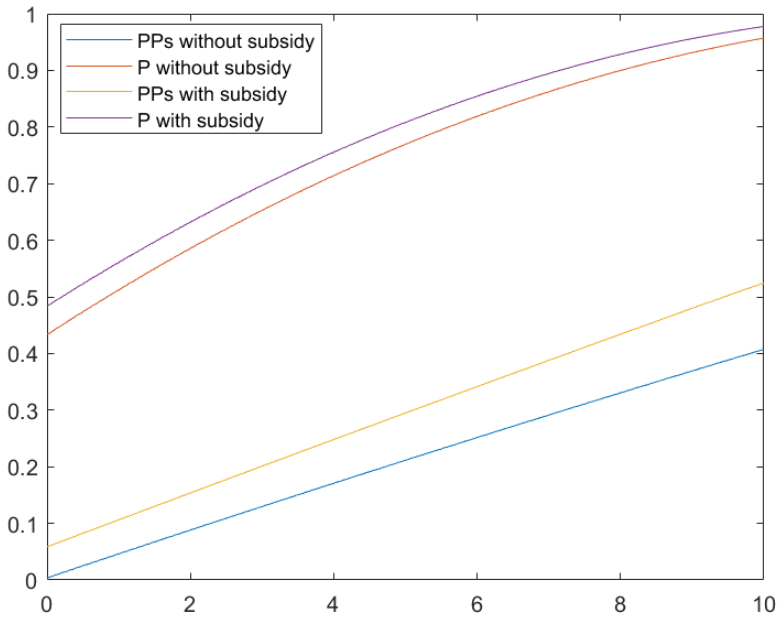
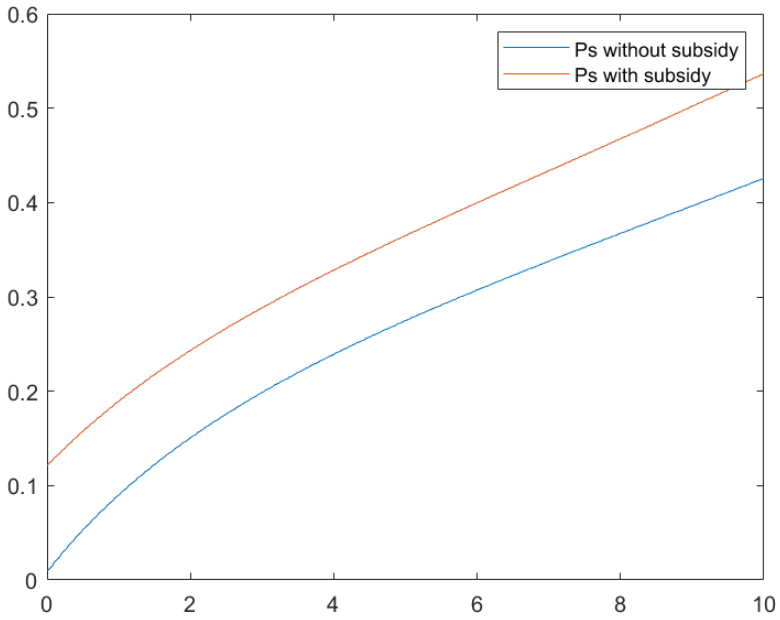


Figure 5: Conditional Probability



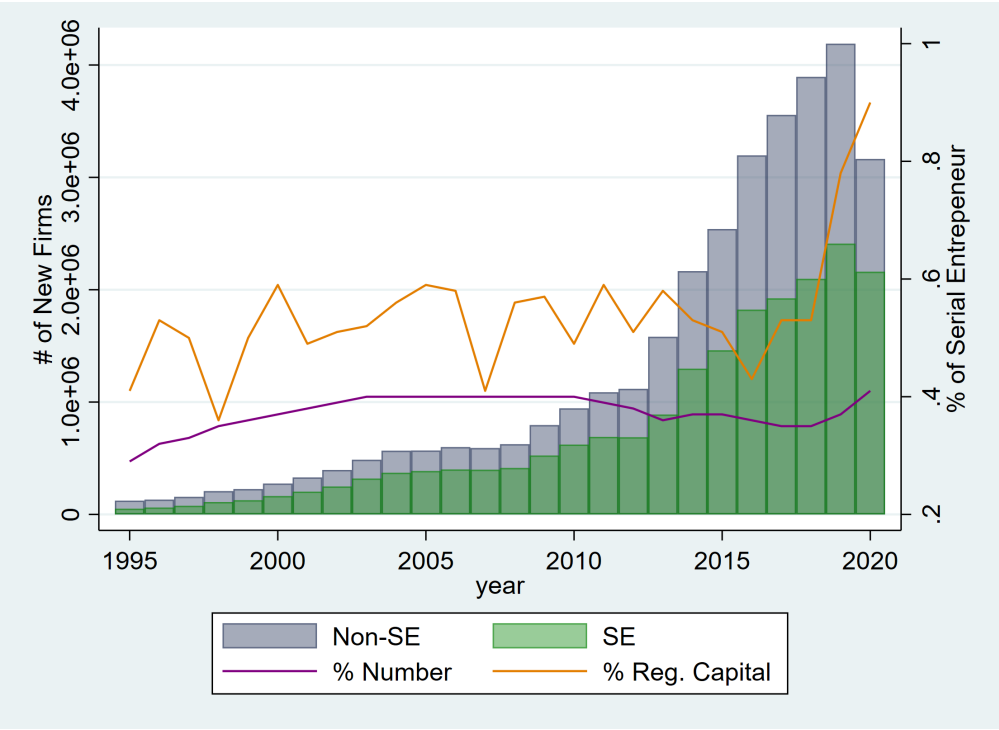
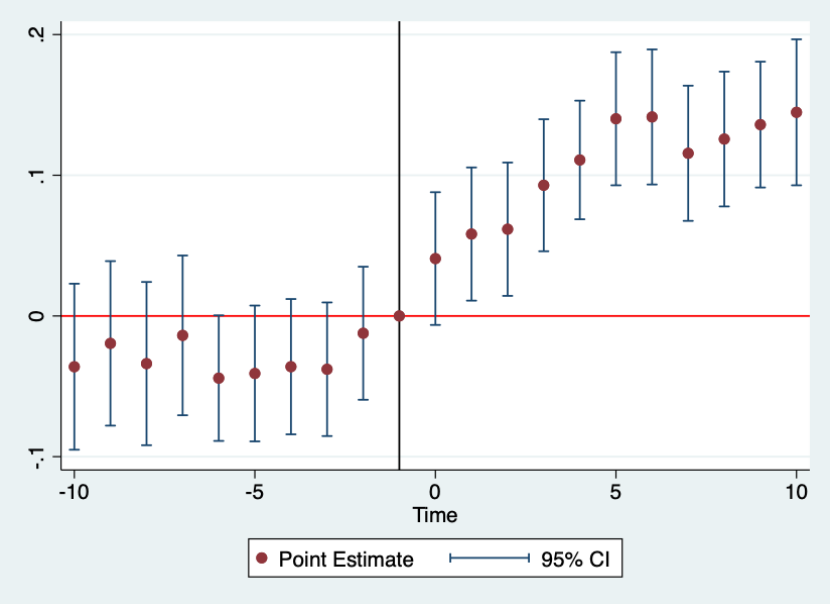
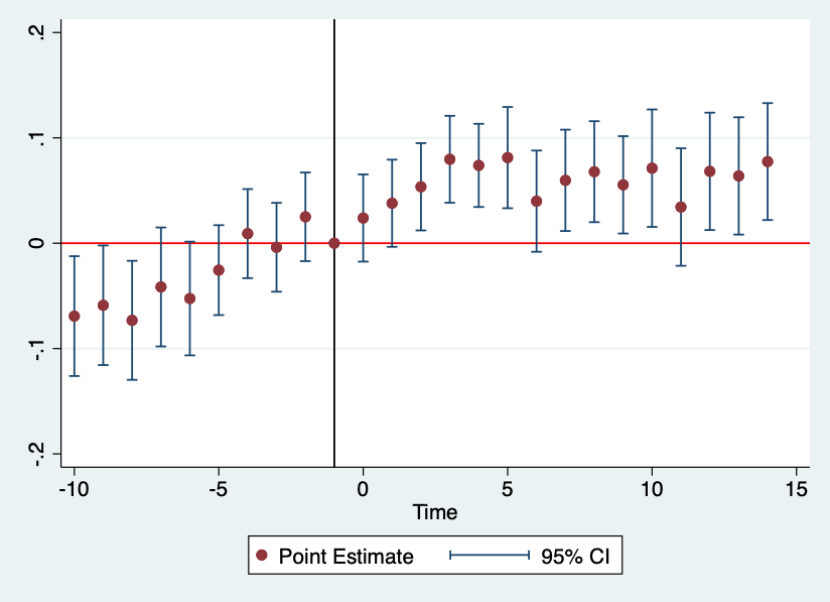


Figure 6: Evolution of Serial Entrepreneur



(a) Entry



(b) Exit

Figure 7: DID Event Study

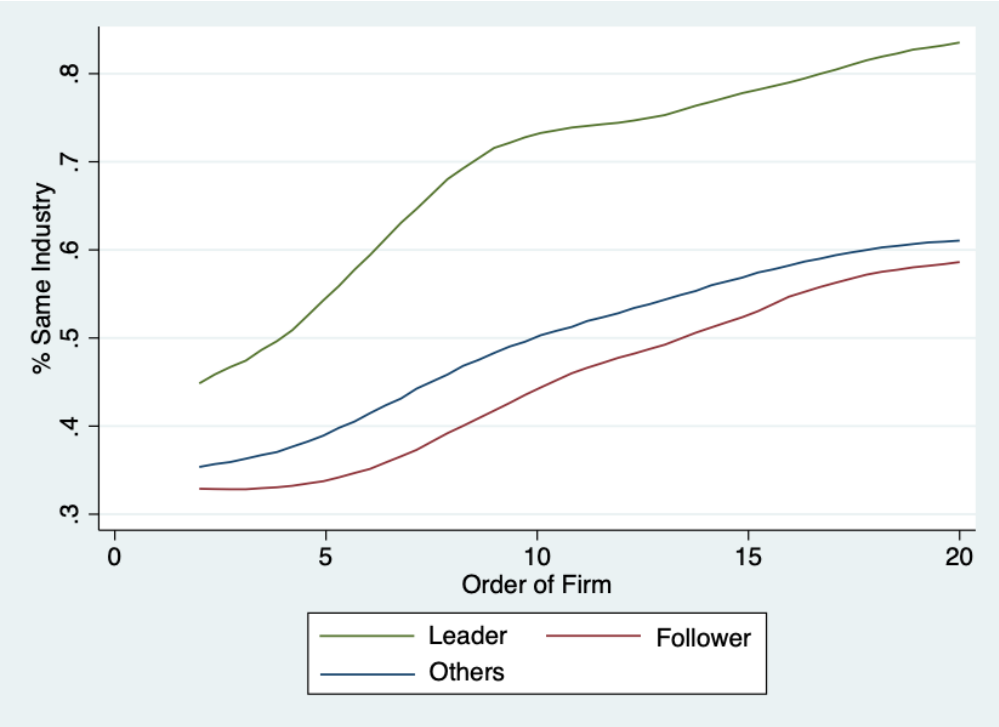
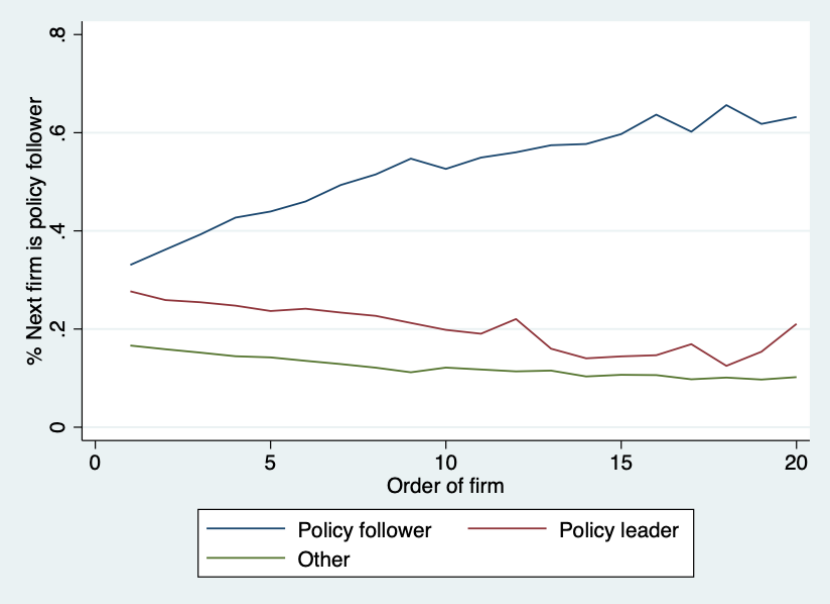
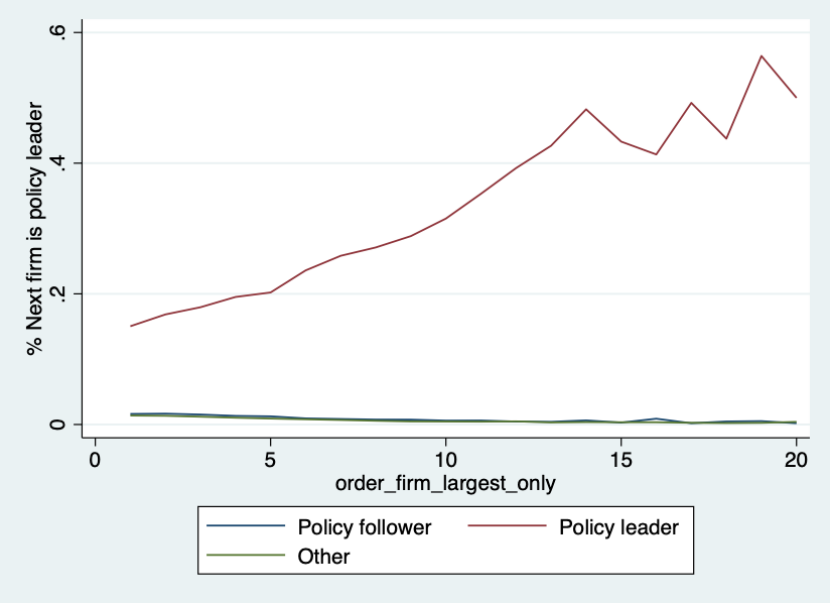


Figure 8: Cross industry expansion



(a) Follower



(b) Leader

Figure 9: Serial Correlation

Table 1: Industrial Policy from Provincial Five-Year Plans

	2001-2005	2006-2010	2011-2015	2016-2020
Panel A: Keywords				
Significant supoort	0.18	0.22	0.11	0.11
Leading industry	0.02	0.02	0.02	0.02
Leading industry of strategic importance	0.01	0.01	0.00	0.00
New industry of strategic importance	0.03	0.01	0.08	0.07
Pillar industry	0.09	0.07	0.08	0.02
Overall	0.21	0.26	0.22	0.19
Panel B: Policy Change				
New-in	0.57	0.53	0.65	0.56
Shift-out	0.53	0.65	0.56	-

Note: This table presents the summary statistics for industrial policy measures from provincial FYPs. Panel A reports the distribution of keywors for industrial policies. Panel B reports the change in the targeted industries over time.

Table 2: Descriptive Statistics for Firm- and City-Level Data

Variable	Obs	Mean	Std. Dev.	Min	Max
Panel A: Firm Registration Data (Firm level)					
log(Registered capital)	51,756,323	4.58	1.80	-13.82	23.29
Serial entrepreneur	51,756,219	0.47	0.50	0	1
Panel B: Administrative Tax Record (Firm level)					
Revenue	3,621,017	78694.91	244735.90	0	1817725
Profit	4,618,047	4653.08	24626.40	-37252	186481
Value-added	3,083,790	13604.84	47663.77	-2524	359855
TFP	2,247,299	0.00	1.16	-16.75	9.75
Employment	4,623,514	120.71	273.14	1	1901
Average wage	4,358,318	0.07	0.11	0.00	0.77
Panel C: Firm Registration (City-year level)					
# of New firms	8,879	3404.42	9776.48	0	277347
GDP	8,416	1255.88	2525.81	0.06	38700.58
pop	7,870	391.70	304.30	0.02	3416.29

Note: This table presents the summary statistics for firm level and city level data. Panel A reports the summary statistics of our firm level registration data. We focus on the firms that are established after 1995. Panel B corresponds to firm-level performance data from the administrative tax records. The sample period is 2008-2015. Panel C corresponds to the city-year level variables aggregated from the firm-registration data. Panel D corresponds to the city-year level variables aggregated from the census data.

Table 3: Follower & Cross Industry Expansion

Order	(1) Total	(2) Different Industry	(3) Follower	(4) Leader
1	39,967,360		9,147,188	2,262,050
2	7,307,130	4,477,384	1,616,098	265,572
3	2,264,437	1,406,020	497,940	64,607
4	927,632	563,243	204,887	21,790
5	453,022	263,291	100,304	9,106
6	238,988	136,802	52,854	4,337
7	141,661	77,342	31,144	2,329
8	90,973	46,872	20,057	1,381
9	62,243	29,968	13,629	854
10	44,770	20,394	9,707	586

Note: This table presents the statistics for the evolution of serial entrepreneurs and the number of policy follower firms and policy leader firms.

Table 4: Industrial Policy and Firm Entry

	Log(# of New Firms)			Log(Average Registered Capital)		
	(1)	(2)	(3)	(4)	(5)	(6)
Policy	0.250***	0.0660***	0.0687***	-0.0201*	0.0108	0.00131
	(0.0199)	(0.0150)	(0.0152)	(0.0119)	(0.0108)	(0.0110)
Constant	4.348***	4.392***	4.391***	6.011***	6.003***	6.006***
	(0.00944)	(0.00694)	(0.00694)	(0.00566)	(0.00500)	(0.00500)
Province FE	Yes	Yes	No	Yes	Yes	No
Year FE	Yes	Yes	No	Yes	Yes	No
Province*Year FE	No	No	Yes	No	No	Yes
Industry FE	No	Yes	Yes	No	Yes	Yes
Observations	56,111	56,111	56,111	56,111	56,111	56,111
R-squared	0.182	0.565	0.576	0.076	0.290	0.308

Note: This table reports the results of estimating Equation (1). The unit of observation is province-industry-year, and the data sample covers the period between 1995 to 2020. Column (1) - (3) report the regression results for the number of new firms, and Column (4) and (6) report the regression results for the average of new firms' registered capital. Standard errors are clustered at the province level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 5: Industrial Policy and Firm Entry

	(1)	(2)	(3)
Panel A: Serial Entrepreneur			
SE	-0.374***	-0.374***	-0.374***
	(0.00828)	(0.00477)	(0.00425)
Policy	0.129***	0.0890***	0.0408***
	(0.0173)	(0.0118)	(0.0108)
Policy*SE	0.0314	0.0314**	0.0314***
	(0.0231)	(0.0133)	(0.0119)
Constant	3.780***	3.785***	3.791***
	(0.00590)	(0.00349)	(0.00313)
Observations	70,544	70,544	70,544
R-squared	0.751	0.922	0.938
Panel B: Cross-industry Expansion			
Diff. Ind.	1.419***	1.419***	1.419***
	(0.00809)	(0.00512)	(0.00475)
Policy	0.0398**	0.0211*	-0.0188
	(0.0169)	(0.0127)	(0.0121)
Policy*Diff. Ind.	0.128***	0.128***	0.128***
	(0.0226)	(0.0143)	(0.0133)
Constant	1.834***	1.837***	1.842***
	(0.00577)	(0.00375)	(0.00350)
Observations	70,544	70,544	70,544
R-squared	0.746	0.904	0.918
Province FE	Yes	No	No
Industry FE	Yes	No	No
Year FE	Yes	No	No
Province*Ind FE	No	No	Yes
Province*Year FE	No	Yes	Yes
Ind*Year FE	No	Yes	Yes

Note: This table reports the results of estimating Equation (3). The unit of observation is province-industry-firm type-year, and the data sample covers the period between 1995 to 2020. Panel A reports the regression results for the number of new firms, distinguishing firm types of serial entrepreneurs or non-serial entrepreneurs. Panel B reports the regression results for the number of new firms, distinguishing firm types of cross-industry new registration, or same-industry new registration. Standard errors are clustered at the province level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 6: Evolution of Policy Followers and Leaders

	Same Industry			Different Industry			Total
	Follower	Leader	Others	Follower	Leader	Others	
L. Follower	693,480	0	287,082	575,421	39,109	1,155,710	2,750,802
	25.21%	0.00%	10.44%	20.92%	1.42%	42.01%	
L. Leader	104,336	133,471	108,845	84,827	59,396	288,733	779,608
	13.38%	17.12%	13.96%	10.88%	7.62%	37.04%	
Others	23,191	0	3,173,564	1,040,068	108,246	3,533,655	7,878,724
	0.29%	0.00%	40.28%	13.20%	1.37%	44.85%	
Total	821,007	133,471	3,569,491	1,700,316	206,751	4,978,098	11,409,134
	7.20%	1.17%	31.29%	14.90%	1.81%	43.63%	

Note: This table tabulates the distribution of policy follower and leader firms by the order of firms for serial entrepreneurs. It describes the distribution of the sectors of the previous firms (row) and their next firms owned by the same entrepreneur (column).

Table 7: Industrial Policy & Policy Tools

	Subsidy	Tax break	Interest rate	CIT
	(1)	(2)	(3)	(4)
Policy	0.0452***	0.0895***	-0.0102***	-0.0177***
	(0.00790)	(0.00455)	(0.00176)	(0.00451)
Log(Reg. Cap.)	-0.00521	0.0204	0.00424	-0.0310
	(0.00647)	(0.0171)	(0.0107)	(0.0267)
Age	0.00240	0.00153	-0.00307	0.00319
	(0.00157)	(0.00450)	(0.00262)	(0.00709)
age^2	-0.000187***	-7.71e-05***	-1.37e-04***	-2.61e-07
	(1.02e-05)	(2.82e-05)	(1.81e-05)	(4.45e-05)
SE	-0.00498	-0.0210	0.0316	0.0351
	(0.0228)	(0.0618)	(0.0370)	(0.0980)
Constant	0.135***	0.379***	0.152**	0.234***
	(0.0354)	(0.0959)	(0.0612)	(0.0151)
Prov*Ind*Year FE	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes
Observations	2,292,169	1,150,868	1,383,536	1,135,562
R-squared	0.591	0.467	0.509	0.511

Note: This table reports the results of estimating Equation (6). The unit of observation is firm-year. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 8: Industrial Policy, Follower and Leader

	TFP	% Perk	% R&D
	(1)	(2)	(3)
Follower firm	-0.0112***	0.0357***	-0.0391***
	(0.00347)	(0.0130)	(0.0117)
Leader firm	0.0114***	-0.0872**	0.0347
	(0.00385)	(0.0356)	(0.0324)
# of Firms	0.0104***	0.0163***	0.0139***
	(0.000827)	(0.00342)	(0.00313)
Order of firm	-0.0120***	0.00357	0.00049
	(0.00167)	(0.00636)	0.00578
Age	-0.00426***	-0.0649***	0.00139
	(0.000410)	(0.00343)	(0.00319)
Age$\hat{2}$	-0.000215***	0.00290***	0.00083***
	(1.46e-05)	(0.00028)	(0.00026)
log(Reg. Cap.)	0.0895***	0.0426***	0.0915***
	(0.000552)	(0.00219)	(0.0020)
Constant	-0.555***	0.826***	-0.162***
	(0.00408)	(0.0163)	(0.0149)
Prov*Ind*Year FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Observations	1,528,515	1,601,265	1,231,854
R-squared	0.143	0.044	0.108

Note: This table compares the performance of policy follower firms that entered the market after the policy announcement, and the leader firms that entered before. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 9: Non-Policy Firms Owned by Follower and Leader Entrepreneurs

	TFP	% Perk Expenditure	% R&D Expenditure
Follower entrepreneur	-0.00875***	0.0394***	-0.0159
	(0.00139)	(0.0143)	(0.0120)
Follower entrepreneur * % Follower	-0.00133**	0.00385***	-0.00231***
	(0.00521)	(0.00109)	(0.00035)
Leader entrepreneur	0.00520***	-0.0477**	0.0655***
	(0.00181)	(0.0188)	(0.0159)
Leader entrepreneur * % Leader	0.00089**	-0.00599***	0.00325***
	(0.00039)	(0.00173)	(0.00096)
# of Firms	0.00673***	0.0144***	0.0224***
	(0.000451)	(0.00470)	(0.00395)
Order of firm	0.00797***	-0.00413	-0.0175**
	(0.000791)	(0.00818)	(0.00685)
Constant	2.004***	0.813***	-0.237***
	(0.00203)	(0.0201)	(0.0169)
Prov*Ind*Year FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Observations	749,040	946,772	719,860
R-squared	0.188	0.047	0.111

Note:This table compares the performance of firms owned by policy follower entrepreneurs and the ones owned by policy leader entrepreneurs. The sample is the group of firms in the non-policy targeted industries that are owned by different types of entrepreneurs. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 10: Industrial Policy and Firm Performance

	TFP	% Perk	% R&D
	(1)	(2)	(3)
Follower firm	0.0184***	0.00531	-0.0288***
	(0.00322)	(0.0108)	(0.00997)
Policy	0.0307***	0.0248	-0.0395***
	(0.00470)	(0.0163)	(0.0148)
Policy*Follower firm	-0.0725***	0.0961***	-0.0238
	(0.00642)	(0.0216)	(0.0196)
# of Firms	0.0110***	0.0166***	0.0138***
	(0.00101)	(0.00341)	(0.00314)
Order of firm	-0.0117***	0.00325	-0.00319
	(0.00188)	(0.00635)	(0.00580)
Age	0.0275***	-0.0573***	0.00191
	(0.00110)	(0.00335)	(0.00315)
Age$\hat{2}$	-0.00264***	0.00212***	0.00091***
	(9.02e-05)	(0.00028)	(0.00026)
SE	0.00501*	-0.00822	0.0335***
	(0.00285)	(0.00960)	(0.00881)
log(Reg. Cap.)	0.0915***	0.0401***	0.0946***
	(0.000649)	(0.00217)	(0.00198)
Constant	-0.653***	0.815***	-0.172***
	(0.00497)	(0.0159)	(0.0146)
Prov*Ind*Year FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Observations	1,167,851	1,603,382	1,234,214
R-squared	0.113	0.025	0.076

Note: This table examines the heterogeneous response to industrial policies by policy followers and leaders. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 11: Industrial Policy and Firm Performance - Diff-in-Diff Estimation

	TFP		% Perk Exp.		% R&D Exp.	
	(1)	(2)	(3)	(4)	(5)	(6)
Policy	-0.0146***	0.0170***	0.0909***	0.0328	0.0686***	0.000627***
	(0.00340)	(0.00502)	(0.0175)	(0.0250)	(0.0148)	(0.000217)
Policy*Follower firm		-0.0999***		0.140***		-0.0572*
		(0.00790)		(0.0384)		(0.0331)
Constant	0.0521***	0.0664***	0.883***	0.834***	0.549***	0.529***
	(0.000618)	(0.000765)	(0.00325)	(0.003855)	(0.00279)	(3.37e-05)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Province*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,612,121	1,145,385	2,271,530	1,599,276	1,643,287	1,163,664
R-squared	0.755	0.755	0.382	0.389	0.547	0.572

Note: This table employs a simple difference-in-difference approach to examine the effect of industrial policy on firm performance. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 12: Persistency of Follower and Leader Type

	All		Different Ind 1 Digit		Different Ind 2 Digit	
	Leader Firm	Follower Firm	Leader Firm	Follower Firm	Leader Firm	Follower Firm
	(1)	(2)	(3)	(4)	(5)	(6)
Previous Follower	-0.0180***	0.0802***	-0.00818***	0.00513***	-0.00701***	0.00851***
	(0.000162)	(0.000292)	(0.000187)	(0.000335)	(0.000203)	(0.000353)
Person age	0.00127***	-0.00140***	0.00132***	-0.00137***	0.00133***	-0.00139***
	(2.31e-05)	(4.38e-05)	(2.41e-05)	(4.55e-05)	(2.45e-05)	(4.61e-05)
Person age^2	-1.29e-05***	1.36e-05***	-1.38e-05***	1.33e-05***	-1.39e-05***	1.35e-05***
	(2.29e-07)	(4.39e-07)	(2.38e-07)	(4.56e-07)	(2.43e-07)	(4.62e-07)
Log(Reg. Cap.)	-0.000502***	-0.00191***	5.50e-06	-0.00152***	4.66e-05*	-0.00163***
	(2.39e-05)	(4.37e-05)	(2.49e-05)	(4.53e-05)	(2.54e-05)	(4.60e-05)
Order of firm	0.000318***	-0.00322***	0.000206***	-7.11e-05	-1.82e-05	-0.00025**
	(5.15e-05)	(9.41e-05)	(5.72e-05)	(0.000104)	(5.98e-05)	(0.00011)
Sequential	-0.00251***	0.00334***				
	(0.000178)	(0.000323)				
Firm age	0.00142***	0.00150***				
	(9.16e-06)	(1.93e-05)				
Firm age^2	-1.42e-07***	1.67e-07***				
	(4.01e-09)	(1.95e-08)				
Same industry	0.00232***	-0.0115***				
	(0.000141)	(0.000256)				
Constant	0.0306***	0.294***	0.0375***	0.299***	0.0387***	0.301***
	(0.000571)	(0.00107)	(0.000596)	(0.00111)	(0.000608)	(0.00113)
P*Y*I FE	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33,718,641	31,077,337	31,434,910	28,893,217	30,461,238	27,969,058
R-squared	0.254	0.253	0.256	0.254	0.256	0.254

Note: This table report results from a simple linear probability model. In column (1),(3),(5), the dependent variable is dummy variable indicating whether the firm was established before the industrial policy being announced, and in colum (2),(4),(6) the dependent variable indicates whether the firm was established following an industrial policy. The data is th sample of firms owned by serial entrepreneurs in the firm registration data. The unit of observation is firm. Standard erro are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectivel

Table 13: Cross-industry Expansion and Performance

	TFP		% Perk Exp.		% R&D Exp.	
	(1)	(2)	(3)	(4)	(5)	(6)
Same industry	0.0494***	0.0149**	-0.0769***	-0.0599*	0.0433***	0.0370
	(0.00372)	(0.00619)	(0.0132)	(0.0306)	(0.0117)	(0.0257)
Sequential	-0.00626	0.0540***	-0.0230	-0.0161	-0.00429	-0.0239
	(0.00565)	(0.0153)	(0.0198)	(0.0742)	(0.0175)	(0.0612)
# of Firms	0.0250***		0.0235***		0.0278***	
	(0.000832)		(0.00288)		(0.00259)	
Order of firm	-0.0200***	-0.00870**	0.0205***	0.00075	0.0104*	0.0517***
	(0.00192)	(0.00366)	(0.00660)	(0.0177)	(0.00588)	(0.0149)
Age	0.000641*	0.0129***	-0.0260***	-0.0150**	0.0156***	0.00506
	(0.000388)	(0.00126)	(0.00133)	(0.00611)	(0.00120)	(0.00527)
Age^2	-0.000287***	-0.000444***	0.00080***	0.00004	-0.00033***	-0.00029**
	(1.45e-05)	(3.35e-05)	(0.00517)	(0.000166)	(0.00004)	(0.00014)
Constant	-0.0854***	-0.359***	0.942***	0.769***	0.279***	0.0315
	(0.00305)	(0.0174)	(0.0102)	(0.0808)	(0.00913)	(0.0690)
Prov*Ind*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Entrepreneur FE	No	Yes	No	Yes	No	Yes
Observations	1,539,927	1,229,099	2,105,720	1,688,164	1,609,336	1,242,342
R-squared	0.128	0.720	0.043	0.366	0.105	0.541

Note: This table compares firm performance for cross-industry expansion and same-industry expansion. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 14: Does the Allocation of Subsidy Depend on Past Performance?

	Full		Leader	Follower
	(1)	(2)	(3)	(4)
Order	0.0448***	0.0172	0.00684	0.00540
	(0.00361)	(0.0133)	(0.00995)	(0.0122)
# of Firms	0.0198***			
	(0.00154)			
# of Firms failed	-0.0530***			
	(0.0198)			
Order*Leader		0.0250**		
		(0.0101)		
Order*Follower		-0.0344***		
		(0.0106)		
Leader firm			0.0142	
			(0.0323)	
Order*Leader firm			0.0289**	
			(0.0126)	
Follower firm				0.0556
				(0.0440)
Order*Follower firm				-0.0241*
				(0.0128)
log(Reg. Cap.)	0.222***	0.189***	0.195***	0.176***
	(0.00141)	(0.00468)	(0.00716)	(0.00748)
Same industry	0.0104	-0.0160	-0.0515**	0.0138
	(0.00685)	(0.0143)	(0.0223)	(0.0221)
Constant	-0.488***	-0.0504	-0.0498	-0.111*
	(0.00981)	(0.0331)	(0.0515)	(0.0565)
Person FE	No	Yes	Yes	Yes
Province*Industry*Year FE	Yes	Yes	Yes	Yes
Establish year FE	Yes	Yes	Yes	Yes
Observations	836,505	691,245	253,242	272,450
R-squared	0.217	0.681	0.682	0.693

Note:This table examines the determinants of subsidy allocation. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 15: Alternative Policy: Government Procurement Contract

	(1)	(2)	(3)
Follower	-0.00413***		-0.00306***
	(0.000375)		(0.000334)
Leader		0.00725***	0.00731*
		(0.000472)	(0.000444)
Policy			0.00174***
			(0.000419)
# of Firms	9.74e-05***	8.45e-05***	0.000104***
	(2.69e-05)	(2.41e-05)	(2.70e-05)
Order of firm	-0.000144***	-0.000129***	-0.000153***
	(3.92e-05)	(3.56e-05)	(3.94e-05)
SE	0.00134***	0.00107***	0.00152***
	(0.000239)	(0.000227)	(0.000239)
Ln(Reg. Cap.)	0.0120***	0.0144***	0.0120***
	(7.17e-05)	(6.74e-05)	(7.10e-05)
Age	0.00133***	0.00307***	0.00129***
	(0.000111)	(5.00e-05)	(0.000110)
Age^2	0.000182***	-2.66e-05***	0.000180***
	(9.00e-06)	(1.88e-06)	(8.93e-06)
Constant	-0.0479***	-0.0660***	-0.0486***
	(0.000496)	(0.000440)	(0.000494)
Prov*Ind*Year FE	Yes	Yes	Yes
County FE	Yes	Yes	Yes
Observations	2,386,517	3,026,970	2,388,310
R-squared	0.099	0.115	0.079

Note: This table examines the determinant of the allocation of government procurement contract. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Table 16: The Effect of Procurement Contract on Firm Performance

	TFP		Log (R&D exp)		log(Perk Exp)	
	(1)	(2)	(3)	(4)	(5)	(6)
Procurement	0.0471***	0.0433***	0.246***	0.265***	0.108***	0.136***
	(0.0103)	(0.0131)	(0.0217)	(0.0277)	(0.222)	(0.284)
Age		-0.0277		0.0954*		-0.00994
		(0.0285)		(0.0504)		(0.0391)
Age^2		-0.000982***		-0.00129***		-0.00125***
		(8.15e-05)		(0.000173)		(0.000166)
ln(Reg. Cap)		0.244		-0.703		0.0505
		(0.170)		(0.454)		(0.246)
Constant	0.0329***	-1.180	0.665***	4.482*	3.017***	2.892*
	(0.000821)	(1.020)	(0.00165)	(2.613)	(0.00172)	(1.491)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Y*I*P FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	619,098	487,042	618,551	489,519	843,880	683,982
R-squared	0.769	0.820	0.770	0.816	0.701	0.760

Note: This table employs a difference-in-difference approach and examiens the effect of obtaining government procurement contract on firm performance. The data is the administrative enterprise income tax records from the Chinese State Administration of Tax (SAT 2008–2015). The unit of observation is firm-year. Standard errors are clustered at the province-by-year-by-industry level. ***, **, and * represent significance at 1%, 5%, and 10%, respectively.

Appendix A:

Proof of Lemma 1

Proof. The first result is obvious from the monotonicity of $\pi_s(\theta, a; \theta_s)$. The second result is from the monotonicity of $\pi_s(\theta, a; \theta_s)$ and $\pi_d(\theta; \theta_d)$. □

Proof of Lemma 2

Proof. It is easy to verified that $\underline{\theta_s}(\theta_d; \theta, a)$ and $\theta_s^\dagger(\theta_d; \theta, a)$ are decreasing on (θ, a) from the monotonicity of π_s ,π_d and $\pi_s - \pi_d$.

Assume $a_1 > a_2$. We obtain that

$$P(\theta, a_1) = P(\theta_s \geq \underline{\theta_s}(\theta_d; \theta, a_1)|\theta) \geq P(\theta_s \geq \underline{\theta_s}(\theta_d; \theta, a_2)|\theta) = P(\theta, a_2).$$

For $P_s(\theta, a)$, we have[13]

$$\begin{aligned}
P_s(\theta, a_1) &= \frac{P(\pi_s(\theta, a_1) \geq \max\{0, \pi_d(\theta)\}|\theta)}{P(\pi_s(\theta, a_1) \geq \max\{0, \pi_d(\theta)\}|\theta) + P(0 \leq \pi_d(\theta) \leq \pi_s(\theta, a_1)|\theta)} \\
&\geq \frac{P(\pi_s(\theta, a_2) \geq \max\{0, \pi_d(\theta)\}|\theta)}{P(\pi_s(\theta, a_2) \geq \max\{0, \pi_d(\theta)\}|\theta) + P(0 \leq \pi_d(\theta) \leq \pi_s(\theta, a_1)|\theta)} \\
&\geq \frac{P(\pi_s(\theta, a_2) \geq \max\{0, \pi_d(\theta)\}|\theta)}{P(\pi_s(\theta, a_2) \geq \max\{0, \pi_d(\theta)\}|\theta) + P(0 \leq \pi_d(\theta) \leq \pi_s(\theta, a_2)|\theta)} \\
&= P_s(\theta, a_2).
\end{aligned}$$

The inequalities are both from $\pi_s(\theta, a_1) \geq \pi_s(\theta, a_2)$. Results above lead to the increasing monotonicity of $P(\theta, a)P_s(\theta, a)$.

For $P(\theta, a)P_d(\theta, a)$, we have

$$\begin{aligned}
P(\theta, a_1)P_d(\theta, a_1) &= P(\pi_d(\theta) \geq \max\{\pi_s(\theta, a_1), 0\}|\theta) \\
&\leq P(\pi_d(\theta) \geq \max\{\pi_s(\theta, a_2), 0\}|\theta) \\
&= P(\theta, a_2)P_d(\theta, a_2).
\end{aligned}$$

The inequality holds because $\pi_s(\theta, a_2) \leq \pi_s(\theta, a_1)$.

[13] We only consider $P(\theta, a) > 0$. The result is trivial when $P(\theta, a_1) = 0$ or $P(\theta, a_2) = 0$.

Assume $\theta_1 > \theta_2$, and we obtain

$$\begin{aligned} P(\theta_1, a) &= \iint_{\theta_s \geq \underline{\theta_s}(\theta_d, \theta_1)} \mathrm{d}F(\theta_s, \theta_d; \theta_1) \\ &\geq \iint_{\theta_s \geq \underline{\theta_s}(\theta_d, \theta_1)} \mathrm{d}F(\theta_s, \theta_d; \theta_2) \\ &\geq \iint_{\theta_s \geq \underline{\theta_s}(\theta_d, \theta_2)} \mathrm{d}F(\theta_s, \theta_d; \theta_2) \\ &= P(\theta_2, a). \end{aligned}$$

The first inequality is from that $F(\theta_s, \theta_d; \theta_1)$ FOSD $F(\theta_s, \theta_d; \theta_2)$[14]. The second is from that $\underline{\theta_s}(\theta_d, \theta)$ is decreasing on θ.

Similarly, for $P(\theta, a)P_s(\theta, a)$, we have

$$\begin{aligned} P(\theta_1, a)P_s(\theta_1, a) &= \iint_{\theta_s \geq \theta_s^\dagger(\theta_d, \theta_1)} \mathrm{d}F(\theta_s, \theta_d; \theta_1) \\ &\geq \iint_{\theta_s \geq \theta_s^\dagger(\theta_d, \theta_1)} \mathrm{d}F(\theta_s, \theta_d; \theta_2) \\ &\geq \iint_{\theta_s \geq \theta_s^\dagger(\theta_d, \theta_2)} \mathrm{d}F(\theta_s, \theta_d; \theta_2) \\ &= P(\theta_2, a)P_s(\theta_2, a). \end{aligned}$$

□

Proof of Lemma 3

Proof. Assume $x_1 > x_2$, $y_1 > y_2$. We show that for any (x, y),

$$M(x_1, y_1) - M(x_1, y_2) \geq M(x_2, y_1) - M(x_2, y_2). \tag{7}$$

There are 6 possible scenarios:

(i) $M(x_i, y_j) = g(x_i, y_j)$, $i,\ j = 1, 2$. (7) holds obviously.

(ii) $M(x_1, y_1) = f(x_1, y_1)$, and for $(i, j) \neq (1, 1)$, $M(x_1, y_2) = g(x_i, y_j)$.

$$f(x_1, y_1) - g(x_1, y_2) \geq g(x_1, y_1) - g(x_1, y_2) \geq g(x_2, y_1) - g(x_2, y_2).$$

(iii) $M(x_1, y_1) = f(x_1, y_1), M(x_1, y_2) = f(x_1, y_2), M(x_2, y_1) = g(x_2, y_1), M(x_2, y_2) = g(x_2, y_2)$.

[14] $F_s(\theta_s|\theta_1)$ FOSD $F_s(\theta_s|\theta_2)$ and that θ_s and θ_d are independent lead to $F(\theta_s, \theta_d|\theta_1)$ FOSD $F(\theta_s, \theta_d|\theta_2)$.

$f(x,y) - g(x,y)$ is increasing on y:

$$\begin{aligned} & f(x_2,y_1) - g(x_2,y_1) \geq f(x_2,y_2) - g(x_2,y_2) \\ \Rightarrow & f(x_1,y_1) - f(x_1,y_2) \geq f(x_2,y_1) - f(x_2,y_2) \geq g(x_2,y_1) - g(x_2,y_2). \end{aligned}$$

(iv) $M(x_1,y_1) = f(x_1,y_1), M(x_1,y_2) = g(x_1,y_2), M(x_2,y_1) = f(x_2,y_1), M(x_2,y_2) = g(x_2,y_2)$.

$f(x,y) - g(x,y)$ is increasing on x:

$$\begin{aligned} & f(x_1,y_2) - g(x_1,y_2) \geq f(x_2,y_2) - g(x_2,y_2) \\ \Rightarrow & f(x_1,y_1) - f(x_2,y_1) \geq f(x_1,y_2) - f(x_2,y_2) \geq g(x_1,y_2) - g(x_2,y_2) \\ \Rightarrow & f(x_1,y_1) - g(x_1,y_2) \geq f(x_2,y_1) - g(x_2,y_2). \end{aligned}$$

(v) $M(x_i,y_j) = f(x_i,y_j)$, for $(i,j) \neq (2,2)$, and $M(x_2,y_2) = g(x_2,y_2)$.

$$f(x_1,y_1) - f(x_1,y_2) \geq f(x_2,y_1) - f(x_2,y_2) \geq f(x_2,y_1) - g(x_2,y_2).$$

(vi) $M(x_i,y_j) = f(x_i,y_j)$, $i,\ j = 1,2$. (7) holds obviously..

□

Proof of Lemma 4

Proof. $M(\theta,a;\theta_s,\theta_d) := \max\{\pi_s(\theta,a;\theta_s), \pi_d(\theta;\theta_d)\}$ has increasing differences by Lemma 3. For simplicity, we suppress θ_s and θ_d below.

Reformulate $\pi_2(\theta,a)$ as $\pi_2(\theta,a) = \max\{0, M(\theta,a)\}$. Utilizing Lemma 3 again, we have the result that $\pi_2(\theta,a)$ has increasing differences on (θ,a). □

Proof of Lemma 6

Proof. Assume $\theta_1 > \theta_2$, $a_1 > a_2$.

$$\begin{aligned} \mathrm{E}\pi_2(\theta_1,a_1) - \mathrm{E}\pi_2(\theta_1,a_2) &= \int_0^\infty \int_0^\infty (\pi_2(\theta_1,a_1;\theta_s,\theta_d) - \pi_2(\theta_1,a_2;\theta_s,\theta_d))\mathrm{d}F_s(\theta_s;\theta_1)\mathrm{d}F_d(\theta_d) \\ &\geq \int_0^\infty \int_0^\infty (\pi_2(\theta_1,a_1;\theta_s,\theta_d) - \pi_2(\theta_1,a_2;\theta_s,\theta_d))\mathrm{d}F_s(\theta_s;\theta_2)\mathrm{d}F_d(\theta_d) \\ &= \iint (\pi_2(\theta_1,a_1;\theta_s,\theta_d) - \pi_2(\theta_1,a_2;\theta_s,\theta_d))\mathrm{d}F(\theta_s,\theta_d;\theta_2) \\ &\geq \iint (\pi_2(\theta_2,a_1;\theta_s,\theta_d) - \pi_2(\theta_2,a_2;\theta_s,\theta_d))\mathrm{d}F(\theta_s,\theta_d;\theta_2) \\ &= \mathrm{E}\pi_2(\theta_2,a_1) - \mathrm{E}\pi_2(\theta_2,a_2). \end{aligned}$$

The first inequality comes from the assumption that $F_s(\theta_s;\theta_1)$ FOSD $F_s(\theta_s;\theta_2)$, and the supermodularity of $\pi_2(\theta,a;\theta_s,\theta_d)$.

The second inequality comes from Lemma 4 directly. □

Proof of Proposition 7

Proof. Conditional on entering, the entrepreneur solves the maximization problem below:

$$\max_{a\geq 0}\Pi(\theta,a)=\max_{a\geq 0}\pi_1(\theta)-h(a)-c+(1-\gamma)(\pi_{12}(\theta,a)+\mathrm{E}\pi_2(\theta,a)), \tag{8}$$

where $\Pi(\theta,a)$ denotes the aggregated expected profits of an entrepreneur with productivity θ and choosing R&D intensity a.

$\mathrm{E}\pi_2(\theta,a)$ has increasing differences on (θ,a) from Lemma 6, and it is easy to verify that $\pi_1(\theta)-h(a)-c+(1-\gamma)\pi_{12}(\theta,a)$ has increasing differences on (θ,a) as well. Therefore, we conclude that $\Pi(\theta,a)$ has increasing differences on (θ,a), which leads to the result that $a^*(\theta)$ is increasing on θ. With the monotonicity of $a^*(\theta)$, the monotonicity of $P(\theta,a^*(\theta))$ and $P(\theta,a^*(\theta))P_s(\theta,a^*(\theta))$ are derived from Lemma 2.

Denote $\Pi^*(\theta)=\Pi(\theta,a^*(\theta))$, and $\Pi^*(\theta)$ is increasing on θ. If entrepreneurs with θ_0 that satisfies $\Pi^*(\theta_0)\geq 0$ enter the market, and so does the entrepreneurs with $\theta>\theta_0$. This implies the existence of the entry threshold $\underline{\theta}\geq 0$. □

Proof of Proposition 8

Proof. S denotes the event of entering the same sector in period 2, and D denotes entering the subsidized sector.

$G_s(\theta)$ and $G_d(\theta)$ denote the distribution on θ conditional on event S and D respectively. We simplify some notations with a slight abuse as follows:

$$\begin{aligned}
P_s^* &= \int_{\underline{\theta}}^{\infty} P^*(\theta)P_s^*(\theta)\mathrm{d}G(\theta|\theta\geq\underline{\theta}),\\
P_d^* &= \int_{\underline{\theta}}^{\infty} P^*(\theta)P_d^*(\theta)\mathrm{d}G(\theta|\theta\geq\underline{\theta}),\\
P^* &= \int_{\underline{\theta}}^{\infty} P^*(\theta)\mathrm{d}G(\theta|\theta\geq\underline{\theta}) = P_s^*+P_d^*.
\end{aligned}$$

Now we prove that $G_s(\theta)$ FOSD $G_d(\theta)$, that is $G_s(\theta) \leq G_d(\theta)$ for all $\theta > \underline{\theta}$:

$$
\begin{aligned}
& G_s(\theta) \leq G_d(\theta) \\
\Leftrightarrow & \frac{1}{P_s^*} \int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \leq \frac{1}{P_d^*} \int_{\underline{\theta}}^{\theta} P^*(x) P_d^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \\
\Leftrightarrow & (P^* - P_s^*) \int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \leq P_s^* \int_{\underline{\theta}}^{\theta} P^*(x) P_d^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \\
\Leftrightarrow & P^* \int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \leq P_s^* \int_{\underline{\theta}}^{\theta} P^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \\
\Leftrightarrow & \frac{P_s^*}{P^*} \geq \frac{\int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta})}{\int_{\underline{\theta}}^{\theta} P^*(x) \mathrm{d}G(x|x \geq \underline{\theta})}.
\end{aligned}
$$

To derive the last inequality, we prove that the following function $m(\theta)$ is increasing:

$$
m(\theta) = \frac{\int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta})}{\int_{\underline{\theta}}^{\theta} P^*(x) \mathrm{d}G(x|x \geq \underline{\theta})}.
$$

Taking derivative of $m(\theta)$ yields

$$
m'(\theta) = P^*(\theta) G'(\theta|\theta \geq \underline{\theta}) \cdot \frac{\int_{\underline{\theta}}^{\theta} P^*(x)(P_s^*(\theta) - P_s^*(x)) \mathrm{d}G(x|x \geq \underline{\theta})}{\int_{\underline{\theta}}^{\theta} P^*(x) \mathrm{d}G(x|x \geq \underline{\theta})} \geq 0.
$$

The inequality is derived by the monotonicity of $P_s^*(\theta)$.[15]

Equilibrium R&D intensity $a^*(\theta)$ and capital investment $k^*(\theta, 0)$ in period 1 and $k^*(\theta, a^*(\theta))$ are all increasing on θ, thus

$$
\begin{aligned}
& \mathbb{E}(\theta|S) \geq \mathbb{E}(\theta|D),\ \mathbb{E}(a^*(\theta)|S) \geq \mathbb{E}(a^*(\theta)|D), \\
& \mathbb{E}(k^*(\theta,0)|S) \geq \mathbb{E}(k^*(\theta,0)|D),\ \mathbb{E}(k^*(\theta,a^*(\theta))|S) \geq \mathbb{E}(k^*(\theta,a^*(\theta))|D).
\end{aligned}
$$

□

Proof of Proposition 9

[15] The sufficient and necessary condition for $G_s(\theta)$ FOSD $G_d(\theta)$ is that $\sup_{\theta \leq x} m(x)$ is a constant for all $\theta > \underline{\theta}$.

Proof. If an entrepreneur with productivity θ_0 enters in period 1 and there is no subsidy, then $\Pi(\theta_0, a^*(\theta_0)) \geq 0$. When the sector is subsidized in period 1, he earns $\Pi_p(\theta_0, a^*(\theta_0)) = \Pi(\theta_0, a^*(\theta_0)) + c - c_1 > 0$ by choosing the same R&D intensity, and $\Pi_p^*(\theta_0) \geq \Pi_p(\theta_0, a^*(\theta_0)) > 0$, thus he enters the sector. The analysis above implies that $\underline{\theta}_p \leq \underline{\theta}$.

The difference of profit in the two model is $\Delta\Pi(\theta, a) = \Pi_p(\theta, a) - \Pi(\theta, a) = h(a) - h_1(a) + c - c_1$, which is irrelative to θ and, and we use $\Delta\Pi(a)$ to represent the difference. $\Delta\Pi(a)$ is positive, strictly increasing[16].

Rewrite the maximization problem (5) as follows:

$$\max_{a \geq 0} \Pi_p(\theta, a) = \max_{a \geq 0} \Pi(\theta, a) + \Delta\Pi(a).$$

Assume that for some type θ_0, $a_p^*(\theta_0) < a^*(\theta_0)$[17]. First we have $\Pi(\theta_0, a^*(\theta_0)) \geq \Pi(\theta_0, a_p^*(\theta))$ by the definition of $a^*(\cdot)$. Moreover, from the monotonicity of $\Delta\Pi(a)$ we obtain $\Delta\Pi(a^*(\theta_0)) > \Delta\Pi(a_p^*(\theta_0))$. Combining the two inequalities yields $\Pi_p(\theta_0, a^*(\theta_0)) > \Pi_p(\theta_0, a_p^*(\theta_0))$, contradicting with the definition of $a_p^*(\cdot)$. Therefore we conclude that $a_p^*(\theta) \geq a^*(\theta)$ pointwisely.

$k^*(\theta, a_p^*(\theta)) \geq k^*(\theta, a^*(\theta))$ is obvious since $a_p^*(\theta) \geq a^*(\theta)$.

$P_p^*(\theta) = P(\theta, a_p^*(\theta))$ and $P^*(\theta) = P(\theta, a^*(\theta))$. Hence we derive $P_p^*(\theta) \geq P^*(\theta)$ from Lemma 2 since $a_p^*(\theta) \geq a^*(\theta)$.

Similarly, $P_{sp}^*(\theta) \geq P_s^*(\theta)$ and $P_p^*(\theta) P_{dp}^*(\theta) \leq P^*(\theta) P_d^*(\theta)$ are derived by Lemma 2. □

Proof of Proposition 10

Proof. We first prove that $G_{dp}(\theta) \geq G_{dp}(\theta | \theta \geq \underline{\theta})$, denoting the probability density function to be $g_1(\cdot)$ and $g_2(\cdot)$ respectively:

When $\theta \leq \theta_p$, $G_{dp}(\theta) \geq G_{dp}(\theta | \theta \geq \underline{\theta})$ holds obviously. When $\theta > \underline{\theta}$:

$$g_2(\theta) = \frac{g_1(\theta)}{\int_{\underline{\theta}}^{\infty} \mathrm{d}G_{dp}(\theta)} \geq g_1(\theta).$$

Taking the derivative of $G_{dp}(\theta) - G_{dp}(\theta | \theta \geq \underline{\theta})$, yields $g_1(\theta) - g_2(\theta) \leq 0$, implying that $G_{dp}(\theta) - G_{dp}(\theta | \theta \geq \underline{\theta})$ is decreasing on θ. At the point $\theta = \underline{\theta}$, $G_{dp}(\underline{\theta}) \geq G_{dp}(\underline{\theta} | \theta \geq \underline{\theta}) = 0$, and at the infinity, $\lim_{\theta \to \infty} G_{dp}(\theta) - G_{dp}(\theta | \theta \geq \underline{\theta}) = 0$. Therefore, $G_{dp}(\theta) \geq G_{dp}(\theta | \theta \geq \underline{\theta})$.

We denote that

$$P_{dp}^* = \int_{\underline{\theta}}^{\infty} P^*(x) n(x) \mathrm{d}G(x | x \geq \underline{\theta}).$$

[16] Remember that $h(a) > h_1(a)$ and $h'(a) > h_1'(a)$.

[17] If $a_p^*(\theta_0)$ or $a^*(\theta_0)$ is a set, pick an element arbitrarily.

Furthermore, we prove that the conditional distribution $G_s(\theta)$ FOSD $G_{dp}(\theta|\theta \geq \underline{\theta})$.

$$
\begin{aligned}
& G_s(\theta) \leq G_{dp}(\theta|\theta \geq \underline{\theta}) \\
\Leftrightarrow & \frac{1}{P_s^*} \int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta}) \leq \frac{1}{P_{dp}^*} \int_{\underline{\theta}}^{\theta} P^*(x) n(x) \mathrm{d}G(x|x \geq \underline{\theta}) \\
\Leftrightarrow & \frac{P_s^*}{P_{dp}^*} \geq \frac{\int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta})}{\int_{\underline{\theta}}^{\theta} P^*(x) n(x) \mathrm{d}G(x|x \geq \underline{\theta})}.
\end{aligned}
$$

To derive the last inequality, we denote

$$
q(\theta) = \frac{\int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) \mathrm{d}G(x|x \geq \underline{\theta})}{\int_{\underline{\theta}}^{\theta} P^*(x) n(x) \mathrm{d}G(x|x \geq \underline{\theta})}.
$$

It is sufficient to prove that $q'(\theta) \geq 0$:

$$
q'(\theta) = G'(x|x \geq \underline{\theta}) P^*(\theta) \cdot \frac{\int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(\theta) n(x) \mathrm{d}G(x|x \geq \underline{\theta}) - \int_{\underline{\theta}}^{\theta} P^*(x) P_s^*(x) n(\theta) \mathrm{d}G(x|x \geq \underline{\theta})}{\left[\int_{\underline{\theta}}^{\theta} P^*(x) n(x) \mathrm{d}G(x|x \geq \underline{\theta})\right]^2}.
$$

We show that $q'(x) \geq 0$ by proving that $P_s^*(\theta) n(x) \geq P_s^*(x) n(\theta)$:

$$
P_s^*(\theta) n(x) \geq P_s^*(x) n(\theta) \Leftrightarrow \frac{P_s^*(\theta)}{n(\theta)} \geq \frac{P_s^*(x)}{n(x)}.
$$

From Assumption 1, $P^*(\theta)$ is increasing, and from Assumption 3, $n(x)$ is decreasing, leading to that $\frac{P_s^*(\theta)}{n(\theta)}$ is increasing. Therefore we conclude that $q'(\theta) \geq 0$, and $G_s(\theta)$ FOSD $G_{dp}(\theta|\theta \geq \underline{\theta})$, which implies that $G_s(\theta)$ FOSD $G_{dp}(\theta)$.

Finally, we conclude that

$$
\mathbb{E}(\theta|S) \geq \mathbb{E}(\theta|D_p), \text{ and } \mathbb{E}(k^*(\theta,0)|S) \geq \mathbb{E}(k^*(\theta,0)|D_p).
$$

□

Appendix B:

Table B1: Serial Entrepreneur and Industries

	Previous Industry														
	Agri.	Mining	Manu.	Util.	Constr.	Sale	Tran.	Acco.	Info.	Finance	Real-est	Service	RD	Public	Other-s
Agriculture	0.437	0.007	0.106	0.005	0.048	0.201	0.015	0.013	0.016	0.003	0.020	0.065	0.040	0.007	0.0
Mining	0.064	0.225	0.157	0.011	0.044	0.283	0.026	0.013	0.012	0.007	0.035	0.067	0.035	0.005	0.0
Manufacturing	0.040	0.005	0.466	0.003	0.033	0.289	0.011	0.008	0.015	0.002	0.014	0.047	0.051	0.002	0.0
Utilities	0.078	0.010	0.105	0.220	0.063	0.216	0.017	0.011	0.022	0.005	0.036	0.087	0.100	0.009	0.0
Construction	0.054	0.003	0.075	0.003	0.301	0.247	0.016	0.012	0.028	0.002	0.037	0.123	0.063	0.009	0.0
Wholesale&Retail	0.030	0.003	0.096	0.002	0.037	0.590	0.017	0.010	0.037	0.003	0.017	0.087	0.053	0.002	0.0
Transportation	0.039	0.005	0.069	0.002	0.042	0.276	0.342	0.010	0.023	0.003	0.018	0.103	0.037	0.003	0.0
Accommodation	0.046	0.003	0.070	0.002	0.053	0.257	0.014	0.211	0.032	0.004	0.043	0.182	0.044	0.004	0.0
Information tech	0.016	0.001	0.040	0.001	0.030	0.258	0.009	0.008	0.316	0.005	0.016	0.155	0.123	0.002	0.0
Finance	0.024	0.007	0.074	0.003	0.035	0.218	0.013	0.014	0.049	0.129	0.060	0.279	0.067	0.003	0.0
Real estate	0.035	0.005	0.075	0.004	0.090	0.219	0.015	0.021	0.028	0.008	0.240	0.172	0.048	0.007	0.0
Service	0.025	0.002	0.049	0.002	0.047	0.218	0.016	0.018	0.051	0.009	0.036	0.412	0.083	0.004	0.0
RD	0.029	0.001	0.093	0.003	0.048	0.262	0.011	0.008	0.071	0.004	0.018	0.149	0.278	0.004	0.0
Public admin	0.111	0.006	0.093	0.008	0.112	0.226	0.020	0.016	0.027	0.004	0.046	0.131	0.093	0.068	0.0
Other service	0.046	0.003	0.074	0.003	0.058	0.280	0.025	0.020	0.039	0.004	0.039	0.169	0.061	0.006	0.1
Education	0.026	0.001	0.042	0.002	0.034	0.172	0.014	0.015	0.064	0.003	0.020	0.291	0.083	0.003	0.0

Note: