Entrepreneurship and Economic Growth during China's Economic Transformation, 1978–2008

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Using China's provincial-level panel data from 1978–2008, we examine the effects of entrepreneurship on economic growth in the context of China's transformation from a centrally planned to a market-oriented economy. We divide entrepreneurship into two types: business creation and innovation. Our estimation results show both types of entrepreneurship have significant positive effects on China's GDP per capita growth rate over the sample period. Specifically, the annual growth rate of the GDP per capita will increase by 1.98 percentage points if business creation entrepreneurship increases by one standard deviation. Moreover, the annual growth rate will increase by 0.134 percentage points if innovation entrepreneurship increases by ten percent. The results are robust even when we control for different sets of demographical and institutional variables. China's experience shows a strong government does not conflict with the entrepreneurs' role.

Keywords: Business creation, China, Economic growth, Entrepreneurship, Innovation

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I. Introduction

Since Adam Smith (1776), entrepreneurs have been recognized to spur improvements in living standards. For example, Schumpeter (1934) argues that entrepreneurs drive economic growth by undertaking risky

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ventures that create and introduce new goods, services, and production processes that displace old businesses. Lucas (1978), Baumol (1990), Murphy *et al.* (1991), and Gennaioli *et al.* (2013) emphasize that human capital of entrepreneurs plays a unique role in shaping the productivity of firms and the growth rate of entire economies. For example, Baumol (1990) claims the main impediment to China's industrialization during the Song Dynasty (A.D. 960–1270) was a social system that inhibited entrepreneurship, thereby causing economic stagnation in medieval China. The model by Zhuang (2003) suggests economies with more entrepreneurs grow faster than those with fewer ones. Most theoretical studies suggest entrepreneurship is crucial to the long-run sustainable growth of an economy, and Porter (1990) even claims that entrepreneurship is "at the heart of national advantage."

For quite some time now, researchers have been confronting real data with ideas. Empirical evidence and the experiential lessons appear to confirm the role of entrepreneurship in growth. Initially, much of this work was conducted using data from developed industrialized countries (data availability may have had a significant role in this choice of samples). Using *self*-employment rate as a proxy for entrepreneurship, Beugelsdijk and Noorderhaven (2004) study the growth difference of 54 European regions. They find that a high score on entrepreneurial characteristics is correlated with a high rate of regional economic growth. Glaeser (2007) uses two measures of entrepreneurship: self-employment rate and the number of small firms. Using city data of the U.S., he finds more entrepreneurial cities are more successful and a strong connection exists between area-level education and entrepreneurship. As more wide-ranging data sets become available, the empirical regularities of the entrepreneurship–growth relationship in transitional and developing economies began to draw the attention of researchers. For example, using China's provincial-level data from 1983–2003, Li *et al.* (2009) conclude that entrepreneurship significantly promotes economic growth.

Inspired by the theoretical insights and empirical findings in the literature, we intend to examine the role of entrepreneurship in China's economic growth by using provincial-level panel data of China from 1978–2008. China's transition from bureaucratic central planning to a private market started in 1978, hence our sample data set starts from that year. As officially declared, the Chinese economy was on the verge of collapse in 1978 after two decades of central planning

and political movements. Then, from 1978 to 2008, China enjoyed substantial economic growth. Its GDP had been growing at an average annual rate of 9.93 percent, which was historically unprecedented (Lin 2012).[1] The Chinese government is widely recognized to have played a fairly proactive role in the economic transition and development since 1978. During this period, numerous entrepreneurs emerged and launched their businesses. By the end of 2015, the number of self-employed individuals and people employed in private enterprises accounted for 36 percent of the total number of employed persons in China (NBS 2016), compared to less than 4 percent in 1990 (NBS 1991). Before 1989, China had no officially registered private enterprises. In a sense, China's economic reform since 1978 is a transformation from the extreme of total collectivism to greater reliance on individual initiative (entrepreneurship) and voluntary cooperation (free market). The transformation continues to convert economic stagnation into rapid growth.

The question we examine in this study is of special importance because we focus on China, which represents the trinity of a developing economy, a transition economy, and a fast-growing economy. In addition, China is a large economy. These characteristics present a unique combination. Previous studies have shown that entrepreneurship plays a critical role for a transition economy's success, such as the case in Russia, Poland, and Vietnam (McMillan and Woodruff 2002; Berkowitz and Dejong 2005). However, research using China's data on the role of entrepreneurship in its transition is far from sufficient. After all, China's transition path and growth pattern notably differ from those of other transition economies, such as Russia and the East European countries (portrayed as gradual reform versus shock therapy in the literature). The role of entrepreneurs is undeniable in a free enterprise system under which private property rights are well protected and the rule of law is strictly enforced. But what is the role played by entrepreneurs in a transition economy like China? Relative to the case of the West, private property rights in a transition economy are usually not as well protected and the rule of law is not as complete (if not absent). By Western standards, China is an authoritarian state

[1] From 1978 to 2016, China's GDP grew at an average annual rate of 9.58 percent (NBS 2017).

in which government plays a leading role in institutional reform and economic development. Unsurprisingly, some people wonder whether entrepreneurship is stifled or at least substituted by the strong government. Certain individuals argue that the role of entrepreneurs is limited in a country like China wherein governments are extremely strong and powerful and they undertake most of the investments. Such people believe economic growth in China has been driven mainly by the governments' fixed investment. Hence, governments basically supplant (rather than supplement) entrepreneurs in China's economic growth. For example, Cheung (2017) argues that China's economic miracle comes from cross-regional competition. The protagonists in the "drama" are local officials, not entrepreneurs. Thus, examining the role of entrepreneurship in China's transition under its special political regime is interesting.

The data we use in this paper are consistently collected, and the variables are defined clearly. The consistency of data collection may affect the regression results significantly. Many cross-country studies suffer inconsistencies in terms of statistical methods and variable definitions. To a certain extent, such inconsistencies undermine the reliability of results (Barro 1991). Hence, all data in our sample follow consistent statistical methods and all variables have unvarying definitions and measurements. All data and variables were gathered and defined (directly and indirectly) by the National Statistical Bureau of China, China's central statistical authority. Such consistency enhances the reliability of our results from the very beginning. This characteristic is an advantage of this paper in terms of data.

Methodologically, we use generalized method of moments (GMM) and valid instrumental variables to overcome the possible endogeneity problem. Regarding the relationship between entrepreneurship and growth, the causality may run in both directions. On the one hand, entrepreneurship serves as a driver of growth. Entrepreneurs start businesses and innovate, leading to higher productivity and economic growth. On the other hand, economically developed regions have a favorable environment to encourage, cultivate, and stimulate entrepreneurship (Zhao 2010). This bidirectional causality may cause simultaneous bias. Moreover, entrepreneurship may be correlated with other unmeasurable variables that affect growth. Such circumstance will cause omitted variable bias. Thus, the endogeneity problem is present either because of simultaneous bias or omitted variable bias.

Realizing that entrepreneurship may be endogenous, we use "the share of employees working in state-owned enterprises (SOEs) in total urban employment with a twenty-five-year lag" as an instrumental variable for entrepreneurship (we will justify this approach in Section 3). In doing so, we can consistently estimate the causal effect of entrepreneurship on economic growth.

Our estimation results show entrepreneurship has played a significantly positive role in China's economic growth over the sample period of 1978–2008. The results are robust even after we control for different sets of demographic and institutional variables. On average, the annual average growth rate will rise by 0.8 percentage points if business creation entrepreneurship (measured by share of urban employed people in non-public sectors) increases by ten percentage points, or by 1.98 percentage points if business creation entrepreneurship increases by one standard deviation. Moreover, the annual average growth rate will rise by 0.134 percentage points if innovation entrepreneurship (measured by number of patent grants) increases by ten percent.

The paper is organized as follows. Section II provides the notion, theory, and measurement of entrepreneurship. In Section III, we formulate the growth equation as a dynamic panel data model and discuss the relevant issues of panel estimation. Section IV reports the data and samples. Section V provides the estimation results and their interpretation. Section VI concludes this research.

II. Entrepreneurs and Entrepreneurship

Entrepreneurs are individuals who create new enterprises, and who discover, evaluate, and exploit market opportunities; specifically, according to Hebert and Link (1989), entrepreneurs "specialize in taking responsibility for and making judgmental decisions that affect the location, the form, and the use of goods, resources, or institutions." Entrepreneurship has been viewed as an important factor of production and one of the most vital sources of sustainable economic growth (Schumpeter 1934; Baumol 1968; Leff 1979; Wennekers and Thurik 1999; Glaeser 2007). Friedman and Friedman (1980) observe that in countries that have developed rapidly and successfully, a minority of enterprising and risk-taking individuals have forged ahead, created opportunities for imitators to follow, and enabled the majority to

increase their productivity.

In the literature however, a universally accepted definition of entrepreneurship is lacking. We do not suggest that people cannot understand what entrepreneurship means. We mean that different authors use different definitions and different measures for it. According to Li *et al.* (2009), three schools of thought exist on entrepreneurship. The schools are related but have dissimilar focuses. The German school, as represented by Schumpeter (1934) and Baumol (1968, 1990), stresses the innovation or "creative destruction" of entrepreneurs. The neoclassical school, as represented by Knight (1921) and Schultz (1980), underscores the risk-bearing of entrepreneurs. The Austrian school, as represented by Mises (1951) and Kirzner (1973), emphasizes the ability of entrepreneurs in discerning market opportunities. Capturing all connotations of entrepreneurship in a single empirical study is not possible. Moreover, we cannot measure the character traits and human capital of entrepreneurs, such as "strong nonroutine cognitive abilities" (Levine and Rubinstein 2017). Notwithstanding the micro-level difficulty, we can still measure entrepreneurship using macro-level data because we can assess the businesses established by entrepreneurs and the innovations they made.

Following Wong *et al.* (2005), we measure entrepreneurship in two ways: as new firm creation ("business creation entrepreneurship") and as innovation ("innovation entrepreneurship"). Entrepreneurs are generally viewed as those people who start new businesses and innovate. Wong *et al.* (2005) argue that business creation and innovation are "two distinct and separate factors that manifest different facets of the entrepreneurship phenomenon." This contention is also in line with the views of Davidsson (2003) and Kirzner (1973) describing entrepreneurship as embodying both new firm entry, and the imitative and innovative entries by established firms. Risk is inherently associated with entrepreneurs' activities: they can reap the benefits of their success but must also bear the cost of their mistakes. Hence, entrepreneurs are individuals who are willing to and can take risks.

Considering data availability and statistical consistency, we use "the fraction of urban nonpublic sector employment," *i.e.*, the share of "employed persons not working in state-owned and collective-owned organizations in urban areas" in the "total number of employed persons in urban areas" to measure "business creation entrepreneurship." The rationale for such choice is that the private

sector is the domain of entrepreneurs. At the national level, the fraction of urban nonpublic sector employment increased from 0.16 percent to 76.5 percent over 1978–2008 (NBS 2009). Measuring the business creation of entrepreneurs could be performed in many ways. Some may criticize that our measure, "the share of employment in non-public sectors," actually gauges privatization rather than business creation by entrepreneurs. However, we argue that China's privatization was promoted by entrepreneurs, subsequently authorized through government decrees, and then promoted by entrepreneurs. This sequence is a reinforcing process. Privatization takes the forms of setting up new private firms and transforming public enterprises into private ones, but neither can occur without entrepreneurs. Moreover, many old state-owned and collectively owned enterprises were "restructured" directly into private ones in the form of management buy-outs. Only persons with "opportunity-motivated entrepreneurship" have the courage and ability to take over such firms. Therefore, in the context of China's transformation from 1978–2008, privatization and business creation entrepreneurship are synonymous in some sense as both forms of privatization are promoted by the "opportunity-motivated entrepreneurship" defined in the literature (see, for example, Davidsson 1991; McMullen *et al.* 2008; Hessels *et al.* 2008).

As for measuring "innovation entrepreneurship," most studies define it by using the number of patent grants or inventions. For example, Acs *et al.* (1996) use the number of inventions per thousand people to measure innovation. Aghion (2017) uses "the number of patents registered at the US Patent and Trademark Office" to measure innovation in the USA. Wong *et al.* (2005) use the ratio of patents to GDP to measure "technological innovation intensity." Li *et al.* (2009) use "number of patent applications" to measure innovation. Kazuyuki (2016) uses patent application to measure innovation. In this paper we use the "number of patent grants" in each region to measure innovation entrepreneurship. From the enactment of China's Patent Law in 1985 to when our sample data ended in 2008, the number of patent grants grew from 138 to 411,982 with an average annual growth rate of 42 percent (NBS 2009).

The full play of entrepreneurship requires a free enterprise system. Clearly, entrepreneurs have a negligible role under a centrally planned economic system, because a bureaucracy exists for everything under such a system. Specifically, production and distribution are determined

by specific instructions from the planning agencies to the factories, indicating from whom and in what quantities they should receive raw materials and services, what they should produce, and to whom they should distribute their output. The workforce is assumed to be fully employed and wages are predetermined. An ultimate consumer is missing, and such consumer is assumed to passively accept the output produced from the orders of the goods planning agencies in a centrally planned economy. Entrepreneurs are also missing, because prices do not transmit information on market demand and supply and people have no incentive to act on that information in a centrally planned economy. Moreover, the whole ideology centers on the alleged exploitation of labor under capitalism. Under this ideology, private commerce and industry are low-status activities which are unfit for a respectable person. If entrepreneurship is one of the engines of economic growth, then centrally planned economies understandably have great difficulty in raising standards of living and creating wealth; hence, the inefficiencies that have resulted from the command system are ubiquitous, and communist countries have experienced economic stagnation and political repression and thus failed in practice (Friedman and Friedman 1980).

Therefore, in discussing the role of entrepreneurs, we must be clear about the institutions in which they exist. As Aghion (2017) states, "… entrepreneurial investments respond to incentives that are themselves shaped by economic policies and institutions." Entrepreneurs need an environment in which they are free to experiment with new businesses and innovations, and at their risk if the experiment fails, and to their profit if it succeeds (note that the free enterprise system is a profit and loss system). Moreover, entrepreneurs need clear price signals to adopt the least costly production methods and thereby use available resources for the most highly valued purposes. Anything that prevents prices from expressing freely the conditions of demand or supply interferes with the transmission of accurate information and thus hinders the functioning of entrepreneurs. For example, one of the major adverse effects of erratic inflation is the introduction of static into the transmission of information through prices. Government, of course, is to blame for inflation. Therefore, the government must provide an environment in which private property is well protected and the free market is well

safeguarded (including keeping inflation low and stable).[2] This situation may be taken for granted in industrialized nations but is worth emphasizing in a transition economy like China, because both private property and free markets were largely absent before its transition. In the 1990s, many students who studied overseas returned to China to start their businesses because they saw that China implemented a market-oriented reform. Infrastructure is also very important to economic growth, while government plays an irreplaceable role in the construction of infrastructure. According to Li Xiaopeng, Minister of Transport of the People's Republic of China, by the end of 2017, China's railway reached 127,000 kilometers and its highways reached 136,000 kilometers, with both infrastructures ranking No. 1 in the world.

III. Model Specification and Estimation Methods

Following Barro and Sala-i-Martin (1995) and Li *et al.* (2009), we formulate the following dynamic panel data model:

$$\log(y_{it}/y_{i,\,t-1}) = \beta_1 \log y_{i,\,t-1} + \beta_2 E_{it} + X_{it}\beta_3 + \tau_t + \eta_i + \varepsilon_{it}. \qquad (1)$$

where $\log(y_{it}/y_{i,\,t-1})$ is the growth rate of the real GDP per capita from period t-1 to period t and $\log y_{i,\,t-1}$ is the natural log of the initial real GDP per capita. E_{it} represents entrepreneurship, which includes business creation entrepreneurship and innovation entrepreneurship. X_{it} designates a set of control variables that may affect economic growth. τ_t represents year dummies, and η_i stands for regional (province) fixed effect. The subscripts i and t indicate province i and period t. In most empirical studies, X_{it} include such traditional determinants of the steady state level of income as savings rate, human capital, and

[2] As Greenspan (2007, pp. 251, 255) claims, "My experience leads me to consider state-enforced property rights as the key growth-enhancing institution. For if those rights were not enforced, open trade and the huge benefits of competition and comparative advantage would be seriously and dramatically impeded. People generally do not exert the effort to accumulate the capital necessary for economic growth unless they own it. … The rule of law and property rights appear to me to be the most prominent institutional pillars of economic growth and prosperity." Acemoglu *et al.* (2002) define "good" institutions as those conducive to growth for "protecting the property rights of a broad cross-section of society."

population growth rate (Levine and Renelt 1992; Islam 1995). In the following sensitivity analyses, X_{it} also includes some demographic and institutional variables, such as birth rate, dependence ratio, foreign direct investment, (FDI) and government size.

The unobservable individual "regional effects" (η_i) in Eq. (1) are usually correlated with other included explanatory variables, such as entrepreneurship. Such relation implies the estimation results obtained from single cross-section regression are biased and inconsistent (omitted variable bias). Islam (1995) suggests a panel data formulation that makes it possible to correct the bias. He divides the entire growth period into several constituent periods. Then, the individual fixed effects are differenced out. Many later studies follow this approach, including Topel (1999) and Li *et al.* (2009).

Accordingly, we divide our sample period (1978–2008) into six consecutive five-year time intervals: 1978–1983, 1983–1988, 1988–1993, 1993–1998, 1993–2003, and 2003–2008. Thus, over the period 1978–2008, we have six data (time) points for each province: 1978, 1983, 1988, 1993, 1998, and 2003. For example, when t = 1983, t – 1 is 1978, and the explanatory variables are averaged over 1978–1983. We can also rule out the time-invariant regional fixed effects by taking first-order difference to Eq. (1). However, given that $(\log y_{i,\,t-1} - \log y_{i,\,t-2})$ in the difference equation would be correlated with the error term $(\varepsilon_{i,\,t} - \varepsilon_{i,\,t-1})$, the differenced lagged dependent variable $(\log y_{i,\,t-1} - \log y_{i,\,t-2})$ is remain essentially endogenous.

To overcome the endogeneity problem, we use GMM to estimate the growth regression in Eq. (1). According to Arellano and Bond (1991), GMM estimation follows two steps: first, the regional fixed effects are differenced out; then, the differenced equation is estimated using lagged variables as instruments of the corresponding endogenous variables in the equation. In this way, the first-differenced GMM estimator (DIF-GMM) is obtained. However, the DIF-GMM suffers from weak instruments and small-sample bias. Therefore, to improve on DIF-GMM, Arellano and Bover (1995) and Blundell and Bond (1998) propose a system GMM estimator (SYS-GMM). According to SYS-GMM, the first differenced lagged variable will be used as the instrument for the level variable in the level equation. That is, $(\log y_{i,\,t-1} - \log y_{i,\,t-2})$ and even earlier $(\log y_{i,\,t-2} - \log y_{i,\,t-3})$ (if existent) will be used as the instruments for $\log y_{i,\,t-1}$ in the level equation. In this paper, we will report estimates from SYS-GMM.

Entrepreneurship may be an endogenous variable in the regression equation. Differencing cannot rule out the potential simultaneous bias of the entrepreneurship variable. Moreover, if other unobservable time-variant factors affect entrepreneurship, then omitting these factors may still cause bias in the coefficient estimations. In China, more developed regions are associated with more entrepreneurs. More entrepreneurs also concentrate on more developed regions. How can we be sure that this relationship is causal and not a mere coincidental correlation? The most commonly used method is that of instrumental variables: we utilize a variable that has a direct effect on entrepreneurship but no direct effect on recent growth. To overcome the endogeneity of the entrepreneurship variable, we use the share of employees working in SOEs in total employment with a twenty-five-year lag as an instrument for entrepreneurship (*i.e.*, over 1953–1983).[3] This instrument is relevant: note that provinces with lower shares of SOE employment are associated with higher degree of entrepreneurship or more entrepreneurs. Under a planned economy, SOE managers needed only to routinely carry out government production plans. Under such a system, people's incentive of starting businesses or innovating was considerably constrained and even extinguished. For example, during the 1950s–1980s, the economy of Northeast China was dominated by SOEs, while SOEs were much less developed in Zhejiang Province. Additionally, entrepreneurship was rarer in Northeast China than in Zhejiang. The instrument is exogenous as well: today's economic growth cannot affect the share of SOE employment twenty-five years ago but the share can affect economic growth through its effect on entrepreneurship.

IV. Research Data

Data used in this paper are from the *China Compendium of Statistics 1949–2008* and the *China Statistical Yearbook* (various years). The data set includes 31 provinces of mainland China over 1978–2008 (*i.e.*, except Hong Kong, Macau, and Taiwan). We start from 1978 because it marks China's initiation of market-oriented reform and opening-up policy. We

[3] China nationalized its private sectors from 1949 to 1952, and thus, the "planned economy" officially started in 1953.

TABLE 1
DEFINITION AND DESCRIPTIVE STATISTICS OF THE VARIABLES

Variable	Obs.	Mean	Std. Dev.	Min	Max
Growth	186	0.09	0.03	–0.08	0.27
Log(y)	186	6.75	0.99	4.76	9.92
Business creation	186	24.60	24.69	0.02	85.16
Innovation	152	6.64	1.75	0	10.74
Birth	186	15.53	5.57	4.80	27.92
Education	186	3.31	0.98	1.69	5.83
Dependency	155	9.69	2.47	5.08	18.85
Government	186	15.67	10.05	5.19	73.09
Investment	186	32.93	12.39	10.73	78.39
FDI	186	2.06	3.18	0	20.24
SOE	174	81.87	10.24	43.46	100.00

Note: (i) "innovation" only has 152 observations because China did not accept patent applications until 1985. (ii) "dependency" only has 155 observations because data from 1978–1982 were not available from official statistics. (iii) "SOE" only has 174 observations because the data of Inner Mongolia, Anhui, and Gansu were not available from the official statistics. (iv) GDP per capita is calculated at constant prices in 1952.

Definitions of the variables:
(1) Growth: annual average growth rate of GDP per capita
(2) log(y): logarithm of the real GDP per capita
(3) Business creation: share of employed people in non-public sectors (%)
(4) Innovation: logarithm of number of patents granted
(5) Birth: birth rate (1/1000)
(6) Education: logarithm of university student enrollment per 10,000 people[4]
(7) Dependency: ratio of population aged over 65 to those aged between 15–64 (%)
(8) Government: ratio of government expenditure to regional GDP (%)
(9) Investment: ratio of fixed asset investment to regional GDP (%)
(10) FDI: ratio of actually utilized FDI to regional GDP (%)
(11) SOE: share of staff and workers working in SOEs with a 25-year lag (%)

chose this period because the three-decade transition since 1978 has brought about astonishing changes to China. Under a centrally planned society before 1978, entrepreneurs had a minimal role, or as Greenspan

[4] We follow Yao and Wei (2007) and Zhao (2013) and use the number of university student enrollment per 10,000 people to measure human capital. Other measures are also used in the literature. Barro and Lee (1993) construct a human capital variable that gives the average schooling years in the total population over age twenty-five.

TABLE 2
CORRELATION MATRIX

Variable	1	2	3	4	5	6	7	8	9	10
1 Growth										
2 Log(y)	0.16									
3 Busi. Creation	0.35	0.64								
4 Innovation	0.23	0.63	0.66							
5 Birth	-0.23	-0.73	-0.49	-0.63						
6 Education	0.26	0.87	0.73	0.64	-0.76					
7 Dependency	0.32	0.66	0.69	0.73	-0.59	0.64				
8 Government	-0.11	-0.04	0.08	-0.48	0.24	0.02	-0.27			
9 Investment	0.25	0.54	0.59	0.12	-0.30	0.58	0.31	0.51		
10 FDI	0.19	0.52	0.33	0.34	-0.30	0.34	0.44	-0.24	0.23	
11 SOE	-0.17	-0.19	-0.31	-0.55	0.21	-0.18	-0.44	0.36	0.14	-0.29

(2007) put it, there was "no creative destruction, no impetus to make innovations." Whether entrepreneurs play an important role in the economy embodies a key difference between a centrally planned and a capitalist society. In a sense, China's economic reform since 1978 is a transition from the extreme of total collectivism to greater reliance on individual initiative (entrepreneurship) and voluntary cooperation (free market).

We take the average values of all other explanatory variables over five years except $\log y_{i,\,t-1}$. Taking the period 2003–2008 as an example, $\log y_{i,\,t-1}$ is the natural logarithm of GDP per capita in 2003. Variables, such as entrepreneurship, human capital, and other demographic and institutional variables take the average values over the five years. With this setup, the error terms in the regression equation are now five calendar years apart and may be thought to be less influenced by economic fluctuations and less likely to be correlated serially than they would be in a yearly data setup.

Tables 1 and 2 present the definitions, descriptive statistics, and correlation matrix of the variables. We find that China's regional economies experienced rapid growth during the period. GDP per capita has been growing at an annual average rate of about 9 percent. The distribution of business creation entrepreneurship is dispersed across regions, and the mean and standard deviation are roughly equal. Innovation entrepreneurship is relatively less dispersed. Other variables differ significantly across regions. For example, over our sample period,

the average ratio of actually utilized FDI to regional GDP was only about 0.6% in West China provinces, such as Guizhou, Yunnan, Tibet, Ningxia and Xinjiang, but was 6% in Guangdong Province.

V. Estimation Results

In this section, we present the estimation results of the effects of business creation entrepreneurship and innovation entrepreneurship on economic growth in Tables 2 and 3, respectively.

A. Effect of Business Creation Entrepreneurship on Economic Growth

We treat business creation entrepreneurship as an exogenous variable and report the estimation results in the first three models. In Model (1) we include two control variables: "ratio of fixed asset investment to regional GDP" (*investment*), and "logarithm of university student enrollment per 10,000 people" (*education* or *human capital*). China's economy relied heavily on fixed investment. Growth theory claims both investment and human capital contribute to economic growth (Solow 1956; Romer 1986). The regression coefficient of business creation entrepreneurship is 0.005 and is statistically significant at 5 percent level. This outcome shows business creation entrepreneurship has a positive effect on economic growth. The coefficient of the initial output level ($\log y_{t-1}$) is negative and statistically significant, which implies different regions of China tend to converge to similar rates of growth and similar levels of per capita income. This outcome is consistent with Barro and Sala-i-Martin (1992) for the case of the USA. As to regional convergence, Islam (1995) suggests persistent differences in technology and institutions rather than capital per capita, are major obstacles to convergence. Differences in technology and institutions are much less persistent across regions in a country than across different countries in the world. For overidentification tests, the Sargan and Hansen tests fail to reject the null hypothesis that the instrument variables used in the GMM estimations are valid (p-value being greater than 0.1). Moreover, the Arellano–Bond serial correlation test also fails to reject the null hypothesis of no second-order serial correlation (GMM estimation only requires the error term to have no second-order serial correlation).

However, Model (1) may have omitted other important variables in the

growth equation. For example, some studies show demographic factors such as birth rate and senior dependency ratio may affect economic growth (Li and Zhang 2007; Bloom and Williamson 1998). Therefore, we control for these two variables in Model (2). Prior research also stresses the effects of institutional variables, such as government size and openness on growth (Barro 1991; Levine and Renelt 1992). Hence, we further include these two variables in Model (3). If entrepreneurship is related to these variables, then omitting them may lead to omitted variable bias. After including these control variables, we find the economic significance and statistical significance of entrepreneurship changes minimally. This outcome indicates our estimation results are fairly robust. In Model (3), FDI and human capital have a significantly positive effect on economic growth, which is consistent with our prediction. The other control variables do not show any significant effect on growth.

In the first three models, entrepreneurship is treated as an exogenous variable. However, entrepreneurship could be endogenous, which implies that the estimations in the first three models may not be consistent. To confirm that the positive effect of business creation entrepreneurship on economic growth is a causal relationship, we use "the share of staff and workers working in SOEs with a twenty-five-year lag" as the instrument for business creation entrepreneurship in Models (4), (5), and (6). We find business creation entrepreneurship still has a significant positive effect on economic growth in Model (4), and the coefficient and significance do not change considerably after we control for other variables in Models (5) and (6). Human capital and FDI both have a positive impact on growth as expected. According to Bond *et al.* (2001), a simple method to determine whether GMM estimation is biased or not is to check whether the coefficient of the lagged dependent variable is between the coefficients of pooled OLS regression and fixed effect regression. To roughly test the efficiency of GMM estimation, we perform the pooled OLS estimation and fixed effect estimation including all the control variables. Results suggest the coefficient interval for the lagged dependent variable is (–0.561, –0.094). The actual coefficient of the lagged dependent variable in Model (6) is –0.486, which falls into the interval, suggesting that the GMM estimation is reliable.

The robustness test shows that business creation entrepreneurship contributes to economic growth. Given that the average coefficient of business creation entrepreneurship is 0.004, the economic growth rate

TABLE 3

EFFECT OF BUSINESS CREATION ENTREPRENEURSHIP ON ECONOMIC GROWTH

Independent Variables	Dependent variable: $\log(y_{it}) - \log(y_{i,t-1})$					
	Business creation entrepreneurship as an exogenous variable			Business creation entrepreneurship as an endogenous variable		
	(1)	(2)	(3)	(4)	(5)	(6)
Business creation	0.005**	0.006**	0.003**	0.004**	0.004**	0.003**
	(2.55)	(2.40)	(2.07)	(2.10)	(2.29)	(2.23)
$\text{Log}(y_{t-1})$	–0.169*	–0.533*	–0.493***	–0.291**	–0.469**	–0.486***
	(–1.85)	(–1.88)	(–3.16)	(–1.95)	(–2.28)	(–2.99)
Investment	0.000	0.003	–0.004	–0.002	–0.003	–0.005
	(0.17)	(0.54)	(–1.43)	(–0.70)	(–0.85)	(–1.61)
Education	0.042	0.106	0.192*	0.283*	0.262**	0.235**
	(0.83)	(0.70)	(2.02)	(1.87)	(2.22)	(2.23)
Birth		0.005	–0.004		0.000	–0.003
		(0.52)	(–0.47)		(0.05)	(–0.38)
Dependency		0.007	0.017		0.050**	0.039**
		(0.25)	(1.02)		(2.81)	(2.50)
FDI			0.014**			0.014*
			(2.28)			(2.02)
Government			0.009			0.001
			(1.50)			(0.23)
D_1988-93	0.149***	0.256***	0.245***	0.150***	0.186***	0.195***
	(4.58)	(3.25)	(5.98)	(4.56)	(3.23)	(4.84)
D_1993-98	0.033	0.266*	0.239***	0.059	0.127	0.138*
	(0.43)	(1.94)	(3.34)	(0.86)	(0.98)	(1.80)
D_1998-03	0.088	0.388*	0.338***	0.027	0.115	0.198*
	(0.79)	(2.01)	(2.88)	(0.28)	(0.55)	(1.93)
D_2003-08	–0.016	0.354	0.288	–0.195	–0.078	0.094
	(–0.09)	(1.40)	(1.64)	(–1.61)	(–0.25)	(0.69)
AR(1)	0.152	0.023	0.050	0.122	0.086	0.042
AR(2)	0.370	0.388	0.459	0.227	0.436	0.548
Sargan test	0.838	0.102	0.488	0.257	0.595	0.975
Hansen test	0.278	0.220	0.446	0.278	0.204	0.745
Observations	155	124	124	145	114	114
Instruments	18	24	23	16	16	27

Note: (1) Numbers in parentheses are heteroscedasticity–robust t statistics. (2) *, ** and *** stand for 10%, 5%, and 1% significance levels, respectively. (3) Sargan test and Hansen test both report the p-values of the test of overidentification restrictions. (4) AR(1) and AR(2) report the p-values of the first-order and second-order Arellano–Bond serial correlation test. (5) In Models (4), (5), and (6), we use the share of employees working in SOEs in the total employees twenty-five years ago as an instrumental variable for entrepreneurship. (6) Instruments report the number of instrumental variables used in each model.

over five years will increase by 4 percentage points (0.8 percentage points annually) if the share of employed people in private sectors increases by 10 percentage points. Conversely, if business creation entrepreneurship increases by one standard deviation, then the annual growth rate will increase by 1.98 percentage points.[5] This outcome implies that business creation entrepreneurship has an economically and statistically significant positive impact on economic growth. FDI shows significant positive effect on growth in Models (3) and (6). Both models indicate that the annual growth rate will increase by 0.28 percentage points if FDI increases by 1 percentage point as a fraction of GDP. This result is consistent with those of Yao and Wei (2007) and Zhao (2013), which assert that China has benefited from foreign investment that enabled it to develop more rapidly than it would have had China chosen or been forced to rely solely on its own savings. Education also shows significant positive effect on growth in Models (4), (5), and (6), which echoes Squicciarini and Voigtländer (2015), who claim that "human capital is a strong predictor of economic development."

B. Effect of Innovation Entrepreneurship on Economic Growth

In this subsection, we use "the number of patent grants" as a measure of innovation entrepreneurship and examine its effect on growth. In the first three models of Table 4, we treat innovation entrepreneurship as an exogenous variable. We find that although innovation entrepreneurship has an expected positive effect on growth, the estimation coefficients are not statistically significant even at the 10 percent level. The coefficient of initial per capita output level is significant at the 10 and 5 percent levels.

As mentioned, entrepreneurship is potentially endogenous. To overcome the endogeneity problem, we also use the number of employees working in SOEs as a fraction of total urban employment with a twenty-five-year lag as an instrumental variable for innovation entrepreneurship in Models (4)–(6). Compared with Models (1)–(3), Models (4)–(6) show statistically significant positive effects of innovation entrepreneurship on growth, and the coefficients are economically

[5] According to Table 1, the standard deviation of business creation entrepreneurship is 24.69, so the annual growth rate will increase 0.004*24.69/5 = 1.975%.

TABLE 4

EFFECT OF INNOVATION ENTREPRENEURSHIP ON ECONOMIC GROWTH

Independent Variables	Dependent variable: $\log(y_{it}) - \log(y_{i,t-1})$					
	Innovation entrepreneurship as an exogenous variable			Innovation entrepreneurship as an endogenous variable		
	(1)	(2)	(3)	(4)	(5)	(6)
Innovation	0.022	0.017	0.013	0.058**	0.065**	0.067**
	(1.10)	(1.25)	(0.76)	(2.33)	(2.73)	(2.64)
$\text{Log}(y_{t-1})$	–0.201	–0.197*	–0.303**	–0.472**	–0.559***	–0.581***
	(–1.65)	(–1.89)	(–2.43)	(–2.48)	(–3.33)	(–3.38)
Investment	0.000	0.001	–0.003	–0.000	–0.003	–0.005*
	(0.21)	(0.73)	(–1.17)	(–0.04)	(–0.83)	(–1.76)
Education	0.132	0.024	0.223**	0.166	0.270**	0.261**
	(1.07)	(0.19)	(1.80)	(1.47)	(2.44)	(2.48)
Birth		–0.012	–0.004		0.000	–0.000
		(–1.26)	(–0.70)		(0.11)	(–0.03)
Dependency		0.011	0.024**		0.064**	0.040*
		(0.64)	(2.07)		(2.70)	(1.90)
FDI			0.020**			0.014*
			(2.44)			(1.73)
Government			0.007			0.006
			(1.39)			(1.27)
D_1988-93	0.140***	0.165***	0.156***	0.171***	0.120**	0.141***
	(3.21)	(3.54)	(3.34)	(4.33)	(2.28)	(3.72)
D_1993-98	0.066	0.065	0.050	0.205**	0.126	0.162**
	(0.95)	(0.94)	(0.84)	(2.23)	(1.34)	(2.50)
D_1998-03	0.184**	0.209**	0.133**	0.365**	0.195	0.269***
	(2.36)	(2.64)	(2.14)	(2.46)	(1.26)	(3.12)
D_2003-08	0.085	0.170	–0.010	0.356*	0.058	0.200
	(1.27)	(1.34)	(–0.12)	(1.82)	(0.24)	(1.64)
AR(1)	0.135	0.151	0.101	0.101	0.082	0.034
AR(2)	0.375	0.413	0.448	0.206	0.345	0.992
Sargan test	0.690	0.142	0.165	0.436	0.657	0.797
Hansen test	0.692	0.137	0.507	0.176	0.473	0.432
Observations	152	152	152	111	111	111
Instruments	16	24	28	14	16	22

Notes in Table 3 apply here.

much larger. Moreover, the coefficient grows larger as we add more control variables into the regression model. Take Model (6) as an example, when innovation entrepreneurship increases by 10 percent, growth rates over five years increase by 0.67 percentage points; in other words, annual growth rate will increase by 0.134 percentage points. Given that patents granted grew in China at an annual rate of more than 40 percent from 1985–2008, this effect is practically significant (annually about 0.5 percentage points of per capita income growth resulted from innovation). The p-values show these models pass the Sargan, Hansen, and Arellano-Bond tests. Moreover, the coefficients of the initial per capital output, education, and FDI all possess the expected signs and are significant. All these outcomes confirm the GMM estimations with exogenous instruments are robust. In Tables 3 and Table 4, government size, which is measured by the ratio of government expenditures to GDP, does not show any significant effect on growth. This finding is understandable because we do not know where the government expenditures go.

Clearly, the effect of entrepreneurship on economic growth is both statistically and economically significant over the sample period. Our finding is consistent with the predictions of Schumpeterian growth models. As demonstrated in Acemoglu *et al.* (2006), the greater the level of development in a country, *i.e.*, the closer it gets to the technology frontier, the greater the role of cutting-edge innovation as the motor of growth, replacing accumulation and technological catch-up. We believe the role of entrepreneurs in China's economic growth will be even larger in both relative and absolute terms in the future. Such belief arises from the main sources of growth in China having gradually shifted from heavy fixed investment and low labor cost advantage to business creation and technological innovation, in which entrepreneurs excel. In the 2017 *World Economic Forum* held in Dalian, China, Chinese Premier Li Keqiang reported that since 2014 14,000 new firms are established every day, on average; that is, more than 5 million new enterprises emerge annually. As to innovation, as discussed, no patent law existed in China before 1985, but by 2015 China has become the country with the largest number of patents granted in the world. The number of patents granted in China increased from 138 in 1985 to 1.72 million in 2015. The expenditure on R&D increased from RMB 10.26 billion to RMB 1.42 trillion over the same period (Ouyang 2017).

VI. Conclusion

From one generation after another, entrepreneurs and entrepreneurship have played a critical role in China's economic growth over the past thirty years. Using China's provincial-level panel data from 1978–2008, we include entrepreneurship into a growth regression model and explore the effects of entrepreneurship on economic growth. We further decompose entrepreneurship into business creation and innovation entrepreneurship. Business creation entrepreneurship is measured by the share of employed persons in urban areas outside of state-owned and collectively owned organizations in the total number of employed persons in urban areas. Innovation entrepreneurship is measured by the number of patents granted. We use the share of employees working in SOEs in the total employment with a twenty-five-year lag as an instrumental variable for entrepreneurship to alleviate possible endogeneity problem. Regression results show that over our sample period, both business creation entrepreneurship and innovation entrepreneurship have positive effects on China's economic growth. On average, the annual growth rate will increase by 1.98 percentage points if business creation entrepreneurship increases by one standard deviation. Conversely, the annual growth rate will increase by 0.134 percentage points if innovation entrepreneurship increases by ten percent. Hence, an economy grows faster in regions with more entrepreneurship. The findings remain robust even when we control for different sets of demographic and institutional variables.

Our finding adds further evidence to Schumpeter's view that entrepreneurship is the engine of economic growth. However, stressing the role of entrepreneurship does not mean denigrating the role of government. We hasten to add that entrepreneurship is not a sufficient condition for prosperity and must be supplemented by "right" government policies. History suggests the entrepreneurial spirit will always exist. The challenge to society is to channel entrepreneurial energies in economically productive ways. For example, government should protect the initiative and incentive of entrepreneurs to start businesses and innovate and to provide basic infrastructure, without which the economy would operate at a lower level of efficiency and effectiveness. Sloth and lack of enterprise flourish when hard work and risk-taking are not rewarded. Thus far, the lessons of history

have shown that only in an economic system with well-protected private property, well-constructed infrastructure, and well-safeguarded free market can entrepreneurship be brought into full play. Where there has been success, where living standards for the majority have increased, more open markets and increased private ownership have played a crucial part in growth. The logic is straightforward: knowing that the government will protect one's property encourages citizens (entrepreneurs) to take business risks, a prerequisite of wealth creation and economic growth. Few will risk their capital if the rewards are going to be subject to arbitrary seizure by the government or mobsters. For example, no significant industrialization occurred in medieval China, and in subsequent centuries Europe saw more economic growth and technological innovation. This circumstance is partly because Chinese emperors had the right to seize their subjects' property and assume control of their business enterprises, a right that significantly reduced their subjects' incentives to undertake business ventures.

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