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Chinese technology transfer policy: the case of the national independent innovation demonstration zone of East Lake

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Abstract This paper analyzes the technology transfer policies that are being developed to reduce the regional disparities in economic growth in China. In particular, these technology transfer policies focus on increasing the innovative activity in central China, in order to spur economic development and growth.

Keywords China · Technology transfer · Economic development · Innovation · Entrepreneurship · Science parks

JEL Classification O12 · O18 · O32 · M13 · R11

1 Introduction

The rapid development of China has grabbed the attention of both scholars and policy makers in recent years. However, what has gone less noticed is the great disparity in economic development in general and economic growth in particular across regions within China. In particular, the central region of China has suffered from less economic development and lower rates of growth than have the more urbanized areas.

In response to these disparities in economic growth, a new policy has been implemented in order to foster economic development and growth in central China. At the heart of this

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policy is to transfer technology from knowledge generating institutions, such as universities, for innovation and entrepreneurship to ignite economic growth and development.

The purpose of this paper is to explain the technology transfer policies that are being developed to reduce the regional disparities in economic growth in China. In particular, these technology transfer policies focus on increasing the innovative activity in central China, in order to spur economic development and growth. The following section of this paper explains why disparities in economic development across regions are a policy challenge in China. The third section of the paper identifies the key role that science parks are playing in fostering technology transfer and the ensuing economic development. Particular technology transfer policies to promote the East Lake region to develop a growth pole for central China are discussed in the fourth section. Finally, in the fifth section a summary and conclusions are provided. In particular, this paper suggests that technology transfer policies are crucial to spur economic growth and development in central China.

2 The economic development disparities within China

Through a series of economic reforms beginning in the late 1970s, China transformed its closed, planned economy into one of capitalistic principles, opening to foreign investment, and promoting entrepreneurship. However, these policies largely benefitted eastern coastal regions that then experienced high rates of economic growth, while central and western China, mostly rural areas, fell behind. Today, these regional economic disparities have widened to the point that China's National People's Congress has listed it as one of the largest challenges the nation currently faces.

Central China is comprised of six provinces—Shanxi, Anhui, Jiangxi, Henan, Hubei, and Hunan—with a total population of 357 million and a GDP that, as of 2010, accounts for 21.5 % of the entire nation. Not only is the area rich in natural resources and culture, but it is also home to a wealth of science, technology, and academic resources. Historically, the region's economy has specialized in agricultural, as well as energy, crude materials, and manufacturing equipment. While the emergence of a knowledge-based, innovative economy and the acceleration of globalization in the 1990s led to growth in eastern China, central China failed to similarly adapt due to the agricultural and planned economy origins deeply embedded in its system. This can be seen through low levels of urbanization, slow development of the service sector, less globalization and openness to foreign investment, and an increased pressure for employment opportunities for the growing population.

In 2006, the Chinese government developed a formal strategic framework for adapting and supporting the economy of central China in order to reduce regional inequalities. This framework calls for the encouragement of independent innovation, upgrading industrial structures, and coordinating regional cooperation and development. The 2009–2015 plan for promoting the development of central China sets out four goals—to accelerate economic development, focus on scientific and technological innovation as a means to growth, achieve sustainable development through environmentally friendly practices, and promote social harmony through equality (National Development and Reform Commission of the People's Rebulic of China 2009).

3 The role of science parks

One approach for promoting regional economic growth through innovation and entrepreneurship is through the development of a science park. Link and Scott (2007) refer to these

parks, specifically those affiliated with a University, as "a mechanism for the transfer of academic research findings, a source of knowledge spillovers, and a catalyst for regional and economic growth." While small firms are less able to sustain long term basic research and universities are unequipped for commercializing theirs (Lindelöf and Löfsten 2004), Ferguson and Olofsson (2004) recognize science parks as a policy initiative that can encourage the growth of new technology-based firms that generate returns on academic research through commercialization.

For example, a study by Link and Scott (2003) documents how the unstable economy in North Carolina after World War II led to the development and growth of Research Triangle Park, a science park which utilized the research of Duke University, North Carolina State University, and the University of North Carolina as a means to attract firms such as IBM and the U.S. Department of Health, Education, and Welfare to the area. Link and Scott (2003) largely attribute the success of the park to the entrepreneurial leadership of Archie Davis and state that "the most successful science parks are those that have benefitted from a continuity of entrepreneurial leadership. Thus, companies are eager to adopt the park's innovative environment and as a result the park grows."

The Key Technologies Program was established in 1983 to revitalize R&D efforts in China, and in 1988 the country began developing national science and technology parks under the Torch Program as an effort to commercialize R&D products (Springut et al. 2011). With these parks came a number of policies, such as subsidies and tax exemptions, to encourage both local and foreign participation and investment (Hu 2007). The Torch Program has since led to the establishment of over fifty science and technology industrial parks in China which have positively impacted their local economies as shown by the average growth rate of over 20 %, higher than the national average (Hu et al. 2010).

The East Lake area of Wuhan, the capital city of the Hubei province in central China, contains a wealth of resources to support a knowledge-based economy including forty-two universities and colleges, more than thirty key national research institutes, four hundred R&D centers, sixty academicians of the National Academy of Science, 20,000 R&D engineers, 200,000 technicians, and 800,000 college students. Within this area is the High-Tech Development Zone of East Lake (HTDZ East Lake) which was created as a science park in 1988 to facilitate technology transfer and knowledge spillovers from the universities and to transform this into innovative activity, commercialization, and ultimately, economic growth. Figure 1 shows the location of HTDZ East Lake in central China as well as the other 52 high-tech development zones. After over 20 years of development, HTDZ East Lake has emerged as a crucial region in China for science and technology resources and a base for high-tech industries, specifically those in opto-electronic information. HTDZ East Lake is the second largest fiber optics producer in the world with domestic and international market shares of 50–12 % respectively.

Impacts such as the global financial crisis and the ever-shifting focus onto entrepreneurship as a means to economic development have presented HTDZ East Lake with both opportunities and challenges. The financial crisis has reconstructed the global competitive environment for science and technology, leading to increased specialization within countries and pressure to capture an emerging and strategic niche through investments in innovative activity. In response, the State Council of the People's Republic of China designated HTDZ East Lake as a National Independent Innovation Demonstration Zone (NIIDZ). As an NIIDZ, East Lake will become a national leader in building an innovative economy, increasing openness by foreign investment and attracting global talents, utilizing environmentally friendly practices, promoting innovation through administrative and

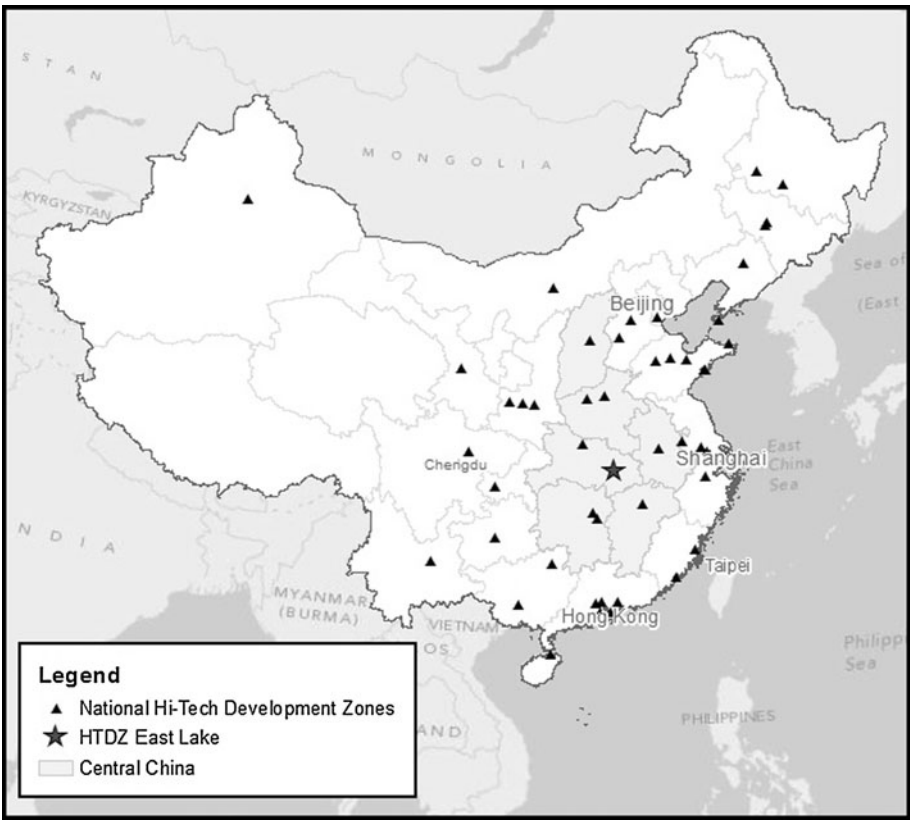

Fig. 1 High-tech development zones in China

financial support, and developing advanced industries through specialization and industrial clusters (State Council of the People's Republic of China 2010).

In addition to being designated as a National Independent Innovation Demonstration Zone, the State Council has also made the city of Wuhan a National Comprehensive Supporting Reform Pilot Zone (NCSRPZ), one of seven in the country. Under this designation, the city will undertake reforms which promote sustainable development through resource conservation and intensive land use, implement innovative financial and taxation policies, encourage networking among industries, and establish cooperative agreements among national ministries and the local governments (Hu and Li 2011). These key designations as well as the history and resources of HTDZ East Lake provide comparative and competitive advantages against other metropolitan cities in the region for developing an innovative, knowledge-based economy and acting as a growth pole for central China.

4 Policies to promote east lake as the growth pole for central China

Economic growth in Central China has suffered from a paucity of entrepreneurship. This could be attributed to a concomitant deficiency of what has been termed as constituting entrepreneurship capital. While public policy has largely been influenced by Robert

Solow's Nobel Prize winning model that econometrically linked physical capital and labor to economic growth, knowledge capital as emphasized by the Romer model and entrepreneurial capital, defined as "the capacity for economic agents to generate new firms" (Audretsch 2007), are also facilitators of growth as is now reflected in a variety of public policies (Audretsch et al. 2006; Audretsch 2009). Entrepreneurship capital includes a variety of regional, social, and individual traits conducive to the start up of new firms.

Saxenian (1996) illustrates the significance of regional culture on economic performance in her comparison of Silicon Valley and Route 128, in which she states, "it is helpful to think of a region's industrial system as having three dimensions: local institutions and culture, industrial structure, and corporate organization…The institutions shape and are shaped by the local culture, the shared understandings and practices that unify a community and define everything from labor market behavior to attitudes towards risk-taking. A region's culture is not static, but rather is continually reconstructed through social interaction." Saxenian (1996) further develops this by characterizing the culture of Silicon Valley in the following: "The region's culture encouraged risk and accepted failure. An entrepreneur who moved to Silicon Valley from Route 128 to start a computer company describes this culture: 'Start-ups here tend to move very fast. The culture of the Valley is a culture of change: the peer pressures and social pressures support risk-taking and people changing jobs a lot.'…Not only was risk-taking glorified, but failure was socially acceptable. There was a shared understanding that anyone could be a successful entrepreneur: there were no boundaries of ages, status, or social stratum that precluded the possibility of a new beginning; and there was little embarrassment or shame associated with business failure. In fact, the list of individuals who failed, even repeatedly, only to succeed later, was well known within the region."

A supportive regional policy to generate entrepreneurship capital regarded as a catalyst for entrepreneurship, the driving force for the development of NIIDZ East Lake. With the understanding of this significance, the Development Plan (2011–2020) of the National Independent Innovation Demonstration Zone of East Lake sets forth to foster a regional, innovative culture so as to form an atmosphere of "encouraging risk and innovation, accepting failure, and pursuing excellence"(State Council of the People's Republic of China 2010).

As numerous studies show, knowledge spillovers occur within geographically bounded regions, and similarly focused firms within geographic proximity exhibit higher levels of innovative activity (Feldman and Audretsch 1999; Jaffe 1989; Jaffe et al. 1993; Glaeser et al. 2002). NIIDZ East Lake utilizes this concept with the development of four specific industrial parks—the opto-electronic innovation park, semiconductor industry park, emerging new technology park, and biological industry park, all containing leading R&D firms for their respective technological fields. In addition to the specialized industrial parks, NIIDZ East Lake will also be comprised of five functional zones—research and innovation, industry cultivation, advanced manufacturing, business services, and business headquarters (State Council of the People's Republic of China 2010).

An important technology transfer policy outlined in the Development Plan (2011–2020) of the National Independent Innovation Demonstration Zone of East Lake is to encourage the development of business accelerators. A business accelerator is the spatial carrier and service network which can satisfy the customized demand from rapidly growing high-tech firms for space, business modes, capital operations, human resources, and technology cooperation through service innovation. Business accelerators are an important link in the innovation chain that can assist firms as they mature. Price (2004)states that "whereas business incubator facilities focus resources on "hatching" new technology-based businesses, the equally

substantial need for maturing existing businesses in their formative years has received less attention. Many economic regions are recognizing the importance of providing continued business development support after a new company is established. Business accelerators have been conceived as a means to support businesses as they meet the challenges of sustaining growth and realizing market potential." NIIDZ East Lake has the following financial support to encourage business accelerators ((State Council of the People's Republic of China 2010):

- Provision premium (up to 10 % for a maximum of 2 years) for loans to business accelerators for infrastructure construction.
- Provision premium (up to 10 % for a maximum of 1 million Yuan per platform) for public service, public technology, and non-infrastructure financing 500,000 Yuan incentive for fostering one initial public offering (IPO) enterprise.

Intellectual property can be a key contributor to the development of a knowledge-based economy as it incentivizes innovative intellectual activity by establishing legal rights to the creators of new knowledge. Though China began adopting intellectual property rights policies in the 1970s, the push for property protection, both domestically and in relation to foreign investors, has increased in recent years (Mertha 2005). The Development Plan (2011–2020) of the National Independent Innovation Demonstration Zone of East Lake sets out four strategies for an effective intellectual property regime that will serve as a conduit for technology transfer and knowledge spillover (State Council of the People's Republic of China 2010). First, the plan encourages the creation of intellectual property by strengthening incentives, authorizing intellectual property applications in accordance with the laws, and emphasizing the firm as the creating entity. Second, intellectual property use will be promoted through financial support and the development of an intellectual property transaction platform. Third, intellectual property will be protected from infringement and the production of counterfeit and inferior goods through improved rights protection assistance. Lastly, the plan promotes the utilization of key intellectual property strategies such as trademarking and global standardization.

One of the biggest obstacles current and potential entrepreneurs face in the formation and growth of a new business is to get access to adequate amounts of capital, and consequently, efforts to lessen these financial constraints are reflected in policies worldwide (Kerr and Nanda 2011). The Development Plan (2011–2020) of the National Independent Innovation Demonstration Zone of East Lake includes two methods of alleviating financial constraints for entrepreneurs. The first is the forthcoming openness of Over the Counter Bulletin Board to NIIDZ East Lake. In China, the security market system consists of three markets: the Shanghai Stock Exchange (SSE), the Shenzhen Stock Exchange (SZSE) and Over the Counter Bulletin Board (OTCBB). Currently, OTCBB only accepts the stocks of non-public-offering corporations from the Zhongguancun Science Park, the first national independent innovation demonstration zone in China. However, on August 3rd, 2012, The China Securities Regulatory Commission announced that HTDZ East Lake will be listed in OTCBB, allowing stocks of corporations from HTDZ East Lake to potentially be traded within this system. Following this, NIIDZ East Lake then announced that a corporation would get 1.2 million Yuan from the government if the stock of that corporation is admitted to be traded within OTCBB. Compared with SSE and SZSE, the threshold for OTCBB is much lower; the requirements for the potential corporations are those with registered capital above five million Yuan and a history of profit of more than two consecutive years. Therefore, the openness of OTCBB to NIIDZ East Lake will provide access to the capital market for existing businesses in their formative years. Second, NIIDZ East

Lake has set up a financing and risk premium fund from the budget of public finance to alleviate financing constraints for startups. The risk premium fund is used to compensate banks and other credit institutions that provide financing for enterprises in NIIDZ East Lake in the event of principal loss up to a maximum of 30 % of the actual loss and no more than five million Yuan (State Council of the People's Republic of China 2010).

5 Conclusions

While the media and public policy rhetoric in the OECD countries has highlighted the astonishing growth rates in China, considerably less attention has been placed on the large disparities in economic development between the urbanized areas and the large region constituting central China. This paper has explained how these economic development disparities constitute a major policy challenge for China. It has also shown that one of the key policy approaches for mitigating these large economic development disparities is the advent of significant technology transfer policies. Through the Chinese technology transfer policies in the central region of the country, a shift is anticipated towards creating a knowledge driven entrepreneurial economy in Central China that may ultimately emulate the growth rates achieved in the more successful parts of the country.

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