

From heavy industry to modern tech hub

Negotiating an economic transition is complicated. The experience of Jinan offers five lessons for other Chinese cities.

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For decades, China built its economic strategy on a foundation of low labor costs and high capital investment. That approach is under pressure. According to the National Bureau of Statistics of China, the size of the labor force has peaked, and capital investment and productivity growth are slowing.

Given global competition and technological change, China must foster a new growth model by developing modern cities with expertise in the fast-growing fields of the future, such as digital and green technologies, pharmaceuticals, and the Internet of Things.

The city of Jinan, located about 500 kilometers south of Beijing, has made concerted efforts in this direction. Based on our research and experiences elsewhere, as well, we believe that Jinan's ongoing transition could serve as an example to other cities in China that are seeking to make a similar transition.

Jinan's economic evolution

Known throughout China as the "City of Springs" for its dozens of natural artesian springs, Jinan has been an important industrial city since the early 1900s. Over the past 35 years, it grew into a metropolis of more than 7 million people, using the traditional template of low-cost labor, high investment, and intense use of natural resources. Home to such giant state-owned companies as Jinan Steel, Jinan Heavy Truck, and Shanshui Cement, Jinan became a regional center of heavy industry.

Over the past decade, the Jinan city government has set out to nudge its economy toward cleaner, higher-value-added industries and to become Shandong province's finance, technology, and innovation center. In 2012, for example, Jinan was allowed to open a free-trade zone; its specialties include logistics, integrated circuits, and advanced manufacturing.

As a result, the structure of Jinan's economy is changing. In 2012, secondary industries (manufacturing and construction) accounted

for 40 percent of the city's GDP and tertiary ones (such as tech and services) 54 percent. In 2016, the figures were 36 and 59 percent, respectively. Foreign direct investment rose more than 50 percent over that period. To take just one sector, the biomedical industry grew 40 percent a year from 2011 to 2015. According to the Ministry of Science and Technology of the People's Republic of China, 59 high-tech enterprises started in Jinan in 2010, and there were 293 such businesses in all. Since then, progress has accelerated, with more than 900 new high-tech enterprises in 2016 and an estimated 1,200 now. The momentum appears to be strong, with the added value associated with high tech increasing 21 percent last year alone. Jinan has become an important site for IT. Its Qi Lu Software Park is home to such major companies as IBM, Microsoft, NEC, and Oracle.

Of course, there is unfinished business; Jinan ranked only 14th in the most recent *Forbes* ranking of best Chinese cities for business. While that is up from 21st in 2011, there is room to do better. The same is true for air quality. Jinan is no longer one of China's ten most polluted cities—in part due to the changing structure of the economy—but is still above global guidelines most days.

Change is difficult, and different cities will face different challenges. Nevertheless, we believe that Jinan's transition so far offers five lessons that other cities in China looking to transform their economies might find helpful.

Build on existing economic strengths

Jinan's new economic strategy replaces smokestacks and mines with smart workshops—but not entirely. By identifying IT as a strategic industry and building an industrial park to support it, Jinan is encouraging both the development of IT and its use in traditional sectors.

One success story is the industrial internet cloud platform built by Inspur, a Jinan-based IT company, to strengthen the city's traditional enterprises.

Using capabilities in data collection, data processing, and industrial applications, Inspur provides solutions to mining, energy, and agricultural clients in areas such as equipment status and quality control. ShanDong Energy used Inspur's platform to integrate 200 million data points from more than 30 data sources; this "corporate brain" helps to monitor the work environment and improve decision making.

Another case in point is Handuyishe. Founded in 2008, it has used digital solutions to disrupt the traditional apparel-manufacturing and -distribution model. As a result, Handuyishe has outpaced its peers and become a major e-commerce apparel company in China. Recognizing Handuyishe's value, the Jinan city government worked with the company to create an incubator to support other e-commerce businesses. Handuyishe provides operational expertise. The government brings policy and regulatory support; city officials even work inside the incubator to be able to provide on-the-spot service. This model has proved so successful that it has now spread to Chengdu, Qingdao, and Shenzhen.

Think in terms of ecosystems

Changing a city's economy should be seen as a long-term effort that takes place over a decade or more. The keys to success are to create an environment for innovation and to be able adapt to conditions as they emerge.

Based on our research and experience, we believe there are five parts to an effective innovation "ecosystem":

- **Knowledge:** scientific and educational institutions that cultivate innovative technologies and share resources
- **Capital:** investment that finances technology commercialization

- **Leading enterprises:** well-managed, mature enterprises that have broad market reach and research and/or manufacturing facilities
- **Innovators:** incubators and start-ups that can promote technology transfers and service upgrades
- **Government:** active, service-oriented government that creates supportive policies and provides the necessary infrastructure

The boundaries among these five elements are not precisely defined; in fact, they are increasingly blurred. Each can affect the other—thus the idea of an ecosystem rather than a linear process. Educational institutions can also be part of the start-up scene, for example, and governments can set the rules for capital investment. A partnership model between the public and private sectors is therefore an important element that can enable success.

Jinan is on track to create such an ecosystem. To develop its healthcare industry, for example, the city's High-Tech Zone Administrative Committee is connecting local and foreign companies and research institutions in areas such as stem-cell application, gene detection, and low-temperature freezing.

In another example of an ecosystem at work, in 2011, Shandong's Science and Technology Department provided funding and a research lab to attract China's leading expert in quantum communication, Jian-wei Pan, to establish the Shandong Institute of Quantum Science and Technology. Six years later, Jinan's government became China's first commercial quantum-security-communication network.

Encourage entrepreneurs in fast-growing sectors

To support long-term organic growth at relatively low cost, it is better to concentrate on incubating high-potential start-ups and encouraging entrepreneurs than picking individual winners.

Consider Jinan's effort to become a center for plant gene editing. Instead of paying to bring in a major company, in May 2018, the city attracted Jian-kang Zhu, a renowned plant scientist. Jinan will provide financial and logistical support for Zhu for the next ten years to promote the seed industry and to industrialize plant genetic-editing technology. The city government has committed to providing financial support for construction, as well as to providing high-quality services.

Jinan is also working with Germany to promote small and medium-size enterprises (SMEs), which are the backbone of Germany's powerful manufacturing industry. In 2016, Jinan launched the China–Germany SME Collaborative Innovation Center in Stuttgart to serve as a bridge between the two countries' SMEs. This helps Jinan-based companies get access to German markets and find local partners. In Jinan itself, a Sino–German industrial park is specializing in new materials.

Create space for future innovation

With technology changing so fast, governments should consider emphasizing flexibility—for example, putting aside some assets, such as capital or land, to be deployed as new opportunities emerge.

The development of Shandong's pilot zone illustrates this principle, literally at the ground level. This large area of former farmland near Jinan will include a central city area and several small industrial towns to be created from scratch. Construction began in August. Authorities have designed an economic strategy that combines a sense of direction with flexibility, emphasizing four areas: high-

end manufacturing, cross-industry technology, industrial services, and high-value consumer goods and services. High-polluting and energy-intensive industries are ruled out.

The cities will be self-sustaining, and there is land set aside for use when additional opportunities arise. The plan is to build the core downtown area in the next two to three years and then develop the rest over the next 15 to 20 years. The goal: have a thriving community of 1.6 million people by 2035. Starting from scratch is an easier way for Jinan to test new city-development concepts. It can then learn from its experiences as it expands. For businesses, the benefit is access to land and services.

Put people at the center of urban 'placemaking'

City planners should think about going beyond the standard concepts of the industrial zone, the science park, or the central business district. Instead, they could be thinking of urban development in broader terms—that is, of fulfilling the needs of the city's residents while also cultivating the social connections that can create communities of innovation.

To connect people this way requires good transportation networks, convenient commerce, mixed-use buildings, parks, distinctive neighborhoods in which people can both work and play, and a variety of living and working environments. All this creates an energetic vibe that enhances communication and encourages spontaneous interactions.

The pilot zone previously mentioned incorporates many of these principles. Jinan's high-tech district, which dates to the early 1990s, is also being redeveloped along people-centric lines. New facilities, such as hospitals, housing, and entertainment venues, are being built in an effort to make it a 24-hour place—lively, balanced, accessible, and open.

Jinan is using concepts that are new to Chinese urban planning to create these communities. One is the “city center innovation community.” The premise is for incubators to be in proximity to commercial, green, and living spaces. New high-rise buildings will be home to a variety of functions, such as stores, apartments, government offices, business incubators, labs, and a subway station.

Another concept is the promotion of co-living and co-working arrangements. The idea is to provide quality spaces that can be shared at a reasonably low cost to attract innovative people. Co-living rental apartments, for example, feature shared kitchens as well as communal areas such as a library and gym. Co-working offices have an open working space, independent meeting rooms, and private conversation areas plus facilities and supplies for start-ups. Shared labs, research equipment, computing devices, databases, and literature are available; there are also affordable display spaces for entrepreneurs and designers. The city government now is working with real-estate developers and operators on this concept.



Jinan is not one of China’s richest or most famous cities. But it does have its own claims to fame. It is the capital of Shandong province, the birthplace of Confucius 2,600 years ago. And just last year, it made international news when it opened the country’s first solar highway. The five lessons of transformation discussed in this article reflect this context, combining as they do a respect for tradition with a focus on the future. This has proved to be a winning formula for Jinan—and one that China’s other industrial cities can adopt, too. ■

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