



A comparative study of Chinese and Iranian Science & Technology, and techno-industrial development policies



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ARTICLE INFO

Article history:

Received 12 August 2015

Received in revised form 10 June 2016

Accepted 12 June 2016

Available online 2 July 2016

JEL classification:

O1

O3

O5

O32

O250

Keywords:

S&T policy

Industrial policy

China

Iran

Developmental state

ABSTRACT

This paper argues that for rapid technological catch-up of latecomer economies industrial policy, active control, and guidance of the market by the state are required. In this framework, the paper compares science and technology, as well as industrial policymaking mechanisms of China and Iran. The similarity of recent histories of the countries, which may have led to similar institutional transformations, makes such a comparative analysis meaningful. The study describes S&T and industrial policy-making systems of the countries, uses a case study for each to assess the degree of effectiveness of the states in assisting the technological learning of the enterprises in their respective countries, and delineates differences and similarities between the two policy-making systems.

The study concludes that Chinese government is actively involved in assisting the state-owned and other enterprises in gaining technological capabilities, and thus is acting as a developmental state. On the other hand, I find that the state's efforts in Iran in technological learning are mostly in the realm of S&T policy making. The role of the state in Iran in this regard can best be characterized as market-friendly since it has no centralized, active, and direct involvement in the techno-economic development of the enterprises.

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1. Introduction

One of the prerequisites for an innovative economy is the presence of firms with advanced technological capabilities. The companies in general, but the leader enterprises in particular, in the industrially developed economies, have accumulated great amounts of formal and tacit technical knowledge. In contrast, firms in the developing countries do not possess the technological capabilities to produce many manufactured goods let alone to be innovative and globally competitive. To assist the firms to overcome their latecomer status and help them to become competitive in the global markets many governments in the developing countries invest heavily in creating the necessary conditions for industrial growth and technological capability building. However, in spite of active involvements in science and education infrastructure investments, many of these governments play a passive role in promoting technological learning of the domestic firms. The passive participation of these states in the industrial development is often manifested by merely

supplying the tools to be used by private and public enterprises for technological capability building. The mere provision of the tools such as adopting science & technology (S&T) development policy, fiscal policy, and financial assistance policy to promote technological learning, has proved to be inadequate for technological capability building of latecomer enterprises in many developing countries. Technological learning requires initiative and active engagement of the entrepreneurs. However, mostly due to the small size of many enterprises in developing countries, entrepreneurs do not have the necessary resources to devote to technological learning and R&D. For example, the data show that 70% of manufacturing establishments in Iran employ 10–49 workers and 14.3% employ between 50 and 99 employees (Statistical Center of Iran, 2012). The companies with fewer than 100 employees are considered small or micro enterprises in many industrialized economies. The attitude of the executives of latecomer firms in many developing countries regarding R&D investment is well represented by the chaff of executives of small and medium-sized Chinese firms who proclaim “Not to invest in innovation is waiting to be killed, but engaging in innovation is seeking to be killed” (Wang, 2013; p.79). In such an environment, the government should fill the gap by acting as an entrepreneur. The industrial policy states of Europe and Asia have assumed such a role and have succeeded in assisting some of the domestic firms to become innovative and globally competitive (Chang, 1993, 2003; Kim, 2003).

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¹ I have benefited from discussions with Professor Ling Chen of Tsinghua University, Beijing, China in writing this paper. This paper has also benefited from valuable comments from an anonymous referee.

The experiences of Japan, post-revolutionary China, South Korea, and the Island of Taiwan, just to name a few East Asian industrial states, have proved that active involvement of the government in control and guidance of the market is the first step on the long road to forming an innovative, globally competitive economy. Moreover, the experiences of latecomer countries have shown that the later a country starts to industrialize, the greater is the need for government intervention in industrial development. (Gerchenkron, 1962).

Both China and Iran are engaged in the development of advanced technologies, even though China's government became actively involved in large-scale industrialization decades before Iran. Although the pre-revolutionary governments in both countries were inadequately and insignificantly involved in industrial development decades before the revolutionary transformations of the countries, the serious industrialization efforts, by relying on indigenous human resources and independent development of technology, did not begin until after the revolution in each country². China, of course, in addition to being technologically more advanced than Iran even in the first half of the 20th century, began the industrialization processes three decades before Iran. Accordingly, concerning technological capabilities, science & technology and industrial policy making China has several decades of additional accumulated knowledge and experiences compared to Iran.

Developmental economists have well documented the view that without control and guidance of the market by the states, rapid technological catch-up by technologically latecomer countries such as Japan, and S. Korea would have been infeasible (Amsden, 1989; Chang, 1993; Johnson, 1982). To appreciate the important coordination role of the government in achieving technological progress, this study examines the entrepreneurial function of the state during institutional transformation resulting from the social revolution in China, in 1949, and in Iran, in 1979. Specifically, this study aims to compare the bureaucratic structures of technological and industrial policy making in China and Iran. It would also use case studies of the actual techno-industrial policies to illustrate the degree of success of the industrial policies in the countries. It turns out that a complex web of policy-making apparatus for reaching the goals of industrial development, technological learning, as well as guiding and supporting the firms to become innovative exists in both countries. However, it appears that policy-making in China is at a more advanced stage of development than policy-making in Iran. China has ushered in using industrial policy for techno-economic development while Iran is lagging in this area.

This study contains ten sections. After the introductory comments in Section 1, Section 2 deals with the theory of structural transformation and provides a rationale for comparing techno-industrial policy making systems in China and Iran. Section 3 discusses the power structures for S&T and industrial policy making in both countries. In Section 4, the focus is on the national S&T decision-making authorities in Iran, while Section 5 examines the national S&T and industrial policy formulation mechanism in China. Additionally, this section deals with recent changes in techno-industrial policy making in China. In Section 6, the current industrialization policy and its supervision in Iran are discussed. In Section 7, an overview of the Petroleum and Natural Gas industry in Iran is given, and a case study of technological achievements of two main SOEs in the Petrochemical industry is presented. In Section 8, a case study of the aircraft industry in China as an example of China's industrial policy is reviewed. In Section 9 the paper compares S&T and techno-industrial policy-making systems of the countries, and finally, Section 10 provides a summary and conclusions of the study.

² I consider the pre-revolutionary industrialization efforts in both countries insignificant and inadequate because both countries were suffering from technological backwardness at the times of the revolutions, and both countries have experienced significant technological progress during the years since the revolution.

2. Structural transformation, the Asian industrial states, and rationale for comparing S&T industrial policy-making systems in China and Iran

The three successful industrial states of Japan, China, and S. Korea, as well as Iran, share some common characteristics: All had experienced devastating war, and in the cases of China and Iran, social revolution. All had gone through a massive structural transformation, where structural transformation refers to significant changes in technology and institutions³.

Of course, structural transformations under the normal developmental process of the economies are routine and in most cases are not catastrophic. However, these changes qualitatively differ from the structural transformation resulting from wars or social revolutions. Under the normal developmental processes, transformation takes the form of innovation, what Schumpeter called "creative destruction," that is, the changes that occur because of the emergence of new products or production processes and vanishing of the old products and methods of production (Schumpeter, 1942). War, with consequential political effect or a social revolution, brings about much faster and deeper transformations in institutions such as production relationship, property rights, new laws and regulations, and eliminates the old ones, alters political institutions, and redefines power relationships.

During "normal" processes of structural change, the individual owners of the means of production face much uncertainty due to lack of the required information for coordination of their collective, interdependent economic activities. The level of uncertainty tends to increase in hostile environments emerging from war and revolution, which heightens socio-economic conflicts. The entrepreneurial confusion and greater uncertainty increase the need for a central coordinating agent. The state is the only viable central authority, which may have the necessary wherewithal to act as the coordinator of these economic activities with the aim of achieving pleasing results by its coordination efforts.

In its coordinating role, the state must accomplish three important tasks: Act as an entrepreneur and provide a "vision" for the future activities of the entrepreneurs, set up institutions to reach the goals articulated in the vision, and resolve conflicts emerging from the working of the economic system (Chang, 2003).

2.1. Similarity of the Chinese and Iranian recent histories

The economies of the People's Republic of China and the Islamic Republic of Iran are vastly different concerning the size of the gross domestic products (GDP), institutional arrangements, technological capability, and the population. China's GDP in 2015 was ranked the second highest globally using the United States dollar and was estimated to be \$11.385 trillion while Iran's GDP was ranked 28th and stood at only \$397 billion in 2015. Adjusting for the population differences between the countries, Iran's per capita, current U.S. dollar GDP was \$5045 and China's per capita GDP was estimated to be \$8280. However, using purchasing parity power exchange rate⁴, Iran's per capita income (PPP 17,572) was higher than China's per capita income (PPP 14,771) (Knoema, 2016).

A question may arise regarding the legitimacy of comparing the technological policy-making bureaucracies of China and Iran. After all, given the vast socio-political, institutional, technological, and cultural differences of the countries, is such a comparative study meaningful? A cursory look at the history of the countries during the 20th century,

³ Institution refers to organizations as well as the "... sets of rights and obligations affecting people in their economic lives" (Matthews, 1986, p. 905).

⁴ Purchasing power parity exchange rate is that exchange rate that makes the average price of a bundle of goods in the home country equal to the average price of the same bundle of goods in the foreign country when both price levels are expressed in the same monetary unit. For a detailed discussion of purchasing power parity theorem, see Soofi and Zhang, 2014, particularly chapter 11.

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