

# Can China Change Its Industrialization Path? Beyond the 2004-2005 Industrial Policy Debate in China

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The chemical accident in Fujian Province in April 2015 and frequent winter smog that often covers a large number of eastern Chinese cities have resulted in policy debates similar to the one held 10 years ago. The topic of these debates is, "Does China need to change its industrialization path?" By reconsidering the 2004-2005 Debate, the paper will focus on the policy content behind the controversy of economic theories and beyond, namely, the relationship between the theories and formation of policies in which stages of diversification and the M-form of Chinese governance are highlights. We conclude that China has experienced environment-forcing and state-oriented economic development paradigm shift.

*Keywords:* Industrial policy, Chinese economy, Hoffmann index, M-form

*JEL Classification:* E02, L52, O25, O53, P51

## I. Introduction

Following the explosion in the paraxylene (PX) plant in Southeast Fujian Province in April 2015, relatively few news reports have been written not only to describe the catastrophe, but also to disclose information on additional plants intended to be built in other provinces because of the proven appreciably lucrative nature of PX. However, inhabitants of those profit-oriented cities have demonstrated completely contradictory attitude toward the plans. Naturally, the central government stands with the ordinary people.

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The chemical catastrophes, the frequent sand storms in spring, as well as the more frequent smog in winter and even in autumn have already given rise to policy debates similar to the one held 10 years ago on the same topic, "Does China need to change its industrialization path without the heavy ratio from state-owned investment and with other targets than unsustainable heavy industry (HI)?" (Wu 2007)

The debate 10 years ago was induced by a researcher from a national think tank, and lasted for over two years. Nearly all of China's renowned economists were involved, including Professor Wu Jinglian, Professor Li Yining, and Professor Justin Y. Lin, who were virtually the representatives of three different groups. The 11<sup>th</sup> Five-Year Plan (FYP) of the year 2006-2010 provided an answer from the central government, who stated explicitly that China should be transformed along a new industrial path with lower ratio of HI investment. However, the path was not changed immediately. According to official data, the amount of HI investment in China remained at an upward trend before and after the debate, and continued even in recent years, although state share in HI has been deliberately reduced.

The debate and following policy process give rise to several questions. One question concerns the "strong government" position in China and other East Asian countries, that is, as one of the main former characteristics of East Asian miracles, are the public policies (WB 1993) still effective? Another question relates to the first question; if these public policies are ineffective, does it imply that East Asian economies are following the institutional paths of the West, only with a time lag (Aoki 2013)? Or is there a half-way option with the challenge of sustainable development and late industrialization?

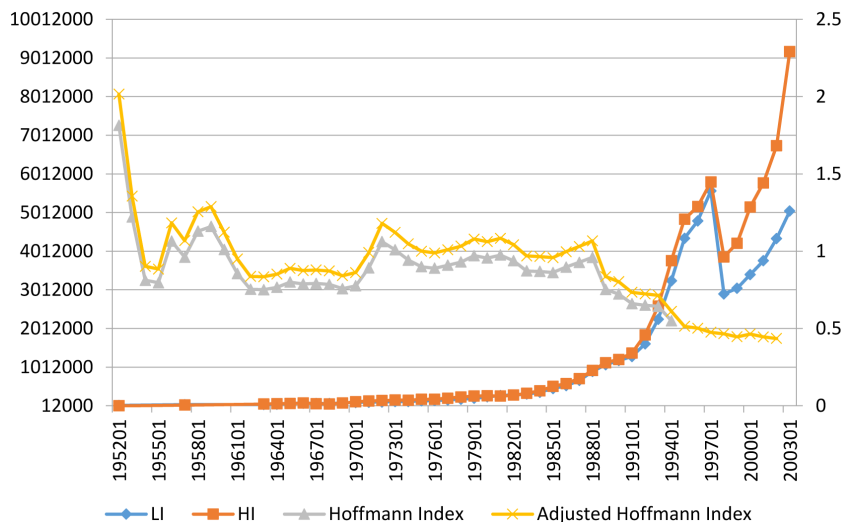
In the next section, we describe the background of the debate, with a retrospective on the HI development in China. The section III reviews the entire process of the debate, and compares the following policy with its reaction through the sector data analysis. In section IV, we analyze the dilemma between market and state to argue that the previous strong government is facing a real challenge from the market. However, the environmental issue also poses a challenge to the government, and developing countries (including China) are forced to upgrade the industrial structure in a global context. In section V, an extensive study of other East Asian economies is conducted to explore the theoretical discourse of the policy debate. Section VI concludes with reference to the "One Belt One Road" policy.

## II. Background: HI in China

China has adopted a different classification scheme of industries from the *International Standard Industrial Classification of All Economic Activities* (ISIC). Before 2013, all industries were divided into two categories, following the economic guidelines from the former Soviet Union, namely, heavy industry and light industry. Light industry (LI) refers to the “industry that produces consumer goods and hand tools. It consists of two categories, that is, industries using farm and non-farm products as raw materials depending on the materials used,” while heavy industry (HI) refers to the “the industry which produces capital goods, and provides various sectors of the national economy with necessary material and technical basis. It consists of the following three branches, that is, (1) Mining, quarrying and logging industry; (2) Raw materials industry such as smelting and processing of metals, coking and coke chemistry; and (3) Manufacturing industry, which processes raw materials for other manufacturing sectors.” (See Appendix)

In 2013, the industries were re-grouped according to the fourth revision of ISIC (ISIC4) into (1) mining, (2) manufacturing and production, and (3) supply of electricity, heat, gas, and water. The new system is called *National Industrial Classification of All Economic Activities* (GB/T 4754-2011). Therefore, no new data exist for light and heavy industries since 2013, and the statistical terms were used only for 60 years since the Liberation in 1949.

Syrquin, and Chenery (1989) distinguish the industries under ISIC code 35-38 (ISIC1) to heavy industry, namely, chemicals and rubber (35), non-metallic minerals (36), basic metals (37), as well as metal products and machinery (38). These categories differ from the Chinese definition of HI in dealing with mining, quarrying, and logging industry (MQL). Another classification, which consists of consumer goods and capital goods industries or heavy and chemical industry (HCI), was made by W.G. Hoffmann (1958, p. 31). Both two methods are less comprehensive than the Chinese method, because the Chinese scheme includes all of Code 1 (mining, B in ISIC4) and a part of Code 3 (manufacturing, C in ISIC4). Available value-added data on Chinese industries demonstrate that MQL industries contribute 15-20% of the total HI amount. In the case of gross output, the value is approximately 7-10% during 1993-2002. The difference between the Chinese HI's definition and other versions can be attributed to the legacy of product-oriented and industry-chain-



Note: Because of issues with data availability, Hoffmann Index, which equals to LI output value/HI output value, is calculated using the gross output value instead of value-added. The MQL value-added is deducted to calculate the Adjusted Hoffmann Index, and pertain to the difference in statistical scope for HI in China.

Source: Gross output value of HI and LI from CEIC data; Hoffmann Index and Adjusted Hoffmann Index are the author's calculations.

**FIGURE 1**  
HOFFMANN INDEX OF CHINA (1995-2002)

oriented tendency in the central planning before 1978.

In contrast to the bottom-up industrial transformation in the free market system, the Chinese government has adopted a Soviet economic strategy since the first FYP (1953-1957), which gave top priority to HI. The resultant industrial structure was in contrast to the one according to Chenery, and Syrquin Norms (1989) or Hoffmann Index (1958, p. 146).

In the first two to three years, the Hoffmann Index was above 2, which characterized the first stage of industrialization from the output ratio viewpoint. From 1955 onwards, most of the data lay between 0.7 and 1.3. After the Asian Financial Crisis, the Index ascended from 0.7 to nearly 0.5. If we simply refer to the Hoffman Index, this industrial development may be considered entirely quick and successful given such a short period. However, as we have pointed out before, the industriali-

zation path had depended on an unbalanced economic policy and over 80% of the aggregated investment in HI and did not involve the process of free market adjustment. Only two exceptions could be found during the long HI-inclined development. The first exception was during the early 1960s, with the failure of the Great Leap Forward Campaign, which had a profoundly negative effect on HI in China. The second rebound period was at the turn of the 1980s, in the years during the implementation of the opening policy. The vast newborn small and medium enterprises during that period in both urban and rural areas had instant impetus on investment in LI, which had lower requirement for capital and relatively higher return than HI.

### III. Debate on the Industrialization Path

With the background of high ratio of HI investment and continued strong control of the government, the debate on industrialization path kicked off at the beginning of the new millennium.

A group of researchers from the Development Research Center of the State Council (DRC), one of the most important official think tanks in China, submitted an economic report (Li *et al.* 2003) to the central government to demonstrate that China had now entered into a new stage of HI industrialization.

The report was not given considerable attention until the drafting of the 11<sup>th</sup> FYP, when one of the leading economists, Professor Wu Jinglian, submitted a counter-proposal to the State Council in July 2004, arguing that the Chinese HI path had become unsustainable and that a new reform agenda without overheated growth of HI should be pursued. As a leading consultant for the Chinese government, Professor Wu's arguments are based fundamentally on policy practice instead of normative theories. In his later report contributed to World Bank's East Asian studies, he summarized his symbolic 40,000-word proposal with four conditions for traditional industrialization path and seven consequences if the path was not be altered (Wu 2007). The latter is dubbed "seven stages of grief" by both Wu's supporters and opponents. The sustainable conditions include government's control over important sources, GDP as a benchmark for political achievements of local governors, a production-oriented value-added tax regime, and distorted resource prices. Those existing conditions lead to an overheated HI investment and overburdened HI sectors. If the policies were not adjusted, the following consequences

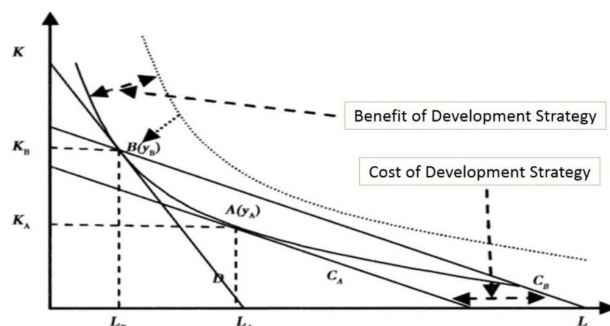
would have caused definite damage to the Chinese economy, such as distorted allocation of resources, delays in technological innovation and product upgrading, shortages in natural resources, worsened ecological environment, inhibited development of service sectors, inefficiency of capital investment, and long-term accumulated financial crisis.

Professor Wu's opponents come mostly from universities, and among them were two chief scholars, Professor Li Yining and Professor Justin Y. Lin from Peking University.

Professor Li's argument is particularly influential. He uses examples of advanced economies, such as those from the UK, the US, and Germany to demonstrate that without exception, all of China's models of development have experienced the HI stage. His students and followers refer to the Hoffmann Index quoted by DRC researchers to support Li's claim. Hoffmann's conclusion (1958) on the common pattern for industrialization gained increased popularity in academic circles in China.

We propose two possible reasons for Hoffmann's popularity in China. The first is because of the focus of Hoffman's book. The book deals with industrialization and not general economic development, which is consistent with the policy aim of China. Furthermore, Hoffmann concludes separately with concrete and practical ratios, that is,  $5(\pm 1)$ ,  $2.5(\pm 1)$ , and  $1(\pm 0.5)$  for the four stages of industrialization, and with lower data on the fifth stage, making it absolutely convenient to study by both researchers and local officials. Second and probably more important is because of the procyclical tendency in the book. The author states firmly that "on the whole, government action has tended to foster rather than hamper the normal trend of industrial change," (Hoffmann 1958, pp. 110-111). Having a non-interference standpoint is highly necessary for different groups.

Compared with Professor Li, Professor Justin Y. Lin (another Wu's opponent) is similar to Professor Li's views on the non-interference tendency of economic policy. However, he differs from Professor Li in that he holds strongly for the comparative advantage (CA) theory, which is beyond his neo-classical standpoint. He is not a supporter of a totally free market, but a revisionist concerning his moderate attitude toward development strategy. His arguments have been systemized into the New Structural Economics (NSE) during his official term in the World Bank (Lin 2011). In the debate, he criticized the industrialization strategy in the 1950s, because according to the CA principle, it was unreasonable. However, the structural upgrading since 1978 has been achieved through market power, thereby requiring maintenance of the path.



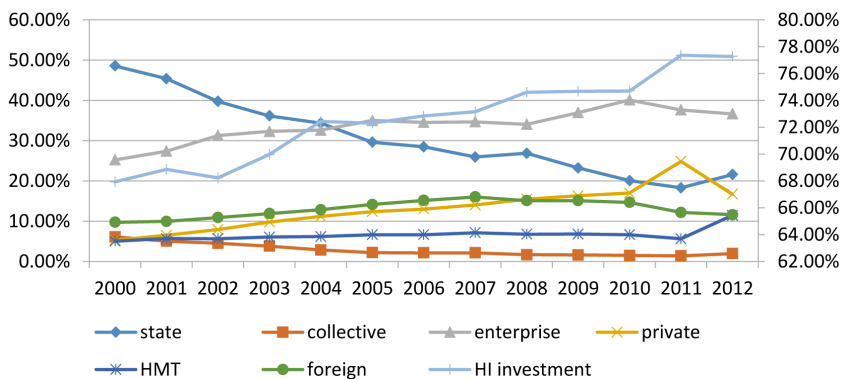
Source: Fu 2014.

**FIGURE 2**  
AN EXTENDED FRAMEWORK OF LIN'S NSE

Fu (2014) extends Lin's framework with an analysis of benefit and cost of development strategy. In fact, all developing countries are rich in labor endowment instead of capital, but nearly all of those governments tend to implement development strategies with more capital-intensive sectors during the initial industrialization stage (Kim 2015), that is, at Point B, not A. The choice at B is conducive to the technological upgrading for enterprises with the promotion of dynamic CA-oriented governments. If the benefit of the policy is more than the cost, and the policy proves to be sustainable, then the CA is self-fulfilled, and the upgrading can be completed successfully. We can conclude from Lin's argument and Fu's extension that policy distortion during the structural change is reasonable as long as the net benefit proves to be positive.

All the arguments above demonstrate that structural change is the key point for Chinese economic growth. The difference lies in understanding the upgrading of the second sector and the attitude toward government interference. All arguments have been proven accurate, but along a different timeline.

The debate was ended by the new 11<sup>th</sup> FYP in 2005. In the third chapter of the plan, upgrading of the second sector is claimed to be resource-saving and environment-friendly in accordance with the principle of "following a new industrialization path" (State Council of China 2005). Undoubtedly, Professor Wu's proposal was accepted in the plan, and the government intends to follow decisively a non-HI industrialization path. In the following period of implementation, the Chinese government



Source: National Bureau of Statistics of China, Available at: <http://data.stats.gov.cn/>

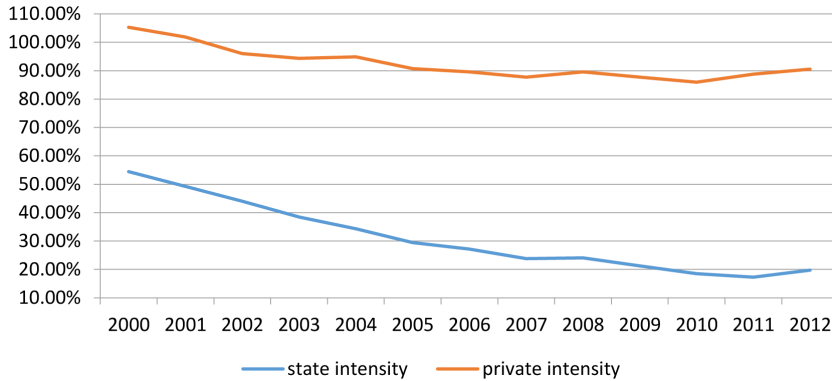
**FIGURE 3**  
YEARLY HI INVESTMENT IN CHINA (2000-2012)

has reduced its investment in the HI sector dramatically, along with the privatization of state-owned assets.

Does the policy matter? The reality was initially consistent with Professor Li's view on Chinese Economy. After the debate and the following policy on anti-HI investment, the investors have yet not to be hindered, and the HI investment has increased dramatically even until recent years. The yearly HI investment increases from 20% of the entire industrial part to over 70% in 2012, with state investment amounting to only 20%, whereas private investment, including domestic and foreign sources, hold over 50%.

We calculate the HI investment intensity of the state and private sectors separately to remove the privatization effect of state-owned assets during the same period. State HI intensity remained under the same trend with investment data, that is, a dramatic decrease from 2000 until 2011. However, a slight upward trend was observed in 2012, when the new government was preparing to take office. Private HI intensity exhibited a stagnant curve after the new policy, with spikes upward in certain circumstances. Although the amount of state HI investment was reduced to convey a strong signal to the market, the private sector did not follow the signal and instead made a virtually independent decision to maintain its investment strategy. Confronted with the possible systematic risk, the private sector increased investments while waiting for





Source: All investment data are obtained from the National Bureau of Statistics of China, Available at: <http://data.stats.gov.cn/>; state and private intensities area obtained through the author's calculations.

**FIGURE 4**

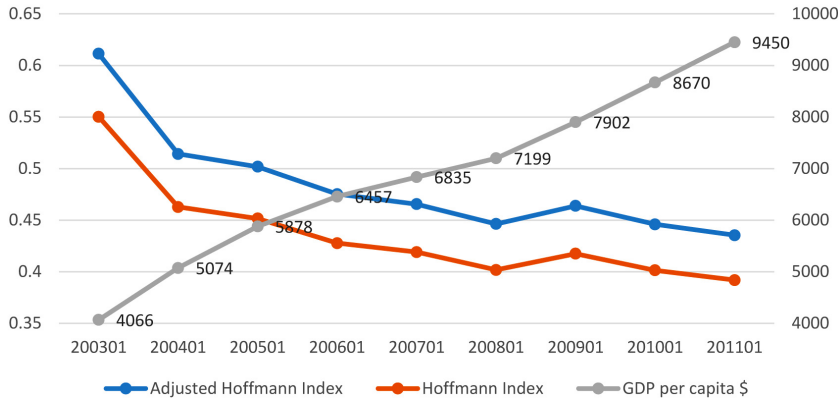
STATE INVESTMENT INTENSITY VS. PRIVATE INVESTMENT INTENSITY IN HI IN CHINA (2000-2012)

further signal from the government.

#### IV. Dilemma between Market and State

In terms of the data obtained, Professor Li and his followers demonstrate forward-looking pro-HI arguments. However, HI development in China is not related directly to the policy process. Hence, from this perspective, the development cannot be attributed to the theories of Li or Hoffman, but rather the success of the market system.

Syrquin, and Chenery (1989) provide a structural change norm through a cross-country study (1950-1983) in which the ratios of LI and HI are along the lines of 1.7, 1.3, 1.0, 0.8, and 0.7 at the level of GDP per capita from 300, 500, 1000, 2000, and 4000, respectively (1980, USD). Haraguchi (2014) adopts a similar method for dividing early, middle, and late industries as that utilized by Chenery, and Taylor (1968), and describes the development pattern with more recent UNIDO data (1963-2007). Compared with these preliminary studies, China's industrialization path is distinctly over-speeded because of the previously unbalanced policy (See Figure 5). Hence, the question then becomes, "When did the transformation appear?"



Note: To maintain comparability through the entire research period (1952-2011), Chinese yearly GDP per capita is calculated from RMB data using the official exchange rate. Because of issues data availability, Hoffmann Index, which is equal to LI output value/HI output value, is calculated using the gross output value instead of value-added. The MQL value-added is deducted to calculate the Adjusted Hoffmann Index pertaining to the differences in statistical scope for HI in China.

Source: Gross output value of HI and LI are obtained from CEIC data; GDP per capita from the CEIC data; author's calculations

FIGURE 5

HOFFMANN INDEX OF CHINA 2003-2011

Imbs, and Wacziarg (2003) demonstrate another form of industrial evolution in the different stages of economic development. As the per capita income increases, the sector concentration follows a U-shaped pattern in accordance with specialization and geographic agglomeration. They observe that the minimum point occurs when per capita income equals approximately USD 9,575 per year (See Figure 6), and in China's case, the country still remains at the pre-specialization phase (1969-1997) (See Figure 7). Zhang, and Cheng (2007) calculate the Gini Index for China from 1988 to 2008, and obtain a similar U-shaped pattern with the minimum point at the level of per capita income of RMB 11,129. The turning year is 2003, which is similar to the turning point of the industrialization policy (See Figure 8).

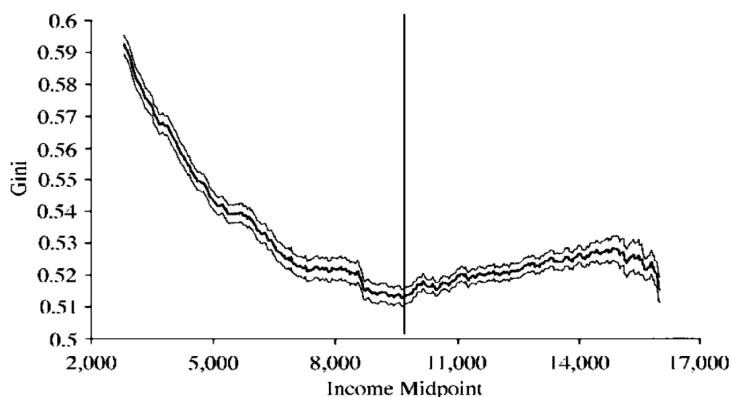
The theory of specialization stage contributes to the understanding of China's private investment into the HI. Sector concentration leads to more investments in HI because of the high possible return from the scale economy and the tendency of specialization, which is a reasonable al-

**TABLE 1**  
DEVELOPMENT STAGES OF MANUFACTURING INDUSTRIES

Early	Food and beverages, Tobacco, Textiles, Wearing apparel, Wood Products, Publishing, Furniture Non-metallic minerals
Middle	Coke and refined petroleum Paper Basic metals Fabricated metals
Late	Rubber and plastic Motor vehicles Chemicals, Machinery and equipment, Electrical machinery and apparatus, Precision instruments

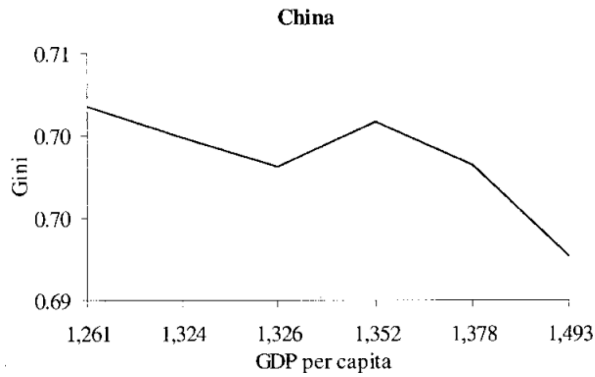
Note: Manufacturing subsectors are classified into early, middle, and late industries if an industry's share in GDP is estimated to peak before USD 6,500 GDP per capita in PPP (constant 2005 prices), between USD 6,500 and USD 15,000, and after USD 15,000, respectively. These income ranges correspond to our income classifications: low and lower middle, upper middle, and high incomes in terms of GDP per capita PPP. Table 1 lists the industries that peaked at the lowest income level up to those that peaked at the highest income level in terms of their value added share in GDP. Industries that peaked at approximately the same income level are listed horizontally.

Source: Haraguchi 2014.



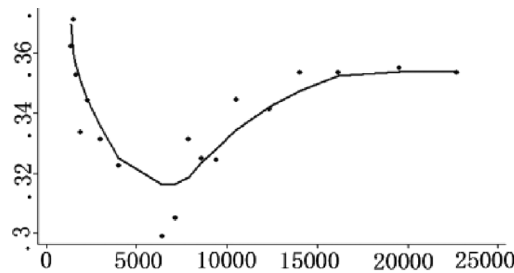
Source: Imbs, and Wacziarg 2003.

**FIGURE 6**  
ESTIMATED CURVE OF SECTOR CONCENTRATION-  
GINNI INDEX-UNIDO THREE-DIGIT VALUE-ADDED DATA



Source: Imbs, and Wacziarg 2003.

**FIGURE 7**  
GINI AND INCOME PER CAPITA IN CHINA- ILO  
ONE-DIGIT EMPLOYMENT DATA

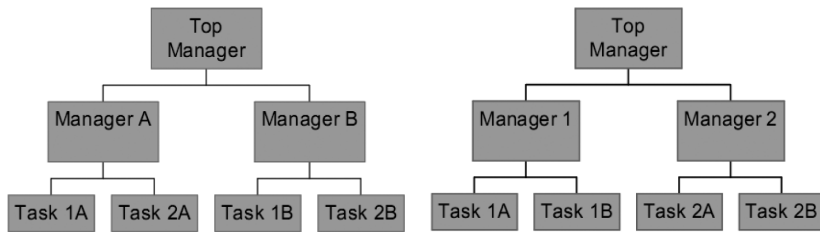


Source: Zhang, and Cheng 2012.

**FIGURE 8**  
GINI AND INCOME PER CAPITA IN CHINA (1988-2008)

location of resource with the increase in income and conforms to Professor Lin’s argument.

Market evolution was strengthened within the M-form organizational structure of the Chinese local governments (Qian, Ronald, and Xu 2006). One of the most important forces of China’s HI boom after 2004 originated from the pooling effect of local investments, such as the swarming PX projects at that time. Local officials were responsible for the growth rate in their own regions, and were free to some extent, to implement regional industrial policies.



Source: Qian, Ronald, and Xu 2006.

**FIGURE 9**  
M-FORM VS. U-FORM ORGANIZATIONAL STRUCTURE

The Soviet economy can be viewed as a gigantic U-form coordinating specialized production in the whole economy... The U-form organization was also replicated at the level of individual ministries... In contrast to the Soviet Union, central planning in China was organized mainly along territorial lines. Regional governments were responsible for the whole array of production in their region... The Chinese economy can be viewed as one gigantic M-form where each region resembles a division in an M-form corporation. (Qian, Ronald, and Xu 2006, also see Figure 9)

At the turning point of specialization, many local governments pooled physical and financial resources for large-scale projects in sectors, such as automobiles, steel, and iron to improve their political achievements. Most collective-owned enterprises are under the control of local governments. Furthermore, the race-to-the-bottom competition for FDI induced foreign enterprises to establish business not only in the East developed area, but also in the West undeveloped provinces, despite the possible negative effects on the environment.

The environmental factor simply leads to an attitude change in ordinary people toward the industrialization path, and forces investors to decrease the HI share of their investment. From this perspective, Professor Wu is correct in the long term. The new government has reinforced the trend and adjusted the M-form structure of local governments through a series of effective measures.

## V. East Asian Experiences

Other East Asian countries, including Japan (Yang 1990) and Korea (Kim 2015) have also experienced an HI policy and investment boom

**TABLE 2**  
HEAVY AND CHEMICAL INDUSTRY DRIVE IN SOUTH KOREA

	1972	1976	1981
GNP per capita (USD)	302	488	983
HCI Share in Manufacturing Value-Added (%)	35.2	41.8	51.0
HCI Share in Manufacturing Exports (%)	27.0	44.0	60.5

Targets: 10 billion USD in exports and 1,000 USD in per capita income by 1981.

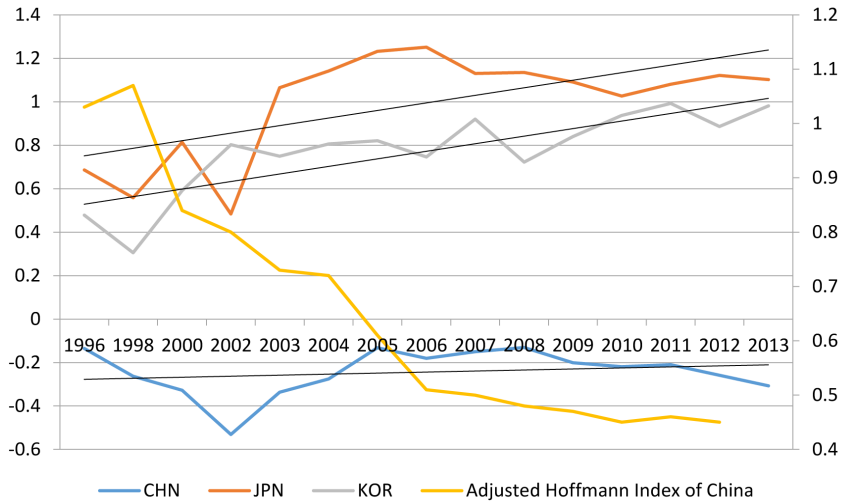
Source: Lim 2012.

after World War II. If we attribute nearly all the policy impetus in China to its socialist ally, then we cannot explain Japan and Korea's policy processes using the same feature. In this section, we intend to discuss the correlativity between the regulation efficiency and HI to complete the policy debate.

The experience of South Korea conforms to the three-stage theory of Auty (1994), that is, the HCI big push construction boom, a GDP slow-down, and a HCI Rebound. Table 2 shows the first stage of big push during the period of 1975-1980. Both the HCI share in manufacturing value-added and manufacturing exports increase distinctively and continuously. However, the 1980s saw a temporary slow-down in Korea's HCI resulting from the depressed "domestic demand below its long-term trend just as many HCI projects are struggling on stream." Coincidentally, South Korea experienced a democratic movement in the 1980s, which proved to be a real challenge to the Korean government. Following the stabilization of HCI, the government regained its power and efficiency (see Figure 10).

HI (HCI in Japan and Korea's cases) is well-known to have been endowed with a political meaning at the very beginning of industrialization, especially in developing countries. Is there any relativity between the power of governments and ratio of HI investment as well as value-added, considering the position of strong government in East Asia?

We place the Hoffmann index and Regulatory quality index in the same figure to demonstrate the possible interaction between the two factors. Unfortunately, the relativity proved to be insignificant at first glance. The government's efficiency decreased significantly as the HI share began to increase at the end of the 1990s. However, the country's entry into the WTO in 2001 improved the regulatory quality for approximately five years. Regulation efficiency stagnated when the state-owned HI in-



Source: Adjusted Hoffmann Index of China are from the author's calculations; Regulatory quality index are obtained from the Worldwide Governance indicators database of World Bank, Available at: <http://databank.worldbank.org/data/views/variableselection/selectvariables.aspx?source=worldwide-governance-indicators#>

**FIGURE 10**

REGULATORY QUALITY INDEX IN CHINA, JAPAN, AND KOREA (1996-2013)

vestment decreased and HI ratio increased thereafter. With limited data, we cannot obtain further results. A comparative study across countries may be a good solution, and the catch-up cycle among the East Asian countries could provide another solution (Lee, and Malerba 2016).

## VI. Concluding remarks

We focus on the 2004-2005 policy debate on the industrialization path in China, and find that the free market system has been gradually strengthened through the country's industrial transformation. The debaters were divided into three groups, and all of them prove to be persuasive, albeit, along a different timeline. An extensive study of the other East Asian countries may disclose the relation between HI and governments' efficiency.

China has experienced an economic transition from an unbalanced-HI-centered and outward path to a balanced-sectored and inward de-

velopment. The strong demand for sustainable environment and concern for middle-income trap have reinforced the position of the Chinese government. The One Belt and One Road strategy is an active state-oriented response to the transition, through which the over-loaded industrial sectors can be transferred overseas and new catch-up cycles be formed worldwide.

At the end of Hoffmann's book (1958, p. 151), the author asks, "Would it be reasonable to anticipate a situation in which only 9 percent of the industrial output of a country consisted of consumer goods and 91 percent of capital goods?" He responds with a negative answer. We hope that in the future, we can answer in the same way.

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### **Appendix: Statistical Definition of Industrial Terms**

Available at [http://www.stats.gov.cn/english/ClassificationsMethods/Definitions/200205/t20020517\\_72382.html](http://www.stats.gov.cn/english/ClassificationsMethods/Definitions/200205/t20020517_72382.html), downloaded on April 1, 2015.

#### *A. Industry*

Industry refers to the material production sector engaged in the extraction of natural resources and processing as well as the reprocessing of minerals and agricultural products, including the extraction of natural resources, such as mining, salt production, logging (but excluding hunting and fishing); processing and reprocessing of farm and sideline produces, such as rice husking, flour milling, wine making, oil pressing, cotton ginning, silk reeling, spinning and weaving, and leather making; manufacturing of industrial products, such as steel making, iron smelting, chemicals manufacturing, petroleum processing, machine building, timber processing; water and gas production and electricity generation and supply; and repairing of industrial products, such as the repair of machinery and means of transport (including cars).

Prior to 1984, the rural industry run by villages and cooperative organizations within a village was classified into agriculture; since 1984, it has been grouped into industry.



### *B. Units of Industrial Statistics and Inquiry*

These units are classified into two categories: (B.1.) corporate industrial enterprises with independent accounting system and (B.2.) industrial establishments.

*B.1.* Corporate industrial enterprises with independent accounting system refer to enterprises engaged in industrial production activities, which meet the following requirements: 1. The enterprises are legally established, with their own names, organizations, location, and can face civil liability; 2. The enterprises possess and use their assets independently, assume liabilities, and can sign contracts with other units; and 3. They are financially independent, and compile their own balance sheets.

*B.2.* Industrial establishments refer to economic units located in one single place and engaged entirely or primarily in one type of industrial activity, including financially independent industrial enterprises and units engaged in industrial activities under the non-industrial enterprises (or financially dependent). Industrial establishments generally meet the following requirements: 1. These establishments have one location each, and are individually engaged in one type of industrial activity; 2. They separately operate and manage their industrial production activities; and 3. They have separate accounts of income and expenditures.

*B.2.1.* State-owned Enterprises refer to industrial enterprises wherein the means of production or income are owned by the state. Joint state-private and private industries, which existed before 1957, have been transformed into state industries. Statistics on these enterprises have been included in state-owned industries since 1957 when separation of data was no longer necessary.

*B.2.2.* Collective-owned Enterprises refer to industrial enterprises wherein the means of production are owned collectively, including urban and rural enterprises invested by collectives and some enterprises. The latter were formerly owned privately, but have been registered in industrial and commercial administration agency as collective units through fund raised from the public.

*B.2.3.* Share-holding Corporations refer to economic units registered in accordance with the regulations of the People's Republic of China on the Management of Registration of Corporate Enterprises, with total registered capitals divided into equal shares and raised through the issuance of stocks. Each investor bears limited liability to the corporation depending on the shares held, and the corporation bears liability to its

debt to the maximum of its total assets.

B.2.4. Enterprises with Funds from Hong Kong, Macao, and Taiwan refer to all industrial enterprises registered as joint venture, cooperative, sole (exclusive) investment industrial enterprises, and limited liability corporations with funds coming from Hong Kong, Macao, and Taiwan.

B.2.5. Foreign Funded Enterprises refer to all industrial enterprises registered as joint venture, cooperative, sole (exclusive) investment industrial enterprises, and limited liability corporations with foreign funds.

B.2.6. Industry of Other Types of Ownership refers to industrial enterprises (units) of ownership other than state-owned, collective, and individual enterprises. These enterprises include private, joint-owned, shareholding economy (companies limited by shares and companies limited with liabilities), foreign-funded enterprises (Sino-foreign joint ventures, Sino-foreign cooperative enterprises and exclusive foreign ventures who have their own investment), as well as enterprises funded by the entrepreneurs from Hong Kong, Macao, and Taiwan (joint ventures and cooperative enterprises with the mainland as well as ventures exclusively with their own investment).

### *C. Light Industry*

Light Industry refers to the industry that produces consumer goods and hand tools. It consists of the following two categories, depending on the materials used:

C.1. Industries using farm products as raw materials. These industries are branches of the light industry, which use farm products directly or indirectly as basic raw materials, including the manufacture of food and beverages, tobacco processing, textile, clothing, fur and leather manufacturing, paper making, printing, and so on.

C.2. Industries using non-farm products as raw materials. These industries are branches of the light industry, which use manufactured goods as raw materials, including the manufacture of cultural, educational articles and sports goods, chemicals, synthetic fiber, chemical products for daily use, glass products for daily use, metal products for daily use, hand tools, medical apparatus and instruments, and the manufacture of cultural and clerical machinery.

### *D. Heavy Industry*

Heavy Industry refers to the industry that produces capital goods and provides various sectors of the national economy with necessary material

and technical basis. This industry consists of the following three branches, which has been categorized according to the purpose of production or the use of products:

*D.1.* Mining, quarrying, and logging industry refers to the industry that extracts natural resources, including extraction of petroleum, coal, metal and non-metal ores, as well as logging.

*D.2.* Raw materials industry refers to the industry that provides various sectors of the national economy with raw materials, fuels, and power. It includes smelting and processing of metals; coking and coke chemistry; chemical materials and building materials, such as cement, plywood, and power; petroleum refining; and coal dressing.

*D.3.* Manufacturing industry refers to the industry that processes raw materials. This industry includes the machine building industry, which equips sectors of the national economy, industries of metal structure and cement products, and industries producing means of agricultural production, such as chemical fertilizers and pesticides. Following the principles of the classification above, the repair trades, which are engaged primarily in repairing products of heavy industry, are classified into heavy industry, whereas the trades engaged in repairing products of light industry are classified into light industry.

#### *E. Gross Industrial Output Value*

Gross Industrial Output Value is the total volume of industrial products sold or available for sale in value terms, which reflects the total achievements and overall scale of industrial production during a given period. This value includes the value of the finished products, which are not to be processed further in the enterprises and have been inspected, packed and put in storage, the value of industrial services rendered to other units, and the changes in the value of the semi-finished products, as well as products in the process between the beginning and closing of the period. The gross industrial output value is calculated using the "factory method." No double calculations are to be made within the same enterprise. However, double counting does occur among different enterprises.

#### *F. Output value of light and heavy industries*

Output value of light and heavy industries is further classified using the "factory" method. Under normal conditions, if the major products of an industrial enterprise belong to light industry products, the gross

output value of that enterprise is classified wholly into light industry; the same principle applies to heavy industry.

### G. Value-added of Industry

Value-added of Industry refers to the final results of industrial production of the industrial trade in money terms during the reference period.

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