Title	Regional Development Scheme in Chine Using the Functions of University and Its Adaptability to Other Developing Countries
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Citation	高知工科大学，博士論文.
Date of issue	2006-03
URL	http://hdl.handle.net/10173/245
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Regional Development Scheme in China Using the Functions of University and Its Adaptability to Other Developing Countries

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A dissertation submitted to
Kochi University of Technology
in partial fulfillment of the requirements
for the degree of

Doctor of Philosophy

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March 2006

Abstract

People's Republic of China has been in the transitions stage from planned economy to market economy since 1978 when the government started economic reforms. With the progress of economic transition, regional disparity in economic development level can be gradually observed. For sustaining the economic growth, China needs to make major changes in its development strategy in order to fulfill its national development targets. China is a developing country with unique characteristics because it is still keeping socialism and at the same time it is moving towards a market economy with a centralized innovation system in transition, which could not be seen in the history of the world. The existence of regional disparity in China shows three different types of "countries" with low-developing, mid-developing, and high-developing level. Finding some schemes to solve the problems existing in China is as same as to solve the problems of global economic disparity.

In this study, the author tries to analyze the situation and find out some schemes to solve the problems. Most of universities in China are province-owned and they have university-run enterprises. Since China's innovation system has experienced a dramatic change over the last 20 years, it offers a unique situation to study the evolving institutional relationships among university, industry and government. The scheme of economic development by using the functions of university shall be required the mutual collaboration among university, industry, research institute, government and other organizations in the local area. The core of this task is that fulfilling close integration of education, science & technology, economy and politics. The operation mechanism of Chinese university-run enterprise has special characteristics, which are government support, relying on university, market mechanism, and industry movement. The functions of university in economic development of China need policy support of promotion, macro planning, guide and harmonization from local and central governments. The author studies the economic development situations of eastern, central, and western regions in China. A primary focus is on the role of different innovative activities players and the interaction of these players. Special attention will be given to the way that these university-run enterprises are created, their industrial distribution, their contribution to the development of indigenous high-tech industries, and the advantages and disadvantages surrounding them will also be examined. The quantitative analysis for the economic profits of education based on economic theory and the case study of Heilongjiang Province in China are also analyzed. Therefore, a new regional development scheme using the functions of university is considered as an effective strategy to promote economic development of China in this transitional stage. This study has been made in accordance with the following theory flow, research structure and research flow.

Keywords: *Regional Economic Development, Regional Disparity, Functions of University, University-run Enterprise, Relationships Framework of 'University – Government – Industry', University Science Town, Economic Profits of Education*

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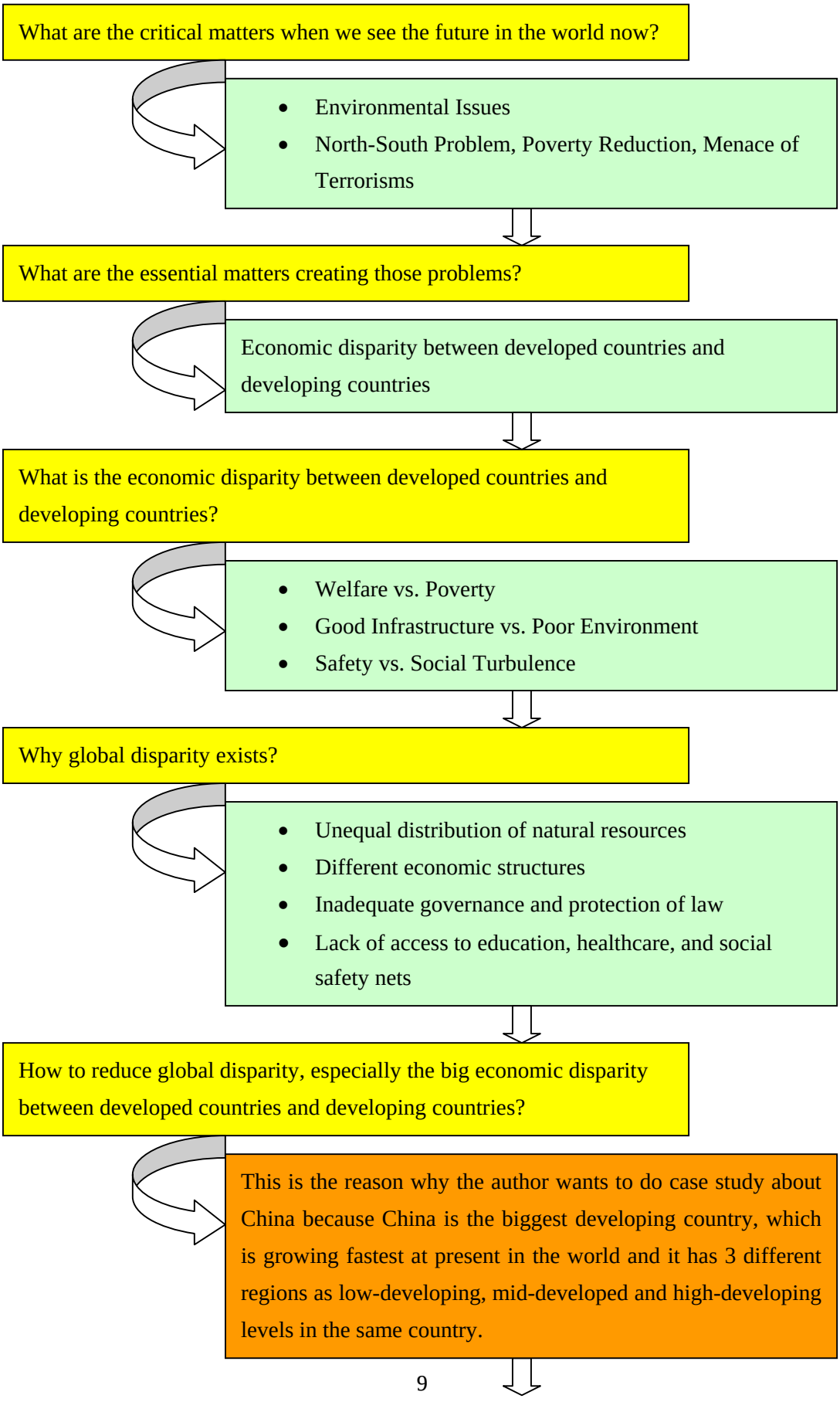
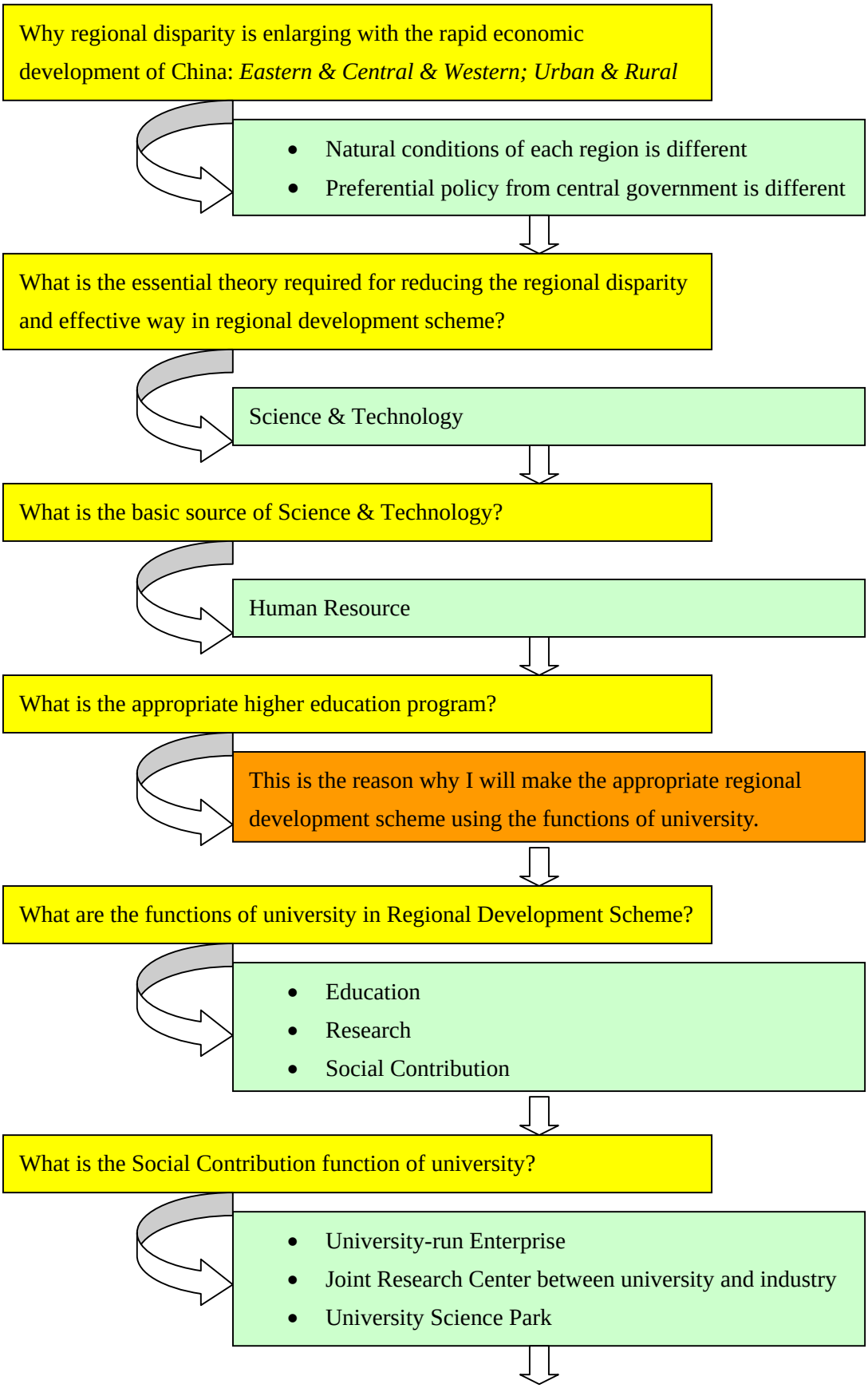
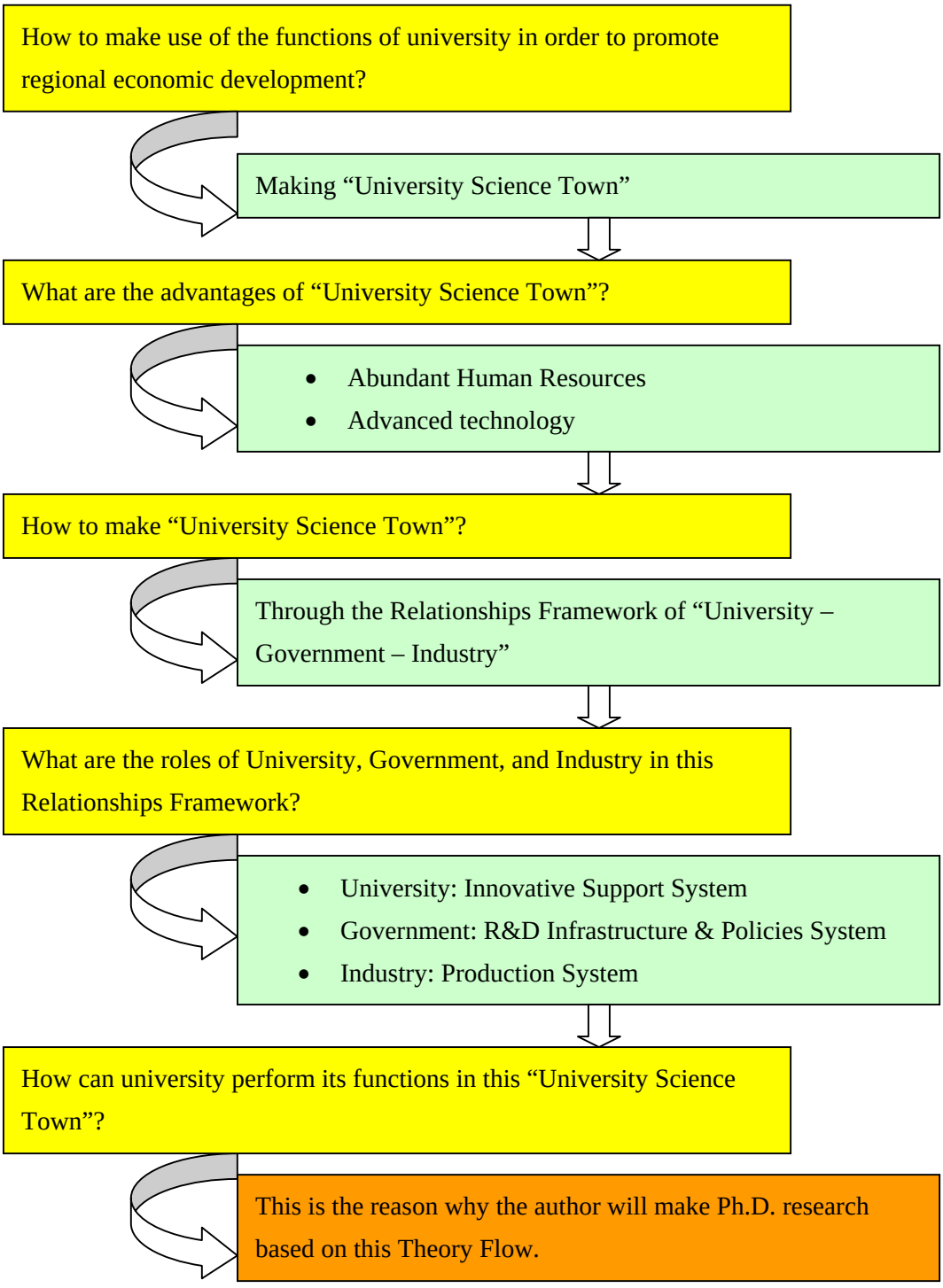
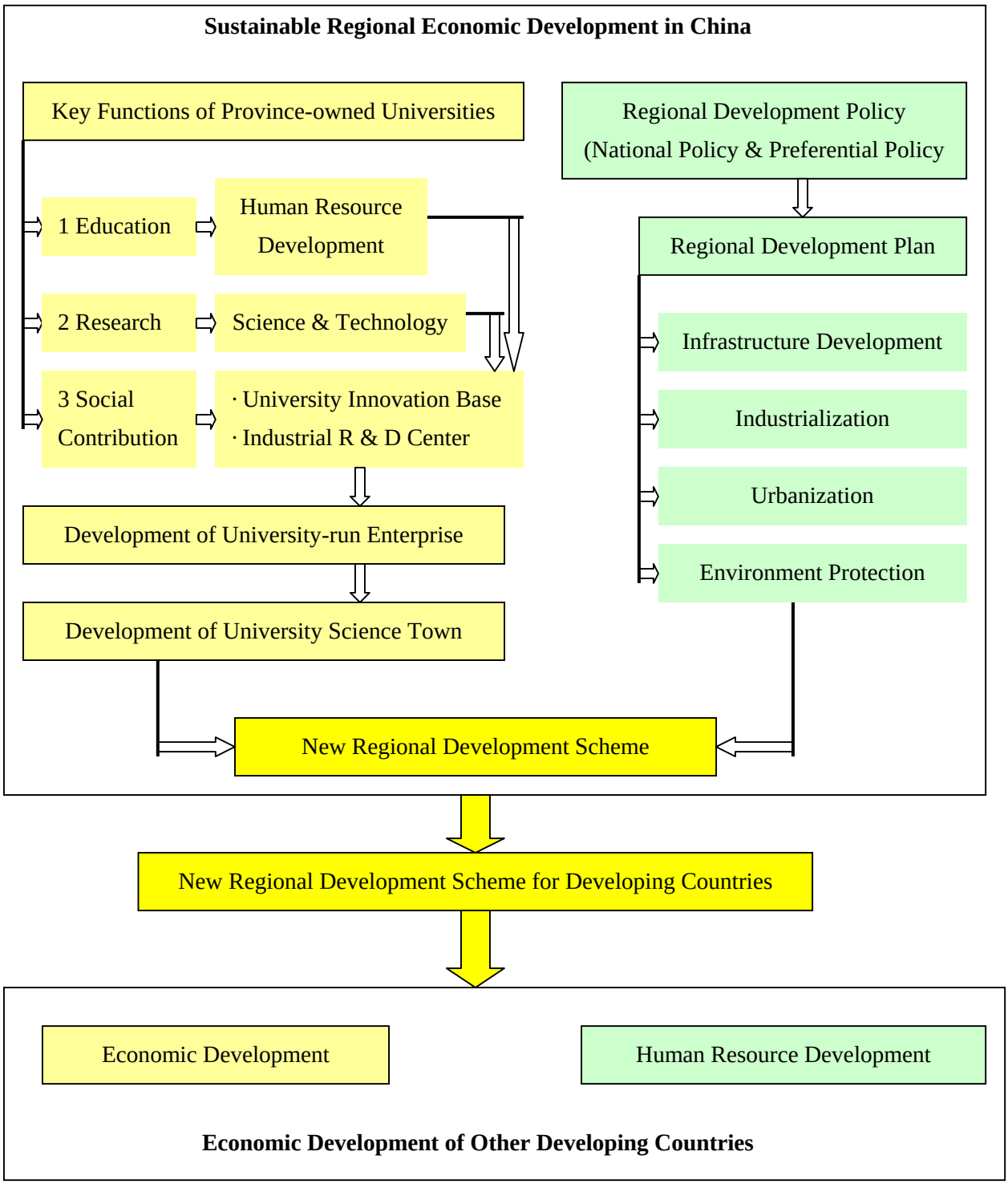
Theory Flow


What are the critical matters when we see the future in the world now?
Environmental Issues
North-South Problem, Poverty Reduction, Menace of Terrorisms
What are the essential matters creating those problems?
Economic disparity between developed countries and developing countries
What is the economic disparity between developed countries and developing countries?
Welfare vs. Poverty
Good Infrastructure vs. Poor Environment
Safety vs. Social Turbulence
Why global disparity exists?
Unequal distribution of natural resources
Different economic structures
Inadequate governance and protection of law
Lack of access to education, healthcare, and social safety nets
How to reduce global disparity, especially the big economic disparity between developed countries and developing countries?
This is the reason why the author wants to do case study about China because China is the biggest developing country, which is growing fastest at present in the world and it has 3 different regions as low-developing, mid-developed and high-developing levels in the same country.

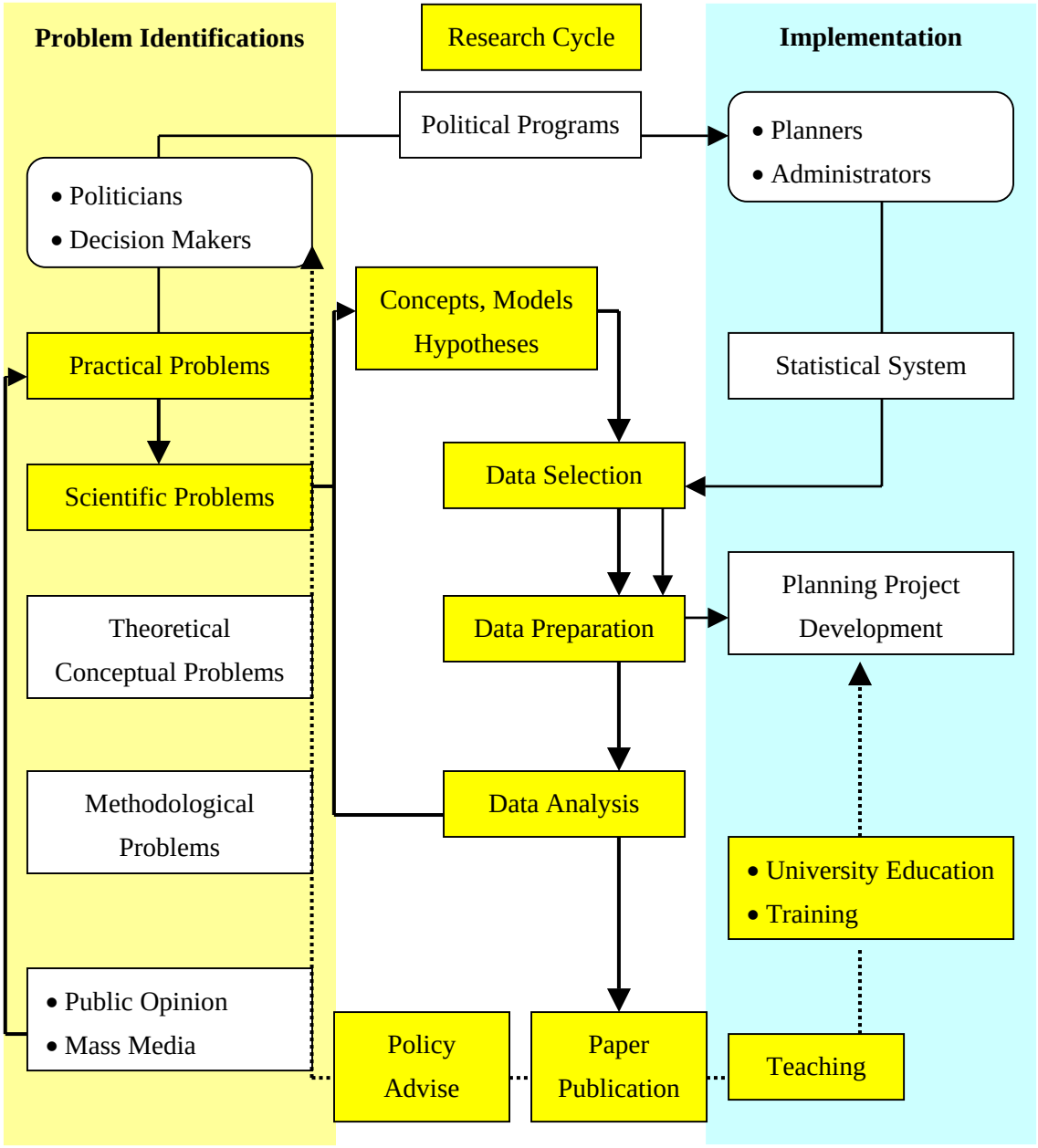

Why regional disparity is enlarging with the rapid economic development of China: *Eastern & Central & Western; Urban & Rural*
Natural conditions of each region is different
Preferential policy from central government is different
What is the essential theory required for reducing the regional disparity and effective way in regional development scheme?
Science & Technology
What is the basic source of Science & Technology?
Human Resource
What is the appropriate higher education program?
This is the reason why I will make the appropriate regional development scheme using the functions of university.
What are the functions of university in Regional Development Scheme?
Education
Research
Social Contribution
What is the Social Contribution function of university?
University-run Enterprise
Joint Research Center between university and industry
University Science Park


How to make use of the functions of university in order to promote regional economic development?
Making “University Science Town”
What are the advantages of “University Science Town”?
Abundant Human Resources
Advanced technology
How to make “University Science Town”?
Through the Relationships Framework of “University – Government – Industry”
What are the roles of University, Government, and Industry in this Relationships Framework?
University: Innovative Support System
Government: R&D Infrastructure & Policies System
Industry: Production System
How can university perform its functions in this “University Science Town”?
This is the reason why the author will make Ph.D. research based on this Theory Flow.

Research Structure



Research Flow



Preface Global Economic Disparity

After entering into the 21st century, the disparity in economic development level among countries in the world is widening. The impact from widening of the disparity is resulting in many problems. The first one is environmental destruction – such as developed countries can afford to over-consume resources, while some developing countries are forced to over-exploit the environment just for survival. The second one is migration – like people are forced to move in search of adequate resources. The third one is conflict – like wealthier nations fight to keep what they have, while those suffering a lack of resources fight to obtain them. The causes of the global disparity in economic development level are diverse and complex. The causes could be unbalanced distribution of natural resources, inadequate governance and protection of laws, and lack of access to education, healthcare, and social safety nets, especially for women and girls. The globalization of economies and economic structures is also recognized as the main cause of the global disparity in economic development level [1].

Globalization – the growing integration of economies and societies around the world, which has been one of the most hot-debated topics in international economics over the past few years. Rapid economic growth in China, India, and other countries has been a positive aspect of globalization. But globalization has also generated significant international opposition over concerns that it has increased disparity and environmental degradation [2]. Income disparity is dramatic in most countries of Latin America, Eastern Europe, Asia and Africa, and has been rising in China and Russia. This problem is widening in developed countries like the United States, Western Europe and Japan. The disparity has been blamed on changes in trade, technology, and migration patterns associated with growing economic integration among countries. It is a unique situation that the disparity tends to be higher in developing countries than in developed countries. Globalization is the trend of increasing integration of economies in terms not only of goods and services, but also of ideas, information, technology and social systems, which has tremendous potential benefits for developing countries. The developing countries face special risks with globalization and with the market reforms that reflect and reinforce their integration into the global economy. To reduce the disparity is not an easy matter to fix. The risk of globalization is that the disparity widening is likely to be greatest in the next decade, as developing countries undergo the difficult transition to more competitive, transparent, and rule-based market systems. But success with that transition will reduce the problem of disparity widening, and will do so more quickly if emphasis is placed on widespread access to the critical asset of education [3]. Fig. Preface-1 shows global disparity in economic development level by GDP Growth Rate, and Fig. Preface-2 indicates such situation by GDP Per Capita.

Global Economic Disparity by GDP Growth Rate (Year: 2002)

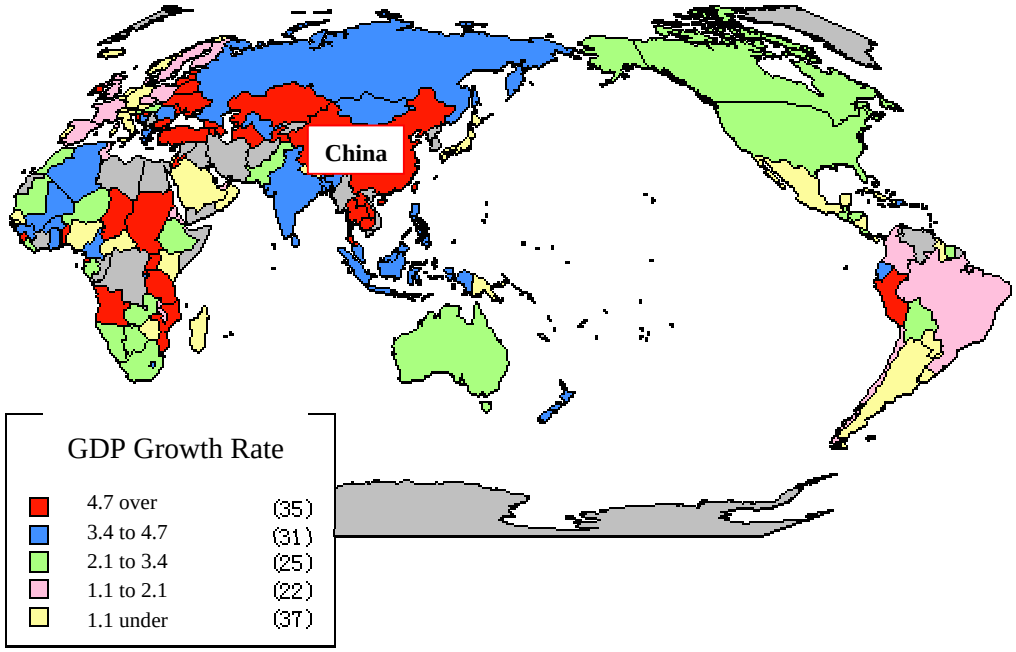


Fig. Preface-1 Global Disparity in Economic Development Level by GDP Growth Rate

(Source: "China Economic Information Network")

Global Economic Disparity by GDP Per Capita (Year: 2002)

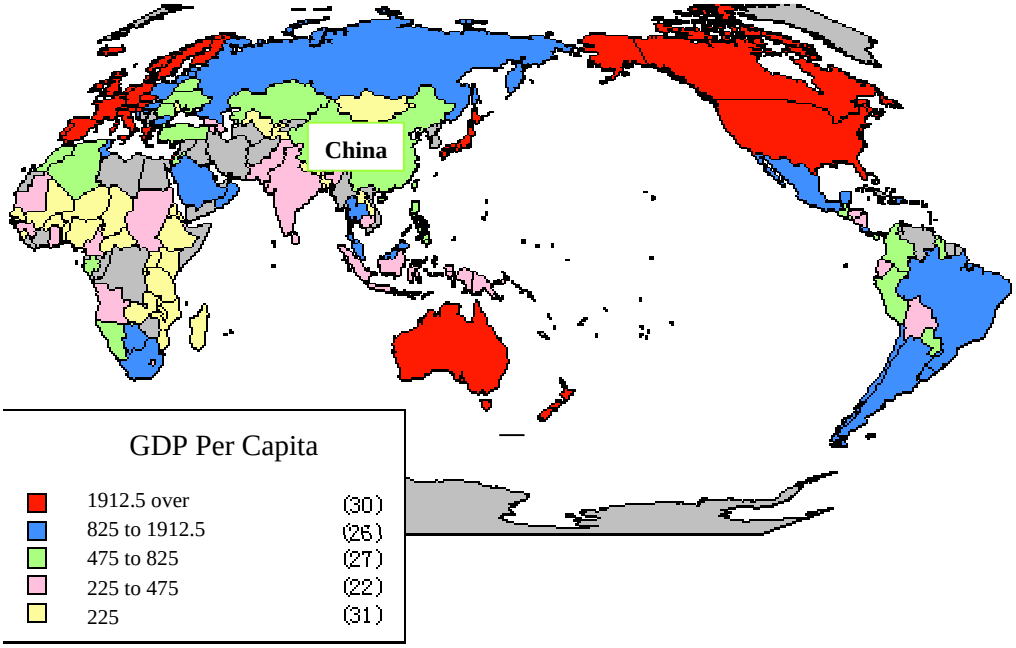


Fig. Preface-2 Global Disparity in Economic Development Level by GDP Per Capita

(Unit: U.S. Dollar)

(Source: "China Economic Information Network")

References:

[1] “Facing The Future – Global Issues”, http://www.global-issues.net/In_Depth/rich1.htm
[2] “The World Bank Group – Globalization”,
http://www1.worldbank.org/economicpolicy/globalization/
[3] “International Monetary Fund – Globalization: Threat or Opportunity?”,
http://www.imf.org/external/np/exr/ib/2000/041200.htm

Chapter 1 Introduction of China

1.1 General Introduction of China

1.1.1 Natural Features

Located in East Asia, on the western shore of the Pacific Ocean, People's Republic of China has a land area of about 9.6 million square kilometers and is the third largest country in the world, next only to Russia and Canada. On the landward side, the boundary measures some twenty thousand kilometers and shares common borders with some countries. The sea boundary is some eighteen thousand kilometers long. The topography of China consists of a variety of features. Mountains, plateau and valley cover approximately two-third of the country while the plains account for one-tenth of the area. There are many rivers in China, five of which have water catchments areas in excess million square kilometers. Centered the major rivers are fifteen large water systems. In addition, China has more than 2,800 fresh water and salt water lakes of which 13 have around more than 1,000 square kilometers. The climate of China varies considerable from north to south. It covers the tropical, subtropical, temperate zones as well as colder climates. The country enjoys good climate conditions because 70 percent of it lies within the tropical, subtropical and temperate zones. The vast land area provides China with favorable mineral deposits and water resources. The mineral deposits in China, in terms of quantity and variety, rank among the world's greatest possesses all of the 150 minerals commonly used in the world today. From a general point of view, China is rich in natural resources, but from the point of view of per capita availability, China is comparatively poor in this respect. The per capita mineral availability rate in China is below that of the average. Similarly, population expansion and increased land use by construction projects are causing a shortage in agricultural land. In this connection, sustainable development and resource conservations are in the forefront of China's economic development objects [1].

1.1.2 Population

China is the world's most densely populated country. "Family Planning" is central to China's population control policy and is also a basic national policy objective. It aims at controlling the total population through promoting late marriage and fewer births, so that better care may be provided to a lesser number of young people, and promoting the single-child family. In the 1990s, the average life span has risen to 73 years, which was the double of the pre-liberation era. The culture quality of the people is constantly rising. The illiterate and semi-illiterate rates are

being greatly reduced. According to the statistics on September 2005 from “WIKIPEDIA”, the total population of China’s provinces, autonomous regions and municipalities amounted to 1.306 million, which is more than one-fifth of the world’s population. The birth rate (the total annual number of childbirths per 1,000 people) was 13.14‰ while the death rate (the total annual number of deaths per 1,000 people) was 6.94‰, thus the natural growth rate is 6.20‰ (Fig. 1-1).

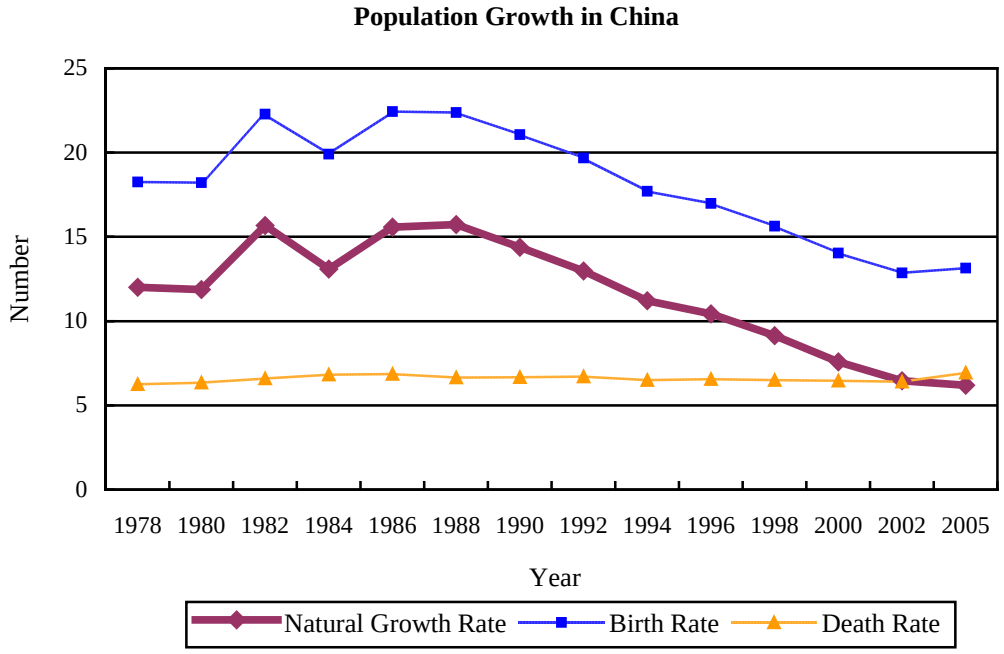


Fig. 1-1 Population Growth in China (Unit: ‰)

(Source: compiled based on data of “China Statistical Yearbook 2003” & “WIKIPEDIA”)

China’s large population is very much unevenly distributed. 75% of the country’s population resides in the four eastern districts, namely Northern, Northeastern, Eastern and Southern Districts, which account for 44% of the country’s land area. Whereas, only 25% of total population resides in Hunan Province and the northwestern districts, which occupy 56% of the country’s land area. Thus, it can be seen that the density of population between the provinces and districts varies enormously. Overall, the most populated areas are the coastal provinces, while the vast area of the West and particularly the Northwest is spare populated. This shows the density of population progressively decreases from East to West. The disparity in population distribution reflects the difference of natural conditions and the economic development level between the areas. One special feature of China’s population structure is that 80% of the

population engaged in agriculture. But since the beginning of 1990s, in the process of industrialization and economic modernization, the people previously engaged in agriculture, are becoming city dwellers, which has witnessed a bigger enhancement in China's urbanization level. In 2004, the number of city-dwellers represents 41.8% of the country's total population, the target of the development trend of urbanization in China is that 45% urban population and 55% rural population (Fig. 1-2). Along with the rapid development of the cities, they have become the major destinations for the workforce immigration from the countryside. In the meantime, while the urbanization level was being raised, the economy in cities saw a rapid development with the economic structure trending for the better [2].

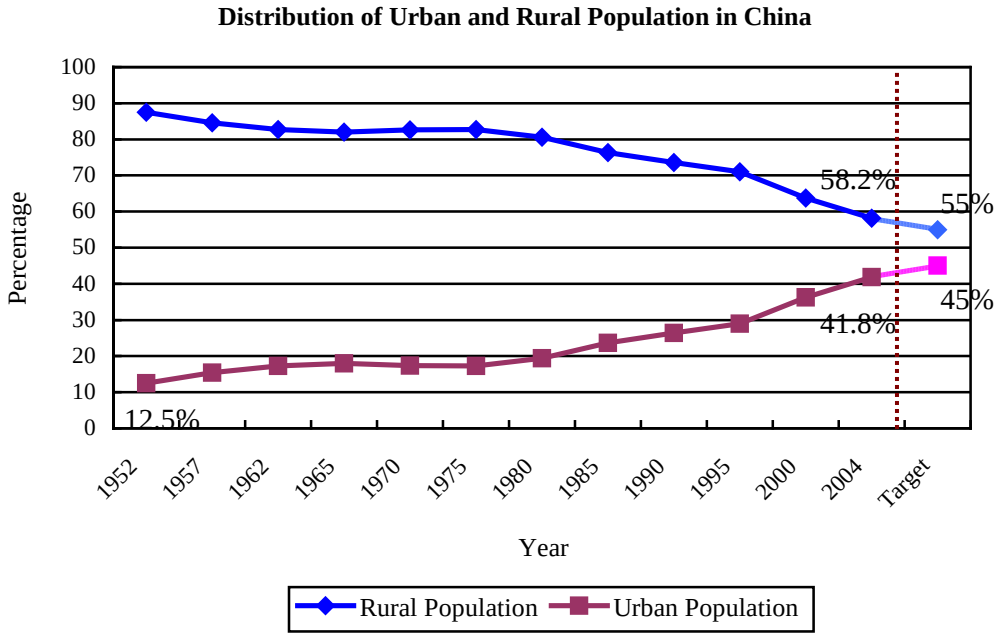


Fig. 1-2 Development Trend of Urbanization in China

(Source: compiled based on data of Gerhard K. Heilig,
"Can China Feed Itself? – A System for Evaluation of Policy Options")

1.2 Social System of China

1.2.1 Political Structure

The basic political structure of China is a multi-parties system under the leadership of Chinese Communist Party. The Communist Party together with other parities coexist and monitor each other and operate, under the framework of centralized democratic principles, the people's representative congress system. The National People's Congress is the highest authority of the country. The government is the executive branch, which is elected by the National People's Congress. The people exercise their authority through the National People's Congress. Chinese people also participate in the political life of the nation through the unions, communist youth and social organizations. The laws and regulations are passed by the National People's Congress or the government and promoted for implementation. The Chinese government, as part of its political reforms and to make structure more responsive to the needs of the socialist market economy policy, has introduced a series of measures, such as the separation of party and executive functions, further down delegation power, reorganization of government institutions, refining socialist democracy, and strengthening the socialist legislative structure.

1.2.2 Administrative System

The State Council is China's highest executive body. Below it is the provincial, municipal, and county levels of local government. Administrative organizations are classified into three groups:
(1) The first group includes the governments of the provinces, autonomous regions and directly administered municipalities.
(2) The second group includes counties, autonomous districts and the governments of cities.
(3) The third group includes districts, ethnic districts and towns.
At the end of 2005, there were 4 directly administered municipalities, namely: Beijing, Tianjing, Shanghai and Chongqing, 22 provinces, 5 Autonomous Regions are province-level divisions with a designated ethnic minority, and are guaranteed more rights under the constitution than provinces. For example, they have a chairman (where regular provinces have governors), who must be of the ethnic group as specified by the autonomous region. Current autonomous regions are: Inner Mongolia, Xinjiang, Tibet, Ningxia, and Guangxi. 2 Special Administrative Regions (SAR) were established specially designed for solving Hong Kong and Macao issues and based on the concept of "one country, two systems". SAR is in a pattern within which two completely different social systems (socialist system and capitalist system) and ideologies can coexist, SAR

has more autonomous power regulated clearly by laws, including executive, legislative and independent judicial power [1]. Fig. 1-3 is the administrative map of China.

Fig. 1-3 Administrative Map of China

(Source: “WIKIPEDIA”)

References:

[1] “CHINAGATE”, http://www.chinagate.com.cn/english/index.htm

[2] Gerhard K. Heilig, “Can China Feed Itself? – A System for Evaluation of Policy Options”

Chapter 2 China’s Economy

2.1 Economic System of China

2.1.1 Economic System

The concept of "one country, two systems" has been formulated according to China's realities, and it has attracted international attention. The policy of “one country, two systems” means that within the People's Republic of China, the mainland with its one billion people will maintain the socialist system, while Hong Kong and Macao continue under the capitalist system. The policy towards Hong Kong will remain the same for a long time to come, but this will not affect socialism on the mainland. The main part of China must continue under socialism, but a capitalist system will be allowed to exist in certain areas, such as Hong Kong and Macao. Opening a number of cities on the mainland will let in some foreign capital, which will serve as a supplement to the socialist economy and help promote the growth of the socialist productive forces. The main part of China remains socialist [1].

2.1.2 National Economic Planning

The economic system of China comprises mainly of: planning, business management, financial regulation, monetary and distribution subsystems. The Chinese economy is guided from the medium to long-term plans for national economic and social development. The long-term plans define the strategic objectives of economic and social development, the strategic process priorities, the economic growth rate, the trends of science and technology development, capital construction and technological upgrading, productivity framework and other major economical technology policies. Medium-term plans are five-year plans, which are based upon and more detailed than the long-term plans. These define the basic activities to be implemented during planning periods, the national economic growth rates and their linkages with other indices, principal industry and agriculture productivity and policies relating to major technological developments and usage, and the importance of new technical knowledge. They also include stabilizing national wealth, setting priority areas for major infrastructure development, and technology reforms. The plan also includes matters relating to revenue and expenditure, and improving the living standard. The needs of the various social development projects, major economic and technical policies as well as the implementation plans of management activities are also included. The annual plans are substantially action plans relating to national economic and social development, their principal functions are to organize the budget for the year, credit,

foreign exchange, resources, investments, market as well as establishing the implementation processes. China's national economic and social development plans are considered and approved by the nation's highest authority – the National People's Congress and implemented by the nation's highest executive branch – the State Council. Formulation of the plans is the responsibility of the State Planning Commission. Department planning is undertaken by various departments of the State Council in conjunction with the relevant authorities of the provinces, municipalities and autonomous regions. District planning is undertaken by the commissions of the respective local governments. Generally speaking, the planning process of China is based on a system of centralized planning with delegated managerial functions. Major economic activities affecting national and welfare of the people such as defining the framework for investment and wealth, major infrastructure and construction projects, productivity planning, the national budget, structure of the import and export trade and high technology projects, are coordinated at the national level. Some projects may be carried out locally so long as they lie within the frame of the national plan, social needs and changing market conditions.

2.1.3 Financial Management

Financial management is an important part of the national economic system. It comprises distribution of business between the central government and the industries, distribution of functions between central and local governments, financial and monetary management systems. Profit tax reforms in number of new management and operation systems have also been introduced. In respect for distribution of functions between central and local governments, a properly defined taxation system, revenue and audit of expenditure as well as a system of delegation of authority has been established. In respect of the special regions such as the areas populated by ethnic minorities, special economic zones, a special budgetary management system have been implemented. Regarding the investment and monetary management system, monies accrued from departments are progressively left to the disposition of the respective enterprises. The depreciation rates allowed and the system for determining the various levels of depreciation has been revised. A new investment system for infrastructure development and loan arrangement has also been introduced [2].

2.2 Economic Development of China

2.2.1 Overall Review

Chinese government chose to “build socialism” in their country, and functioned as the guiding force by formulating central decisions on economic and social policy. Until 1976, three key elements were central to China’s economic policy, these were:

(1) The collectivization of land centralized control over the accumulation and reinvestment of capital.

(2) Central government ownership of major industries and banks as well as smaller-scale enterprises.

(3) Self reliance, entailing strict limitations on foreign capital and external economic factors.

Land reform was the first step in the collectivization of rural areas. However, the redistribution of land away from the landlords and rich farmers to smaller private holdings was not as successful as initially hoped. Private farms were not a part of socialist policy, and new divisions, exploitation and uneven land ownership showed signs of re-emerging. During the 1950s, therefore, collectives were established that enabled government to control the means of production even further, and were given quotas to supply the central government with a portion of their output at pre-determined prices and also acted as pools of labor that could construct irrigation networks, roads and railway tracks. Collectives also enabled the generation of a gross operating surplus that paid for education and health services. However, Chinese government felt that industrialization was still too slow and in a bid to quicken its pace, collectives were further organized into “people's communes” under the guide of the “Great Leap Forward” in 1958. Farmers were directed to build roads, dams and other projects relating to improving China's infrastructure. Cotton was also planted throughout China at the expense of staple crops, but had little success because of wide climatic variations. This activity came at the expense of agriculture, and resulted in widespread famines and illness. As for the industrial sector, large-scale industrial enterprises were allowed to operate independently from the central government for a short period of time after liberation. However from the early 1950s, the nationalization of industries commenced. Chinese government launched its first “Five Year Plan” in 1953, and placed the industrial sector under direct state control. Profits from industry were diverted to areas deemed as key industries in the economy, such as iron, steel and textiles. The strong movement so called “Cultural Revolution” was executed and hindered rapid industrial growth. It gave a big negative impact mainly on the rural sector. The “Cultural Revolution” did have an adverse impact on China’s foreign trade. Throughout the period of the “Cultural Revolution”, China was in effect cut off from the rest of the world.

2.2.2 Economic Development

In late 1978 the Chinese government began moving the economy from a sluggish, inefficient, Soviet-style centrally planned economy to a more market-oriented system. Whereas the system operates within a political framework of strict Communist control, the economic influence of non-state organizations and individual citizens has been steadily increasing. The authorities switched to a system of household and village responsibility in agriculture in place of the old collectivization, increased the authority of local officials and plant managers in industry, permitted a wide variety of small-scale enterprises in services and light manufacturing, and opened the economy to increased foreign trade and investment. The result has been a quadrupling of GDP since 1978. Since the implementation of the Open Door Policy and economic reforms, economic growth in China has been rapid. Fluctuations in the growth rate of China's national income are closely related to domestic political conditions and campaigns. Figure 2-1 illustrates clearly the economic development of China by GDP index since 1950s. Chinese society has undergone great changes in its socio-economic, political, and cultural realms. Over the past two decades, China's GDP has kept an annual growth rate of about 8% on average. Together with the increased industrial labor productivity, the living standard of the Chinese people has increased at about 7% each year (constant price).

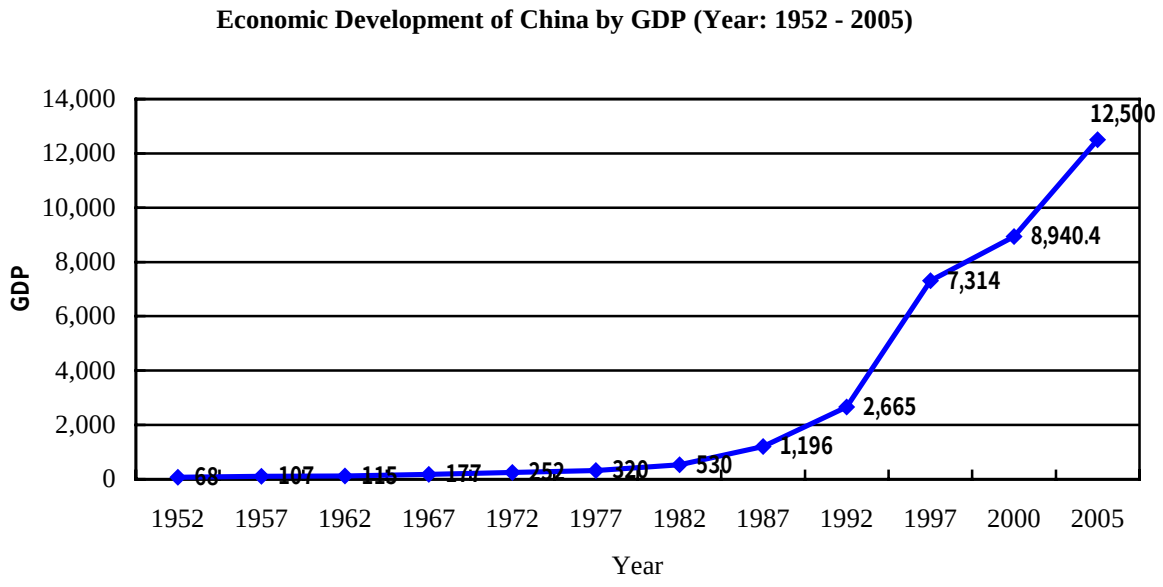


Fig. 2-1 Historical Review of China's Economic Development by GDP (Unit: RMB Billion)

(Source: Compiled based on data of Ravi Kanbur and Xiaobo Zhang,
"Fifty Years of Regional Inequality in China)

Twenty years of reform efforts and modernization drive have won China international acknowledgement for its achievement in economic development. Nowadays, Chinese government is facing some problems to solve. Approximately 100 to 150 million people started to move from rural areas to urban areas, many of them are compelled to survive through part-time, low-paying jobs. At the same time, one demographic consequence of the "one child" policy is that China is now one of the most rapidly aging countries in the world. Another long-term threat to growth is the deterioration in the environment such as air and water pollution, soil erosion, and the steady fall of the water table especially in the north. China continues to lose arable land because of erosion and economic development. At the same time there is additional pressure on the hybrid system of strong political controls and growing market influences. China has benefited from a huge expansion in computer internet use, with 94 million users at the end of 2004. Foreign investment remains a strong element in China's remarkable economic growth. Shortages of electric power and raw materials may affect industrial output in 2005. With the completion of Three Gorges Dam construction, more power generating capacity is scheduled to come on line in 2006 [3].

2.3 Economic Reform of China

Since economic reform started in China in 1978, there has been a remarkable growth in GDP. Chinese government has adopted institutions and policies that enable the Chinese people and foreign investors to make good use of resources for the development of China's economy. The farmers became energetic and productive since 1979. The township and village enterprises were the most dynamic element for growth in the 1980s and early 1990s. Many private and foreign enterprises flourished. The key point of success of China's economic reform is to allow the non-governmental sectors to develop in the setting of a market economy. Table 2-1 shows those movements.

Table 2-1 Main Contents of Economic Reform in China

Reform Items	Reform Contents
Contracted Production Responsibility System in Rural Area	People who produced more could get more and sell it in the market
Rural Township Enterprise	As these enterprises grew, the planned system was reduced proportionally
Special Economic Zones	They played an exemplary role for other cities and areas in the country
Gradual Liberalization of Prices	Through a period of "double-track" prices (planned prices and market prices), the prices of most of commodities have been deregulated and set by the market supply and demand by late 1990s
Government-owned enterprises	Introduction of the stock system and the gradual formation of the capital market
Other Enterprises	Promotion and development of private enterprises, joint venture enterprises, and foreign direct investment

(Source: compiled base on data of Min Weifang,
"Economic Transition and Higher Education Reform in China")

The open-door policy is an essential element of the economic reform process. It encourages foreign investment and promotes foreign trade. Foreign investment has provided capital, new technology, managerial skill, and labor skills training to China. It has introduced modern managerial system, business practices and a legal framework for conducting business transactions. In addition, it has provided competition in the domestic market, and competition has forced domestic enterprises to become more efficient. Foreign trade has enabled the low-cost and high-quality labor in China to produce goods to be sold at higher prices in the world

market, thus increasing the compensation to Chinese labor. It has also enabled the import of technology and high-quality capital goods for use in production in China, as well as the import of high-quality consumer goods. The availability of high-quality capital goods improves productive efficiency. The availability of high-quality consumer goods not only increases consumer welfare directly; it also acts as an important competitive force in the Chinese consumer market that stimulates the improvement of the quality of domestically manufactured products. China’s entry into the World Trade Organization (WTO) will make China’s door even more open. Both foreign investment and foreign trade are expected to increase. Foreign firms will begin to get into China's financial and telecommunication sectors. Trade will increase in both directions and Chinese tariffs will be lowered and Chinese goods will have better access to world markets open to members of the WTO. The major objective in seeking to join WTO is to stimulate the domestic economy by influence of the foreign competition [4].

2.4 China's Transitional Economy

2.4.1 Prices

Before the economic reform and Open Door Policy were introduced, price of main commodities were decided by central government, and other less-important commodities were virtually set by provincial and local governments. Prior to reform price fluctuation existed, but it was not so obvious because many prices remaining fixed at the same level for decades. Prices were not important factor in enterprises operations since almost all of commodities were produced by the government-owned enterprises, and production volumes were decided in accordance with the flow of inputs and outputs within the planning system. The ultimate objective of government-owned enterprises was fulfilling output targets rather than cost efficiency or profitability.

However since the economic reform and Open Door Policy started, the government has carried out price reform step by step, along with the expansion of the commodity market scale and the movement of the balance between supply and demand. The government set new prices for fixing commodities prices as follows:

(1) Government fixed prices

(2) Government guiding prices

(3) Market regulatory prices

The percentage of market regulating prices has been gradually increased. These prices were regulated mainly through the relations between market supply and demand. In accordance with the requirements of the socialist market economy, China has been establishing a pricing mechanism macro-regulated and controlled by the government, and fixing prices through the market. In order to extend the regulatory function of the market, the government has gradually reduced the categories of products for planned production, eliminated the restriction that enterprises were only allowed to engage in production but not in business operation, and abolished the practice of the government fixing commodity prices.

2.4.2 International Trade

Prior to 1978, China aimed at self-sufficiency, importing only those goods it could not locally produce and exporting goods only to pay for essential imports. Trade was monopolized by 12 Foreign Trade Corporations, which were controlled by the central government ministries, and other trades were not permitted. Export and import plans covered virtually all foreign trade, applying to around 3,000 commodities. Exports were compulsorily procured at government

controlled prices by the Foreign Trade Corporations under the foreign trade plan. Similarly, import commodities were sold to domestic firms and consumers at government controlled prices. Trade was therefore only a small proportion of the economy.

China's Open Door policy has dramatically changed the autarkical policy existed in pre-1978, and aggressively accepting foreign investment and trade. As a result, imports and exports are increasingly led by the market forces and industrial comparativeness. The Ratio of imports and exports to GDP is now 42% and China is now the tenth biggest trading country in the world. The non-governmental sectors are particularly export-oriented. In fact much of China's trade is now being conducted by foreign funded enterprises, and foreign funded enterprises can automatically trade on their own account. The highly market-oriented township and village enterprises are also conducting a growing proportion of China's trade. Aside from the central government control, a number of other schemes are employed by the government to manage the trade regime. These schemes include tariffs, licenses and quotas, restricted trading rights, subsidies and foreign exchange controls. Nearly half of China's total trade flows operate under a very liberal set of policy conditions.

2.4.3 Role of Government in Economy

Prior to reform, the role of government in the economy was pervasive. The central government produced, planned and distributed practically all output. The bulk of resources, including land, labor, raw materials and final output were allocated under the government's planning system. Production and distribution plans were determined by the central and lower levels of government and implemented by government-owned production or distribution enterprises. Most inputs were supplied in accordance with the government plan and most outputs were purchased and distributed as well. Private enterprises were generally not permitted. Over three quarters of industrial output was produced by the government-owned enterprises. All of the rest was produced by urban and rural collectives. There were no foreign owned or private sectors.

The government's role in the economy has changed considerably over the reform period as a more market-based economy. Hence in most industries planning has disappeared nowadays. Most enterprises produce and sell on the basis of market prices and the desire to get the maximize profits. Energy is one of the few sectors where plan controls still remain. Even in these industries however, only a small proportion of output is produced for the plan, the majority of output is sold at market prices in free markets. Most government fixed priced inputs are allocated to defense industries, important infrastructure projects and key heavy industries,

such as iron and steel. China's credit plan is still the most important means of allocating capital through the government-controlled banks, and only indirectly affects the fast-growing non-bank, non-governmental financial sectors. While this quantitative control is still in place, credit management is also effected by a managed interest rate regime based increasingly on market-determined rates.

2.4.4 Competition in Industry

Competitive activities were virtually not existed in the market prior to the economic reform. China's industry was dominated by the central government-ownership and a rigid regulatory regime. Production and investment by government-owned enterprises were controlled through a system of government authorities, usually the industrial ministries at the central and provincial level. Profits made by government-owned enterprises were surrendered to the government through their governing authorities and investment funds were allocated by the government from the budget. Regional comparative advantage was ignored and regional self-sufficiency became an overriding policy goal. Heavy and military industries were given first priority, but light, consumer goods industries got second priority.

As a result of significant relaxation of government restrictions on the non-governmental sector, competition has increased considerable since 1978. The biggest problem was that industries did not have strong intention to make high quality products and to improve productivity. This must be the main reason why the government decided to set the present economic policy. Entry barriers for domestic and foreign firms to most industries and sectors, with some notable exceptions, have been considerably reduced. Competition in the domestic economy has grown despite the absence of a rigorous bankruptcy mechanism.

2.4.5 Changing to Market Framework

Before 1978, 791 products were controlled under the production and distribution plans, which were made by the central government. But as of year 2005, those categories of products have been reduced to only five, and the rest have been shifted to the free economy market products. Nowadays, those products are being sold in department stores, supermarkets and chain stores, which are scattered everywhere in both rural and urban areas. Meanwhile commercial business of electronic products has developed rapidly, the agent system has been widely adopted by various trades, and great progress has been made in the circulation and delivery of commodities. New material circulation enterprises have replaced traditional storage and transport enterprises.

A great variety of food, clothing and other commodities satisfy the needs of consumers. The total market sales grow each year. At the same time a wholesalers' market has appeared in the commodities sector in which the supply and demand of most commodities are kept in balance, the supply of some goods exceeds the demand, price trends are steady, and the guiding function of the market for producers has been strengthened. As a result, the rights given to private enterprises for purchasing, producing and selling commodities have been extended. Enterprises may organize and establish wholesale markets and trading centers, the wholesale and retail commercial systems are being restructured. Through the reform, the unitary pattern in which the government-control economy monopolized commercial activities has been shifted year by year and step by step. The commodity market pattern of diversified economic elements and operation systems with government ownership of commerce has been established as the main body. Since the reform and opening began, China has continuously expanded the capital market by improving the credit and loan mechanism, and developing stock and government bonds markets. At the beginning of the 1980s, the reform of the credit and loan mechanism, beginning with "unified plan, multi-level control, connection of deposits with loans, and being responsible for making up differences" was developed in accordance with the ratio between assets and debts, and eliminating the limits for the sizes of loans. In order to match this important change, new measures have been adopted, such as making market business public, thus standardizing and strengthening the control and adjustment of the credit and loan market. At the same time, the stock market grew from nothing to become a large-scale as symbolized by the Shanghai and Shenzhen stock exchanges.

Generally speaking, the process of the economic reform in China is following the route of giving guide to market mechanisms. Socialist market economy is characterized by the guiding principle that the government's macro-control is dominant and to have trends to control economic elements that are allowed to develop to enable the market to play a fundamental role in resource allocation and distribution. Since China is on the transitional economic stage from Planned Economy to Market Economy, a series of macro-adjustment and control measures are being adopted to carry out the reform in depth and in all aspects. The governmental ownership will continue to be the main form of ownership as various types of ownership are jointly developed, the operation mechanism of government-owned enterprises will be further transformed to meet the requirements of the market economy, the property rights and responsibilities of enterprises will be clearly defined. The open and unified national market system will be established, closely integrating urban and rural markets, providing for reciprocal flows between domestic and international markets, and promoting the optimization of resource allocation, changing the government's functions in economic management and establishing an

optimal macro-regulatory system chiefly employing indirect means, an income distribution system based on distribution according to work done will be established in which efficiency is given precedence and fairness in distribution is taken into account, a multi-tier social security system will be set up to accelerate the development of China's economy (Table 2-2) .

Table 2-2 Main Contents of Chinese Socialist Market Economy

Reform Items	Pre-Reform	Post-Reform
Structure of Ownership	Single Public Ownership	Dominated by public ownership, with individual, private, and foreign capital ownership as well
Income Distribution	Single Distribution Pattern	Distribution according to work done, combined with other considerations
Economic Operation	Unified Plan	· Combination of both planning and market mechanisms · Remove price controls on most commodities
Economic Decision-making	Highly-centralized System	Multi-level involvement in which enterprises and individuals can play a very active role under the direction and macro-regulation of the central government

(Source: compiled based on data of "CHINA'S AGENDA 21")

While the free market mechanism now has been introduced throughout the country economy, the complex task of establishing the necessary institutional framework to support and facilitate the operations of a market-based system is still in progress. It is clear that China's transition to a market economy country is advancing strongly, and that this process is irreversible. However, its movement should be monitored carefully because the economy of this country has already become enough size that can make critical influences to not only the Asian countries but also the world economy [5].

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[5] George Mina and Frances Perkins, "China's Transitional Economy – Between Plan and Market"

Chapter 3 Regional Disparity of China

3.1 Regional Development of China

3.1.1 Three Regions

As mentioned in Fig. 1-3 of Chapter 1, there are 31 provinces in China, such as 4 directly administered municipalities, namely Beijing, Tianjing, Shanghai and Chongqing, 22 provinces and 5 autonomous areas. These 31 provinces in Mainland China can be grouped into 3 geopolitical regions, which are Eastern region (8 coastal provinces, 4 municipalities), Central region (8 provinces, 1 autonomous region) and Western region (6 provinces, 3 autonomous regions, 1 municipality). Hong Kong and Macao are not included in these 3 regions since they are Special Administrative Regions.

1. Eastern Region

As shown in Fig. 3-1 and Fig. 3-2, approximately 41% Chinese people are living in eastern region, which occupies only 14% China's total area. Historically, eastern region has a dense population because this region has rich land for cultivation and easy access ways from other areas and other countries by road, river and sea. Therefore many kinds of business and industries are located in this area. Consequently the area has been keeping high-quality labor resources. Since China initiated reforms and began opening up, the focus of the government investment has been gradually shifted to the eastern coastal areas. Furthermore, most of the reform measures formulated since 1978 were tried out first in the eastern region. These measures helped spur economic growth and development in the region's promotion. Since the region was opened to the outside world at an early date, it has all the special economic zones and most open cities in China. As for the year of 2004, more than 85% of direct investment foreign firms have been located in this region. Therefore, the region is the most developed and dense population area in China. It accounted for 66.16% of China's GDP in 2001.

2. Central region

The central region, through which the plain runs relatively unimpeded from the north of the Yellow River to the south of the Yangtze River, the temperature and rainfall make this region the agricultural heartland of China. The central region covers 8 provinces and 1 autonomous area. It accounts for 29% of China's land mass and 36% of its total population. The central region is relatively backward in infrastructure, such as transportation and telecommunications. Moreover, because of a relatively weak economic foundation and a slow process of industrialization and urbanization, by the end of 2000, the central region had accounted for

8.78% of the total amount of foreign funds utilized by China. Compared with the eastern region, the central region as a whole is far behind in the degree of an export-led economy. Its level of economic development is relatively low.

3. Western Region

The western region covers 6 provinces, 3 autonomous areas and 1 municipality. It accounts for 57% of China's land mass and 23% of its population. The western region is marked by desert on its western and northern borders. Generally this region has a problem to get water resource, so only 8% of the land is arable for agricultural activities. The western region has also infrastructure utilization problem especially transportation and telecommunications. Because of weak economic foundation and a slow process of industrialization and urbanization, the western region had accounted for 5.42% of the total amount of foreign funds utilized by China by the end of 2000 [1].

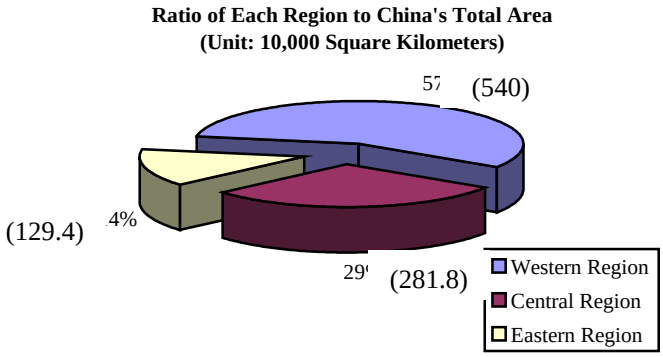


Fig. 3-1 Area Size of Three Geopolitical Regions in China

(Source: compiled based on data of "China in Brief")

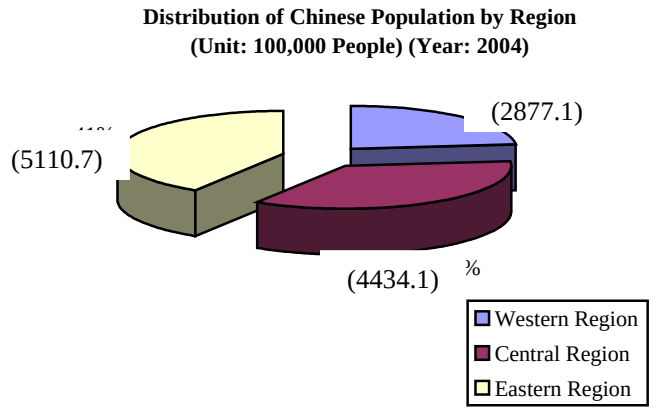


Fig. 3-2 Population Distribution of Three Geopolitical Regions in China

(Source: compiled based on data of "China in Brief")

3.1.2 Regional Disparity

1. Introduction of Gini Coefficient

Gini coefficient is a measure of inequality developed by the Italian statistician Corrado Gini. It is usually used to measure income inequality, but can be used to measure any form of uneven distribution. The Gini coefficient is a number between 0 and 1, where 0 corresponds with perfect equality (where everyone has the same income) and 1 corresponds with perfect inequality (where one person has all the income, and everyone else has zero income). The Gini index is the Gini coefficient expressed in percentage form, and is equal to the Gini coefficient multiplied by 100. The small sample variance properties of G are not known, and large sample approximations to the variance of G are poor. In order for G to be an unbiased estimate of the true population value, it should be multiplied by n/(n-1). The Gini coefficient is calculated as a ratio of the areas on the Lorenz curve diagram. If the area between the line of perfect equality and Lorenz curve is A, and the area underneath the Lorenz curve is B, then the Gini coefficient is A/(A+B). This ratio is expressed as a percentage or as the numerical equivalent of that percentage, which is always a number between 0 and 1 (Fig. 3-3). The Gini coefficient is often calculated with the more practical Brown Formula shown below:

$$G = \left| \; 1 - \sum_{k=1}^{n} (X_k - X_{k-1})(Y_k + Y_{k-1}) \; \right|$$

G: Gini coefficient

X_k: cumulated proportion of the population variable, for k = 0,...,n, with $X_0 = 0$, $X_n = 1$

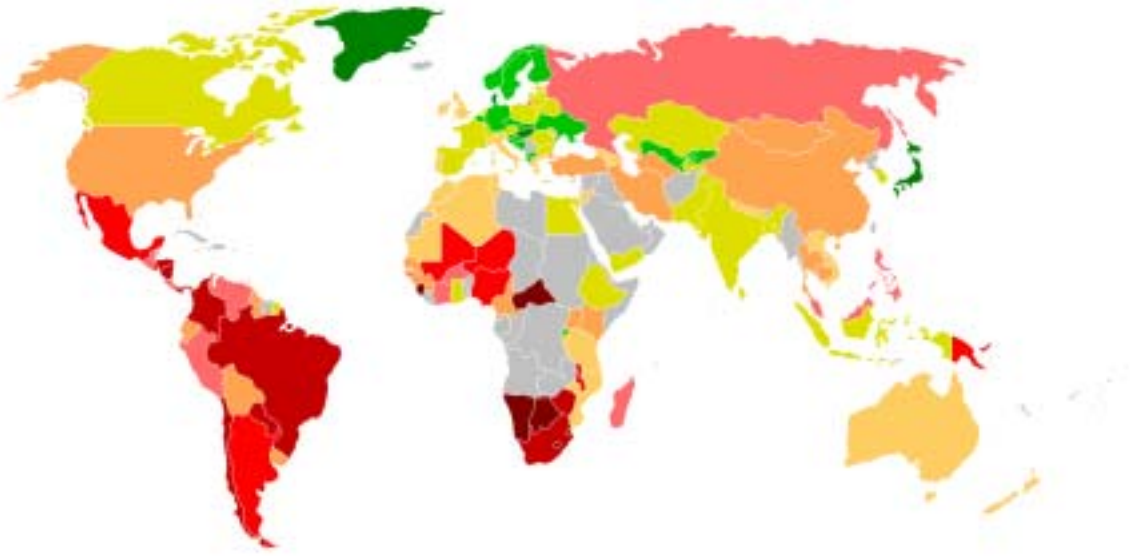
Y_k: cumulated proportion of the income variable, for k = 0,...,n, with $Y_0 = 0$, $Y_n = 1$

Fig. 3-3 Graphical Representation of the Gini coefficient

(Source: “WIKIPEDIA”)

Fig. 3-4 shows that while most developed European nations tend to have Gini coefficients between 0.24 and 0.36, the United States Gini coefficient is above 0.4, indicating that the United States has greater inequality. Using the Gini can help quantify differences in welfare and compensation policies and philosophies. However it should be borne in mind that the Gini coefficient can be misleading when used to make political comparisons between large and small countries. The Gini coefficient's main advantage is that it is a measure of inequality, not a measure of average income or some other variable which is unrepresentative of most of the population, such as Gross Domestic Product. It can be used to compare income distributions across different population sectors as well as countries [2].

Gini Coefficient in the World (Year: 2005)



Color	Gini coefficient
	< 0,25
	0,25 - 0,29
	0,30 - 0,34
	0,35 - 0,39
	0,40 - 0,44
	0,45 - 0,49
	0,50 - 0,54
	0,55 - 0,59
	> 0,60
	NA

Fig. 3-4 Global Disparity by Gini Coefficient

(Source: “WIKIPEDIA”)

2. Regional Disparity of China by Historical Review

It can be observed serious problem of expanding regional disparity 3 times over the past 50 years in China. The first case was happened in 1952, right at the beginning of the data series. The second case was happened in 1967, at the end of the recovery from the “Great Famine” and before the effects of the “Cultural Revolution” set in. and the Third case was started in 1984, at the end of the rural reform period and the start of the expansion based on global integration. In sum, regional disparities seem to have been low when policy was encouraging to agriculture and the rural sector. However it will be high when the sector was relatively neglected. All these events have affected the course of economic growth and income distribution. Gini index is one of the ways to find out regional disparities (In this index it is inequality). The study is coving the second half of twentieth century, a comprehensive time-series of regional inequality in China. This study was made with taking into account its decompositions into rural-urban and inland-coastal components, from 1952 to 2000. As a result, and as shown on Fig. 3-5, it is found that the changes in regional inequality match the phases of Chinese history remarkably well, as do its rural-urban and inland-coastal components [3].

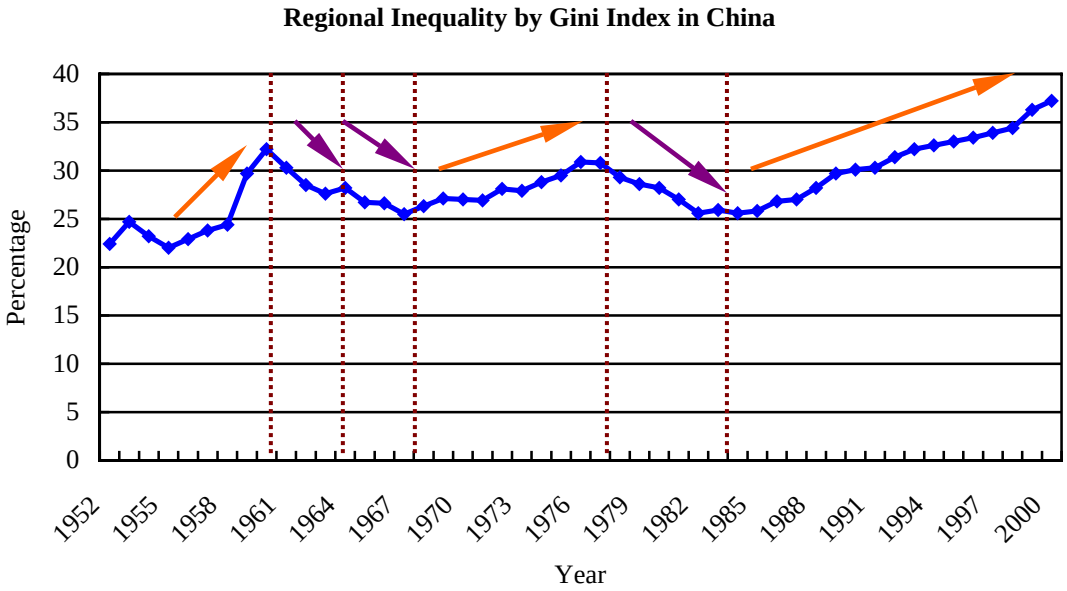


Fig. 3-5 Regional Disparity of China by Gini Index

(Source: Ravi Kanbur & Xiaobo Zhang, “Fifty Years of Regional Inequality in China”)

3. Regional Disparity of China by Comparing with Other Asian Countries

Fig. 3-6 shows the economic development level of China's provinces by comparing with Japan. Taiwan and Hong Kong are regarded as special areas here compared with Mainland China. The GDP Per Capita of China's provinces were in the year of 2004. For Mainland China, nearly 20 years difference in the economic development level between the lowest GDP per capita area Guizhou and the highest area Shanghai. If it is compared with Hong Kong, the difference can be 30 years. Therefore, the existence of regional economic disparity in China shows three different types of "countries" with low developing, mid developing, and high developing level.

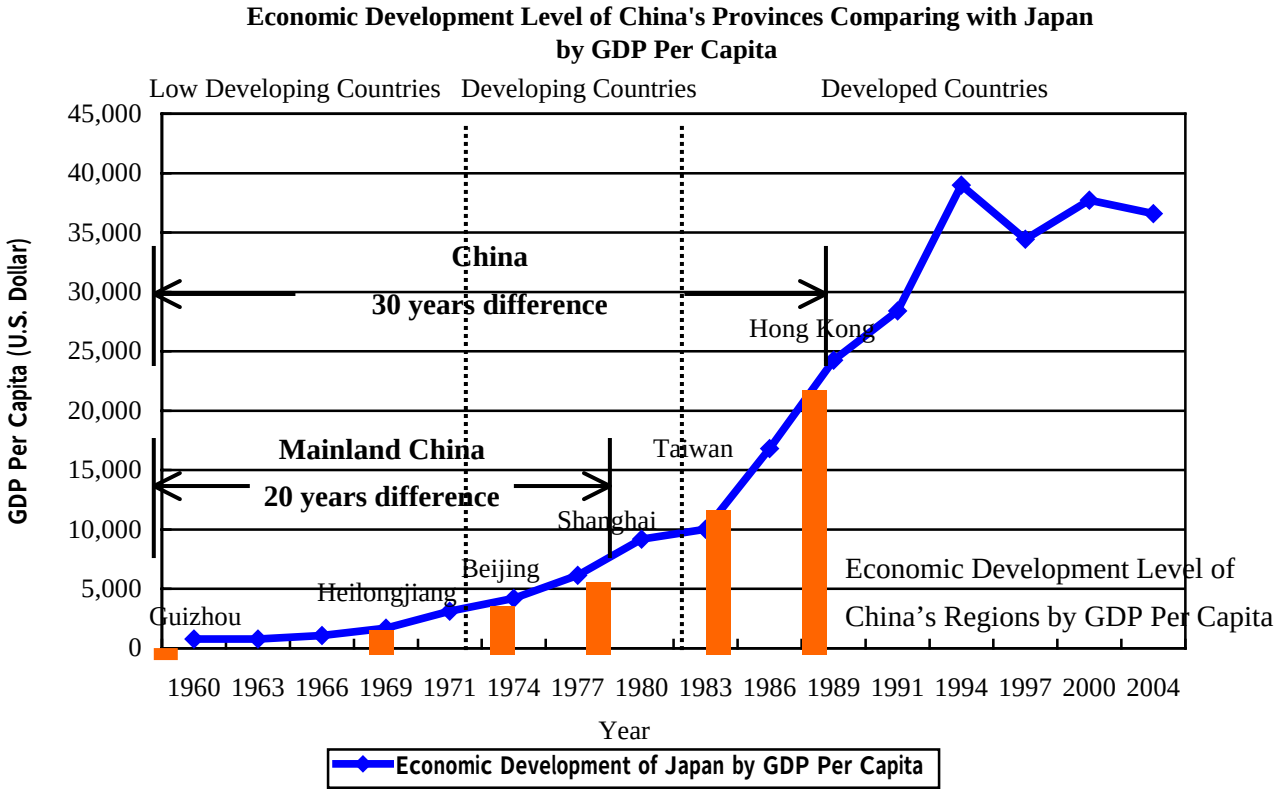


Fig. 3-6 Economic Development Level of China's Regions Comparing with Japan by GDP Per Capita

(Source: Compiled based on data of "China Statistics Bureau" & "WIKIPEDIA", Data of Japan Provided by Mr. GOSO Takashi)

Fig. 3-7 shows the economic development level of China's provinces by comparing with other Asian countries in the year of 2004. Shanghai had the highest GDP Per capita of $6,661 in Mainland China. The second one was Beijing, which indicated $4,454, this figure is as similar

as that of Malaysia. The GDP Per capita of India was $622, so the economic development level is as similar as that of Gansu in China.

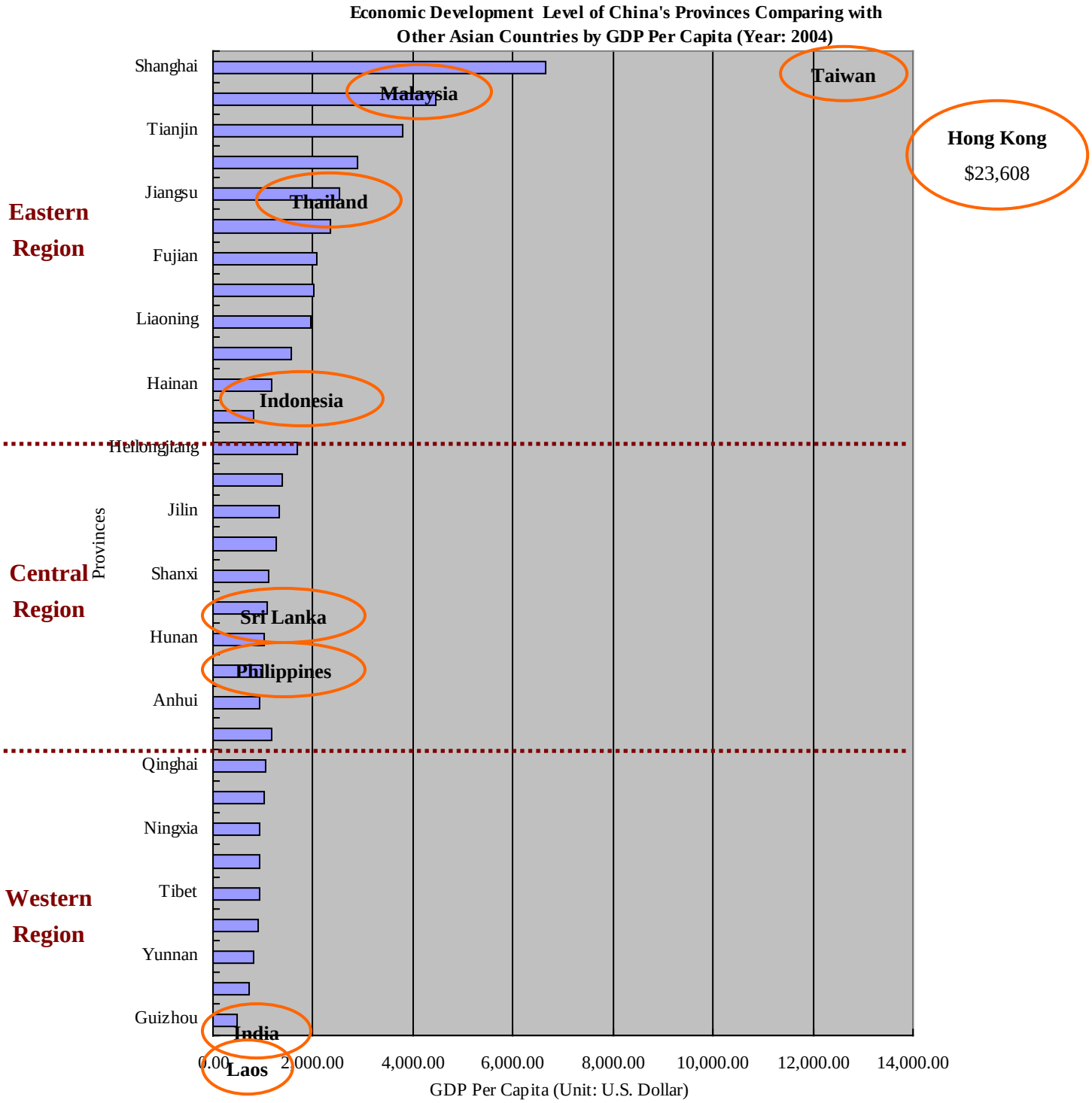


Fig. 3-7 Economic Development Level of China's Provinces Comparing with OtherAsian

Countries by GDP Per Capita (Year: 2004)

(Source: compiled base on data of “China Statistics Bureau” & “WIKIPEDIA”)

3.2 Regional Development Policies of China

3.2.1 Regional Economic Policies

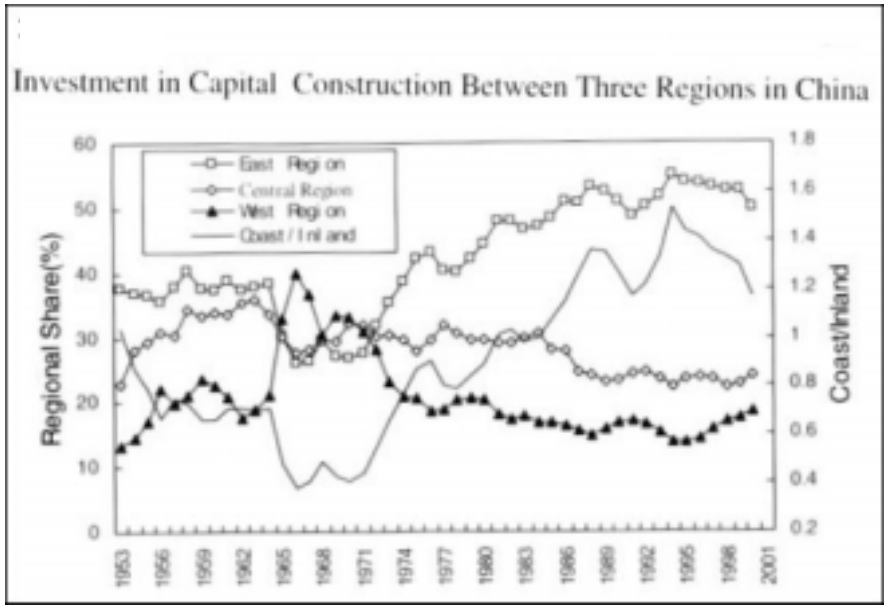
It must be problem that the substantial disparities in regional incomes are clearly observed among the 3 geopolitical regions, and the causes of the disparity are numerous and complex. What is clear, however, is that the successful development strategy of a country must have a function of promoting regional economic development. During the central planning period from 1949 to 1978, China adopted the three key sets of guiding principles behind the Soviet development strategy.

(1) Marxist principles of common ownership with the government as trustee and of generalized egalitarianism.

(2) Stalinist practices of central planning for resource allocation, suppression of light industries and services in favor of heavy industries, and minimization of trade and financial linkages with the capitalist economies.

(3) Principle of regional economic self-sufficiency, that is a region should be self-sufficient not only in food production but in industrial goods as well.

The third principle unquestionably had the greatest impact on regional economic outcomes. The self-reliance principle overlapped with the egalitarian principle because it reduced provincial inequality.



Year

Fig. 3-8 Regional Disparity of China by Investment Distribution

(Source: Dr. Ravi Kanvor & Dr. Xiaobo Zhang)

As shown in Fig. 3-8, the First Five-Year Plan (1953-1957) allocated 56% of government investment to the interior provinces, and that the Second Five-Year Plan (1958-1962) allocated 59%. As the concern for national security grew in the early 1960s, the Third Five-Year Plan (1966-1970) allocated 71% of government investment in the interior provinces. The primary causes of the higher productivity of the coastal industries were that the coastal provinces had deeper pools of management and technical expertise, better linkages between the industrial enterprises and the local economies, and a more developed infrastructure. From 1972 to 1978, China reduced its discrimination against investments in the coastal provinces and increased its economic interaction with the capitalist economies. This policy shift occurred because the government realized that China's economy and technological capacity was falling further behind the rest of the world. Economic modernization required the import of foreign technology, and this necessitated that China increase its export earnings.

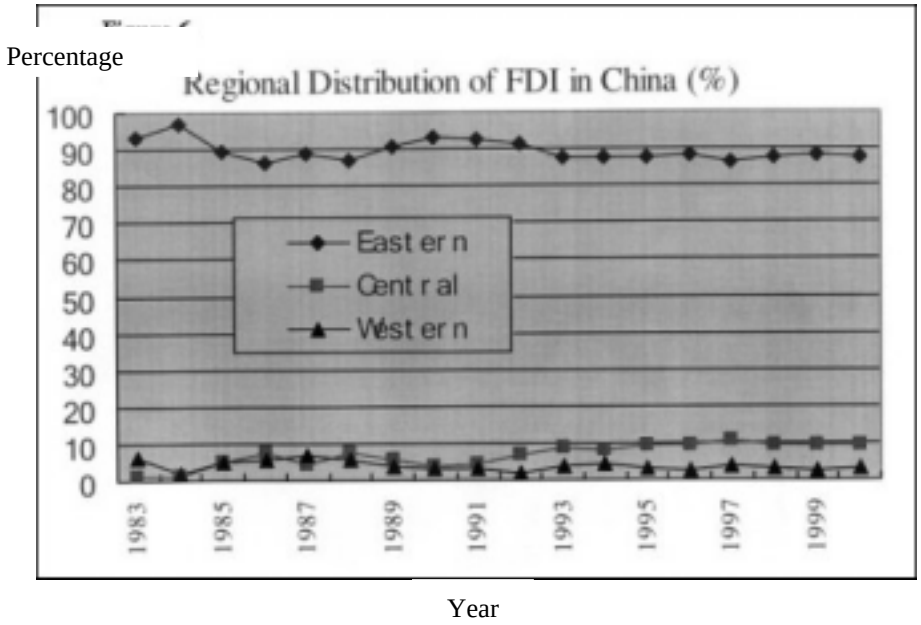


Fig. 3-9 Regional Disparity of China by Foreign Direct Investment (FDI)

(Source: Dr. Ravi Kanvor & Dr. Xiaobo Zhang)

The process of increased economic interaction with the outside world accelerated at the end of 1978. The strategy on the domestic front was the decentralization of agriculture production, the decentralization of the fiscal system, and the deregulation of prices, the strategy on the international front was the Open Door Policy. It consisted of attracting foreign direct investment and promoting foreign trade in targeted areas. Fiscal decentralization took the form of tax

contracting between the central government and the provinces. The taxation reform in 1994, which had a value-added tax as its centerpiece, has reduced the discriminatory elements of the fiscal system, but it has not restored the fiscal capacity of the central government to help the poorest provinces significantly. Since the central and western provinces are the main suppliers of raw industrial materials, the continuation of artificially low prices for these industrial inputs mean that the dual track pricing system was in effect transferring income from the interior producers to the coastal factories (Fig. 3-9).

3.2.2 Regional Preferential Policies

When China opened some coastal cities for foreign direct investment, the government set up the Special Economic Zones so called SEZs. Those zones quickly grew up as the vibrant export platforms and immediately created deep business linkages with the surrounded areas. The open economic zones provided investors various advantages such as preferential taxations, duty exemptions and special labor regulations. The preferential policies extended to coastal regions seem to be the essential policies for capitalization and internationalize of coastal economies. These preferential policies allow coastal provinces to operate in an economic environment closer to those of their East Asian neighbor countries.

The implementation of regional preferential policies went through three broad stages as follows:
(1) In early 1980s: Established SEZs in between 1979 to 1980, as opening to a limited extent.
(2) In middle to end of 1980s: In 1984, coastal preferential strategy enforcement, with the designation of Coastal Open Cities (COCs), which were given the advantages to set up their own Economic and Technological Development Zones (ETDZs). In 1985, followed by the establishment of Coastal Open Economic Zones (COEZs). In 1988, an Open Coastal Belt (OCB) and in 1990, the Shanghai Pudong New Area were created.
(3) In early 1990s: Further extension of Open Door Policy to all of China was issued. New open economic zones were officially started in Major Cities (MCs) along the Yangtze River, Border Economic Cooperation Zones (BECZs), Capital Cities (CCs) of inland provinces and autonomous regions, ETDZs and Bonded Areas (BAs) [4].

In conclusion, the preferential policies and strategy of developing the coastal region were effective. As a consequence of development of the coastal region, the gap between that region and the central and western regions of the country widened. The economic gaps among different regions represent a potential obstacle to future economic growth in China. Therefore, it is the right time for China to find its way to balance the economic development of each region.

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Chapter 4 Industry in China

4.1 Industrial Structure of China

The enterprises in China are classified into two categories:
(1) Central government-owned enterprises, their capital belongs to the government. The government assumes contractual responsibilities in respect of the enterprises and they are allowed to manage and operate on their own. Independent audit has been introduced and the management is responsible for profit and loss.
(2) The second category is corporations, private businesses and individual-owned businesses are being operated under the laws and policies of the government and they pay taxes according to extend legislation. The operations are flexible and are regulated by market forces. University-run enterprises belong to this type.

Domestically, modernization and economic growth have been the focus of the reform policies, and in attempting to achieve this, the leadership has implemented the “Four Modernizations Program” that lays special emphasis on the fields of agriculture, industry, education, science & technology, and defense. In the countryside, the “responsibility system” has been implemented and basically represents a return to family farming. Under this system, families lease land for a period of up to thirty years, and must agree to supply the government an agreed quota of grain or industrial crops at a fixed low cost in return. The remaining surplus can either be sold to the government or on the free market. As a result, farmers have been increasing their agricultural output in response to these incentives. Together with the “responsibility system”, there have also been a number of reforms relating to rural businesses, especially in the spheres of commerce and manufacturing. The increase in personal income brought about through the “responsibility system” has led to a burgeoning of small-scale enterprises that remain completely in private hands.

Fig. 4-1 shows the industrial structure by GDP share in China. Since the 1950s, the trend away from the agricultural sector toward industrialization has been dramatic, and is a result of both policy changes and free market mechanisms. During the 1950s and 1960s, heavy industry received most attention and consequently grew twice as rapidly as agriculture. After the reforms of 1978, more attention to the agricultural sector as well as a move away from heavy industry toward light industry resulted in agricultural output almost doubling with only marginal

increases for industry. The role of free market forces has also been instrumental in altering China's sector make-up. After 1979, the forces of supply and demand meant that consumers could play a greater role in determining which crops would be planted. This had the effect of making more profitable the planting of such crops as fruit, vegetables and tea. As a consequence, however, traditional grain crops have suffered, as farmers prefer to plant the more profitable cash crops. Increases in light industrial production and more profitable crops brought about by the loosening of market controls have not always been enough to satisfy consumer demand, which in turn has led to inflation. Rather than increased demand being met with increased supply, China's manufacturing sector and economic infrastructure are still too underdeveloped to supply a population of over one billion people with the commodities they want or need.

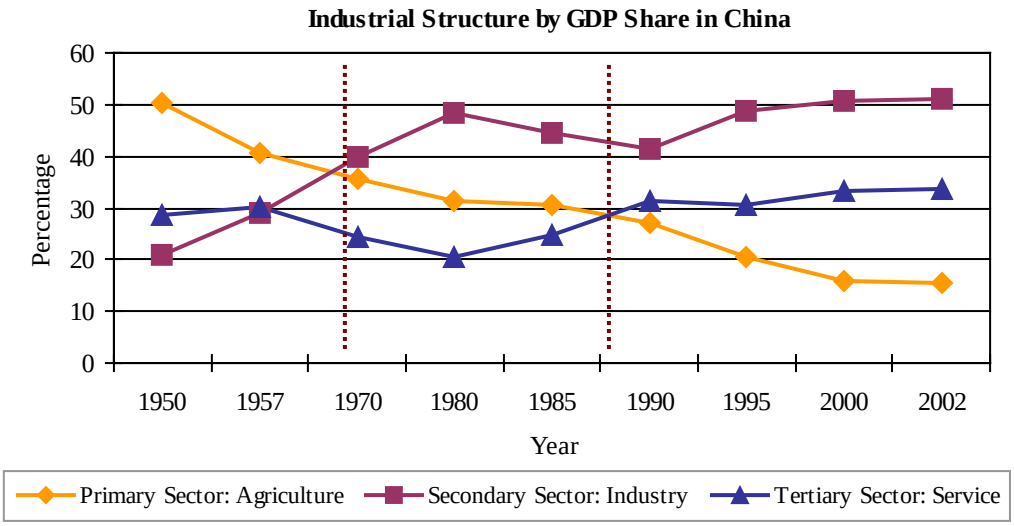

Fig. 4-1 Industrial Structure by GDP Share in China

(Source: compiled based on data of Huijiong WANG,
"Sustainable Industrial Overview of China – Current and Future Perspective")

China's current eighth Five Year Plan from 1991 to 1995, which reflects the goals of slowing the economy down to a manageable level after the excesses of the late 1980s. The growth rate of GDP is planned to average 6% annually, and government investment will be drawn away from national construction programs towards agriculture, transport and communications. Increased investment into capital construction programs and Township and Village Enterprises (TVEs) was China's solution to reviving its economy. However, by mid-1991 signs re-emerged that China's economy was about to overheat once again. Rises in industrial production within TVEs of 32% for the first half of 1991, refusal to heed calls for curbs on investment capital construction in the provinces as well as the re-emergence of double-digit inflation. The rapid

growth of early 1991 indicated that Chinese government is still going to have to struggle further with enforcing its economic policies [1].

4.2 Industrial Development of China

In 1949 China's industry had accumulated only RMB 12.4Billion in fixed assets, and industrial products were very few. Most finished industrial products were imported at that time. After the founding of People's Republic of China in 1949, Chinese government started construction on a large scale. As a result, the country's industrial foundation has been strengthened and its production level was raised rapidly. The metallurgical, mining and energy industries, airplane and automobile industries, and the new industries, including petrochemicals, computers, telecommunication equipments, instruments and meters, and aeronautics have been built up from nothing. Since 1978, the policies of reform and opening to the outside world have enabled China's industry to enter a stage of great innovation and development. From 1978 to 1999, China's industry increased at an average rate of 11.1% every year, and the comprehensive industrial strength was remarkably enhanced. By 1999, some RMB 3,535.7Billion of industrial added value had been attained, an increase of 10.2 times over 1978.

China's industrial reform first began by giving more rights to and leaving more profits for enterprises, extending enterprises' independent operations and practicing the "enterprise contract responsibility system", which fully mobilized the initiative and creativeness of enterprises and their workers and staff members, and created an excellent environment for the improvement of the operation mechanism of enterprises. Next, China speeded up its industrialization through the introduction of foreign capital and opening to the outside world. The establishment of large numbers of Sino-foreign joint and wholly foreign-owned enterprises has not only brought more capital to enterprises, but also advanced equipment and modernized management. Through 21 years of reform, China's industry has got rid of the backwardness in which it could only make one or a few varieties of products and its technological level was low. The production level of industrial products has increased by a big margin. The growth rates of chemical fibers, fertilizers, ethylene, plastics, plate glass and other important means of production products have doubled or more than doubled. Many consumer goods closely related to people's lives have grown from zero and expanded from small to large, the growth rate of some products has even reached more than one hundred times, such as color TV sets, refrigerators, washing machines, air-conditioners, cameras, video recorders, VCD and DVD sets, and stereos. A number of new and high technology products have appeared quickly, such as stored-program-controlled switching systems, large-scale integrated circuits and micro-electronic computers. The output of cars is also increasing at a rapid rate, along with the increasing number of cars possessed by households. The reform of central government-owned

industrial enterprises, especially large and medium-sized enterprises, is the constant focus of China's economic system reform. At present, in accordance with the principles of the "modern enterprise system", the property rights and responsibilities of enterprises will be clearly defined, the functions of government separated from those of enterprises. In recent years a large number of enterprise groups have been set up through annexation during the re-organization of enterprises, such as the China Petroleum and Natural Gas Group, Shanghai Baoshan Iron and Steel Group, and some household appliance industrial groups, for instance, Changhong, Haier, Konka, Kelon and TCL. The Legend and Founder of Beijing University groups are prominent in the micro-computer industry. These groups take part not only in domestic but also international competition.

Though China has made rapid progress in industry, irrational structure within industries and unbalanced development in regional economies still exist. The reform of central government-owned enterprises has just been started, and the tasks are hard. Facing the 21st century, China will quicken its steps in restructuring industry and establishing its new-type industrial system as fast as it can in order to suit the development of socialist market economy [2].

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Chapter 5 Education in China

5.1 Education Development of China

5.1.1 Education System

China's education system is composed of 4 components, basic education, common higher education, adult education and occupational / polytechnic education. China has adopted a nine-year compulsory schooling system, which means all children are required to attend school for at least nine years. Students have to complete both the primary school program and the junior middle-school program. Higher education is only for those students who have passed examinations of all levels. Students must pass the entrance examination for senior middle schools or middle-level technical schools. After two, three or four years, they have to go through national college entrance examination for admission to universities.

1. Basic Education

Basic education comprises of pre-school education, primary (6 years) and junior (3 years) and senior (3 years) middle schooling. Children aged from 3 to 6 will attend kindergartens located near their houses, where they learn the basic native language and subjects. Most of people in China have a strong intention to give their children education since they know that a person's personality is mould in the early childhood and good education is necessary to get higher income after children grown up. The primary school education requires 6 years. Pupils are required to take a variety of subjects such as the Chinese language, fundamental mathematics and moral education. They also take part in sports and extra-curriculum activities. Foreign languages such as English are optional courses in the senior year of the primary education. High school education has two parts, 3-year junior high school program and 3-year senior high school. From junior high school, students begin to learn a variety of science subjects such as chemistry, physics and biology and other subjects such as history, geography, and foreign languages. Physical education is enthusiastically encouraged. Senior high school education is a continuation of junior high school. Students take up specific subjects in either science or humanity subjects. Many contests are organized annually in all levels to encourage their study. The purpose is for them in preparation for the national college entrance examination. Examinations are designed separately for science and arts students.

2.Higher Education

Common higher education comprises of junior college, bachelor, master and doctoral degree programs. Junior college program usually lasts 2~3 years, bachelor program is 4 years (medical and some engineering and technical programs will be 5 years), master program is 2~3 years, doctoral program lasts 3 years. China's higher education is characterized by various forms, which encompasses basically all branches of learning, combines both degree-education and non-degree education and integrates college education, undergraduate education and graduate education. Chinese government attaches great importance to the international cooperation and exchanges of higher education.

3.Adult Education

Adult education comprises of schooling education, anti-illiteracy education and other programs oriented to adult groups. Adult schools usually consist of the following: education radio and television universities, institutions of higher learning for workers and farmers, colleges for management personnel, education institutes, independent correspondence colleges, adult education offered by regular institutions, TV education via satellite as well as the system of examinations for self-taught students at higher level.

4. Occupational Education

Occupational education is mainly composed of medium-level professional schools, polytechnic schools, occupational middle schools as well as short-term occupational and technical training programs of various forms. China has been actively engaged in the international cooperation and exchanges in the field of vocational education. China has also made more and more contact with the UNESCO, UNDP, World Labor Organization, UNPF, APEC and other international organizations while the bilateral cooperation and exchanges between China and other countries has been increasingly expanded.

In summary, the focus of China's education is to improve the country's intellectual outlook and bring about competent students in all aspects of China's development. China's future relies on the younger generation to take the country into the new era [1].

5.1.2 Education Development

Shortly after the founding of People’s Republic of China, the government took education as a matter of primary importance, and made enhancing the cultural quality of the people the basis of the construction of the nation. Before 1949, China had a population of nearly 500 million, of

whom 80% were illiterate. Proceeding from reforming the educational system, the Chinese government made an overall plan and adjusted its educational policies, with the result that the number of students increased rapidly. Currently, 91% of the country has instituted compulsory primary education, nearly 99% of school-age children are enrolled in schools, the dropout rate has decreased and the illiteracy rate of young and middle-aged people has declined to less than 7%. Since the initiation of the reform and opening policies in 1978, marked by the restoration of the higher-education examination system, China's education got on the road to accelerated development. As one of the priorities of China's economic and social development, education is a matter of great concern to the government (Fig. 5-1).

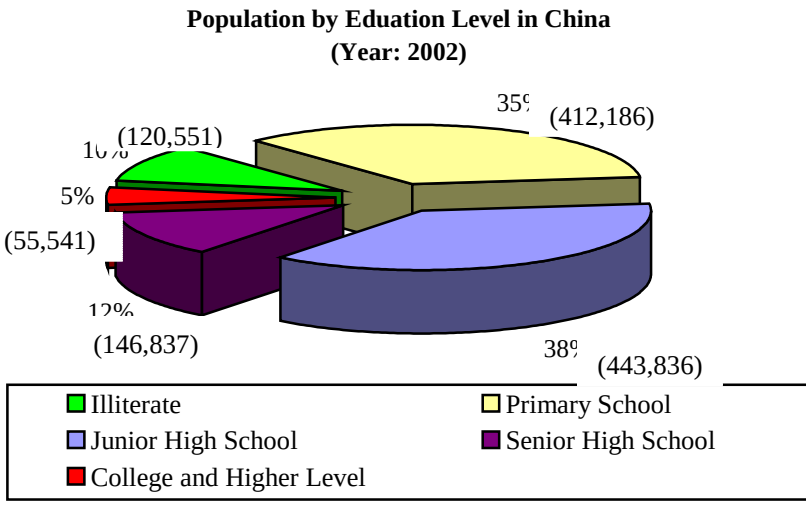

Fig. 5-1 Population by Education Level in China (Unit: 1,000 People)

(Source: compiled based on data of "China Statistical Yearbook 2003")

(Note: Statistical figure in this chart refers to the population aged 6 and over)

The cross-century period is an important phase in China's economic and social development. Giving priority to the development of education is the basis of the two major national strategies of improving the quality of people and rejuvenating the nation by relying on science and education and realizing sustained development. As human society enters the knowledge and information age, education is expected to play an increasingly important role.

5.2 Higher Education System in China

5.2.1 Higher Education Development

The first wave of higher education development came in the 1950s when the communist government introduced a higher education system geared to train students to meet the manpower needs of government and the society at large. During the period from 1966 to 1976, China's higher education system was destroyed by the “Cultural Revolution”, and it was rebuilt in the late 1970s as one element of a strategy to modernize the country. Much external assistance at the time was in a piecemeal, rehabilitative mode. The 1978-1994 period witnessed a remarkable proliferation of public, regular higher education institutions, from 598 in 1978 to 1,080 in 1994. Enrollment numbers grew from 0.86 million in 1978 to 2.8 million in 1994. Full-time students in undergraduate and short-cycle courses grew at an annual growth rate of 7.7%. Graduate course enrollment rose from zero to 0.13 million by 1994. The higher education participation rate at just over 4% of gross enrollment, however, it is very low when comparison to other East Asian countries. This may have serious implications for the sustainability of economic growth and long-term social development in China. In relation to the pressures of a growing market economy, the higher education sub-sector as a whole faces some problems, which may obstruct its further reform and development. Since 1978, the Government has placed priority within the education sector upon rapid expansion and improvement of higher education to help reduce the human resource constraints on the country’s economic and social development. In 1985, the government adopted the document “Decision on Education Reform”, which aimed at providing the mix of skills required in a rapidly developing society to improve efficiency, quality and equity, and to release resources required to develop and enhance education at lower levels. More recently, in order to speed up transformation nationwide from a planned economy to a market economy, the “Guidelines of China's Educational Reform and Development” adopted a major strategic approach of decentralization in institutional management and administration while maintaining managerial oversight at the macro level.

Higher education in China is to train specialists for all the sectors of the country's development. Universities, colleges and institutes offer four-year or five-year undergraduate programs as well as special two-year or three-year programs. Students who have completed a first degree may apply to enter graduate schools. University admission is operated on a centralized enrollment system, in which admissions committees at the provincial level are under the Ministry of Education. Admission is granted on the basis of academic, physical and moral qualifications.

Special allowances are made for minority nationality and overseas Chinese candidates. Candidate can take the examination in either one of the two categories, humanities or sciences/engineering. They apply for the institutions and departments they wish to enter in order of preference. Enrollment is determined by the examination results. Brief investigation into their social behavior and moral character is conducted before students are admitted. In some faculties, specific physical requirements must be met**.** The number of university is increasing continuously since the founding of People's Republic of China in 1949, except two periods, which are "Culture Revolution" and "University Merger". There are 1,683 universities in China now, and the university undergraduate enrollment in 2004 was 4.2 million (Fig. 5-2).

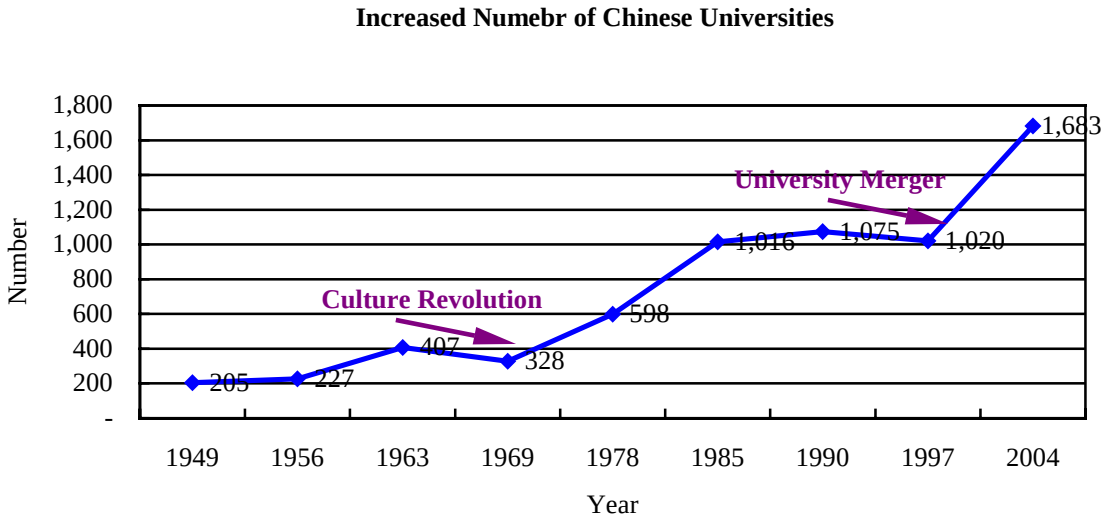

Fig. 5-2 Increased Number of Chinese Universities

(Source: compiled based on data of 'Ministry of Education, China')

5.2.2 Reform of Higher Education System

Chinese economic system used to be highly centralized. To adapt to that, the former higher education system was also centralized, with education provided by the central and local governments respectively and directly under their administration. The disadvantages of this system were that the central government undertook too many responsibilities and the schools lacked the flexibility and autonomy to provide education according to the needs of the society. With central departments and local governments providing education separately, the structure of education was irrational and segmented. There were too many single disciplinary and professional Higher Education Institutions, with the establishment of disciplines over-lapped,

the efficiency of some universities fell very low which in return hampered the improvement of education quality. Therefore, the structural reform of higher education has become a key for other higher education reforms. The reforms of higher education consist of five parts. They are reforms of education provision, management, investment, recruitment and job-placement, and the inner-institute management, among which management reform is of most importance and difficulty (Table 5-1).

Table 5-1 Brief Historical Review of Higher Education Reform in China

Time	Background	Reform Contents	Characteristics
Reconstruction & 1st Plan Period (1949 – 1957)	Founding of People's Republic of China	∗nationalization & reconstitution of institutions founded before 1949 ∗adoption of Soviet Model ∗centralized policy ∗sending students to Soviet countries	Development of a New Model
2nd Plan & Adjustment Period (1958 – 1965)	"Great Leap Forward" Revolution	∗providing access to higher education for all qualified and willing youth and adults ∗reduce instruction on theory in curriculum	Rapid Expansion & Change
Cultural Revolution Period (1966 – 1976)	"Cultural Revolution"	∗discontinuation of national examination for admissions to university ∗completely stop in admissions of undergraduates for 6 years, graduates for 12 years ∗initiate the admission of students from farmers and working class	Drastic Change
Reform & Opening Period (1977-Present)	Reform & Opening Policy	∗reform in admissions, graduate placement, and management ∗develop 100 key universities and key disciplines ∗expansion of student enrollment ∗more university management power for provincial governments ∗develop private education institutions	Further Reform

The overall objectives of higher education reform are to smooth the relationship among government, society and universities, setting up and perfecting a new system in which the central government is responsible for the overall planning and macro management while the universities follow the laws and enjoy the autonomy to provide education according to needs of the society. Regarding management system reform, the relationship among universities, government and society has been gradually smoothed out by various ways such as joint establishment, adjustment, cooperation and merger. A two-level education provision system has

taken shape in which the central and local government will take different responsibilities to provide education with the former responsible for the overall planning and management. As a result, the overlapping of education was overcome. At the same time, the government streamlined their administration and delegate more independence and management powers to the universities, consequently universities could expand their autonomy of providing education for the society according to the laws (Table 5-2).

Table 5-2 Classification of Chinese Higher Education Institutions

(Year: 2004)

University Funding / University Classification	University Funded by Government			University Funded by Private
	Central Ministry-owned		Province-owned	
	Ministry of Education	Other Ministries		
Universities & Colleges	73	23	1,587	197
Others	548			2

(Source: compiled based on data of 'China Education and Research Network')

With regard to the financing system, the old system in which the funding of higher education depended on the governments only has been changed and a new system capable of pooling resources from diverse channels with the main responsibilities on government has been gradually established and perfected. With regard to the reform of recruitment system, fees charging and graduates job-placing, on the basis that all citizens should enjoy the legally equal right of receiving higher education, which should be consistently stick to, in the light of local economic development, a new system in which all students should pay reasonable tuition fee to their own higher education has taken shape. Simultaneously, a scholarship system for excellent student both academically and morally and a loan, stipend and taking part-time jobs system for students with family economic difficulties has been brought into common practice, ensuring that none students will drop out of school because of economic reasons. After their graduation, the students will mainly select their own jobs under the guidance of the state policy. With regard to the reform of internal administration mechanism, the key lies in the personnel system and the allotment system reforms. On the basis of reasonable organization structure delimitation, all the teaching staff carry out the post responsibility system and appointment system and working achievements are emphasized concerning the personal income allotment, which strengthens the

encouragement mechanism in allotment and mobilized the enthusiasm of teaching. After several years the structural reform of higher education has gained heartening achievements. In the field of education provision reform, the old system in which the central government undertook the establishment of all universities has been broken, and a new system in which the government take main responsibility with the active participation of local governments, society and individuals has been taking shape [2].

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Chapter 6 University-run Enterprise of China

6.1 General Introduction of University-run Enterprise in China

6.1.1 Emergence, Growth, and Development of University-run Enterprise

Nowadays nearly all of the universities in China have affiliated enterprises or firms, they shall be called "University-run enterprises". Those enterprises or firms are established by the universities with their own funds and universities are managing them as the largest shareholders, there are some other cases not only 100% owned by the universities but also joint operation, joint venture and consortiums etc. As shown in Fig. 6-1, until the end of 2000, 5,451 university-run enterprises have been established in China. 40 of them are already listed on the stock markets. Most of these enterprises are located in Eastern Region, while only 15% of them are being managed by the universities located in Western Region.

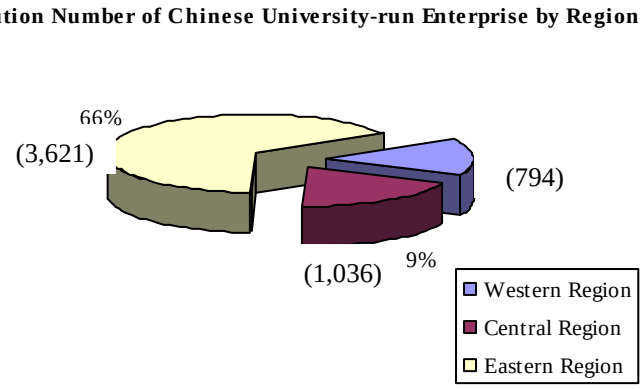

Fig. 6-1 Distribution of University-run Enterprises by Region in China

(Source: compiled base on data of 'S & T Development Center, Ministry of Education, China')

University-run enterprises came into being since 1950s. Particularly those, which have engineering and science-bases have had university-affiliated factories, which are mainly used for students to get short-term internship or apprenticeship in a real production environment. Also under the "self-sufficient organizational system" for enterprises, universities, and other social institutions in China after the founding of the People's Republic of China, many universities had their own service providers, such as print shops, publishers, guesthouses, and so

forth. The real development of university-run enterprises occurred from the early 1980s to 1990s. During this period, China began to implement reforms and the open door policy, which included encouraging the educational institutions to engage in the economic and social development. Faced with the commercial opportunities in the society and their internal financial needs, the traditional university affiliated service providers began to open up to the general society, while many new services were also created. Most of these operations were focused on technology transfer and development, technology consulting and services [1].

Table 6-1 General Statistics of University-run Enterprises in China

(Year: 2000)

Category Items		Ratio (%)	Income (RMB\Billion)	Profit (RMB\Billion)	Tax Paying (RMB\Billion)
Type of Business	Manufacture	36.6	28.61	2.66	1.54
	Trade & Related Service	15.6	4.35	0.24	0.16
	Others	47.8	15.50	1.66	0.85
Type of Ownership	University-owned	87.9	32.18	2.51	1.61
	Joint Ventures with Domestic Partners	10.2	14.37	1.81	0.83
	Joint Ventures with Foreign Partners	1.9	1.90	0.24	0.11
Type of Management Control	Belong to University	77.4	45.53	4.38	2.41
	Belong to School, Department or Institute	22.6	2.93	0.18	0.13

(Source: “Science & Technology Development Center, Ministry of Education, China”)

Table 6-1 shows the general statistics of university-run enterprises in China. They are being run under three models. The first one is university affiliated factories or print shops. The second model is to use university technologies to establish commercial entities jointly with enterprises outside universities. The third model is companies or firms of technology development created by universities or their own departments. Among these university-run enterprises, in terms of business orientation, about half were engaged in production and trade and the rest in service businesses, such as a guesthouse. As seeing from this table, it is clear that enterprises in production can generate more income, profit and tax on a per capita basis. In terms of ownership structure, 88% of these enterprises were owned by universities, with some domestic and

international joint ventures. It is interesting to note that at the enterprise level, joint ventures with domestic partners performed much better than both university single ownership and international joint ventures. In addition, about 80% of the enterprises were managed at university level. These enterprises performed much better than those managed at the school or department level.

6.1.2 Reasons for Establishing and Managing University-run Enterprise

Several reasons can be cited as to why Chinese universities want to set up and operate their own affiliated enterprises or firms. One reason is that universities had no demand for their retained technology seeds for a long period of time. Under the former Soviet-style innovation system in the pre-reform period, no mechanism existed to transfer universities' research achievements to the industry, thus technology transfer from universities to the industry was extremely difficult. Secondly, there is also a problem of universities' fiscal management. Chinese universities, which are funded by the government, receive budget allocation from the Finance Ministry and technically they can ask for an increase in budget allocation. As the government fiscal constraints became obvious in the 1990s, the allocation of education-related budget has been coming under strong retrenchment pressure. Given the circumstances, Peking University and Tsinghua University have been shouldering roughly half of the expenses on their own, with profits from their affiliated enterprises covering major portion of such self-supporting funds. In other words, university-run enterprises are counted on to make up for the shortage in the budget coming from the government.

6.1.3 Operation System of University-run Enterprise

Today, however, relationships between universities and their affiliated enterprises are being reexamined. An emerging trend is to strengthen a science park-based incubation function to make clearer distinction between education and social activities. Providing higher education and research activities are the original role of universities, and the management of enterprises should be shifted away from the conventional way of the direct ownership and management to their affiliated companies by universities. In the background of such development lies the ownership problem of university-run enterprises. Most of the university-run enterprises established before the issue of the 1994 Company Law are wholly owned by the central government, and questions are now being raised over the lack of clarity as to what portion of equities belong to each of concerned parties, a university, the government and a university-run enterprise. According to the information published by Education Ministry, 90% of these 5,451 university-run enterprises

are wholly owned by the central government. Thus, ultimate responsibility should be substantially held by the central government. A university is taking a full risk for the operation of its affiliated enterprise. To this, the State Council is responding by putting in stricter discipline over university-run enterprises to prevent their bankruptcies and subsequent negative impact on universities. Specifically, the council decided to reform those under Peking University and Tsinghua University, setting a model for other university-run enterprises. University-run enterprises, by getting transformed into either a limited liability company or a joint-venture as stipulated under the law, would become a separate entity independent from universities and be re-registered as such. With this, universities would become a sole stockholder of their affiliated enterprises and their liabilities would be limited to the amount of their paid in capital. As shown in Fig. 6-2, there are two types of management system for operating university-run enterprises. One is called Peking University style and another is Tsinghua University style. These are depending on the ways of clarifying management responsibility by establishing an organization that separate corporate management and university's original functions such as research activities and education. Peking University has a kind of "direct control system" with the management department within the university completely taking charge of the management of affiliated enterprises. In contrast, Tsinghua University has opted for an "indirect control system" by founding Tsinghua University Enterprises Group as a holding company. For further preferable development in the future, Tsinghua University style provides greater clarity of responsibility and accountability, it is closer to the system adopted by U.S. universities or a Silicon Valley model in the U.S. [2].

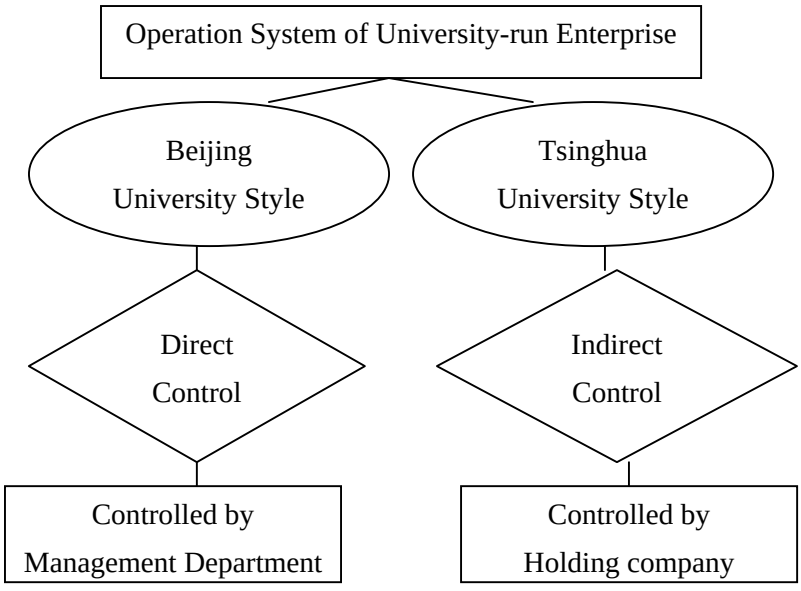

Fig. 6-2 Operation System of Chinese University-run Enterprise

(Source: compiled based on SUNAMI Atsushi,

"Industry-University Cooperation and University-affiliated Enterprises in China")

6.2 University-run Enterprise Assessed by SWOT Analysis

It is necessary to do analysis on university-run enterprises so that a proper "Regional Development Scheme" based on education can be put forward. SWOT (strengths, weaknesses, opportunities, and threats) analysis is one of the most effective tools to assess the strategic situation and identify strategic options for organizations or firms. A strength is a resource of what the organization can use effectively to achieve its objectives. A weakness is the limitation or defect in the organization that will keep it from achieving its objectives. An opportunity is any favorable situation in the organization's environment. A threat is any unfavorable situation in the organization's environment that is potentially damaging to its strategy. Thus, the strategy of further development for university-run enterprises can be set up by such analysis (Fig. 6-3).

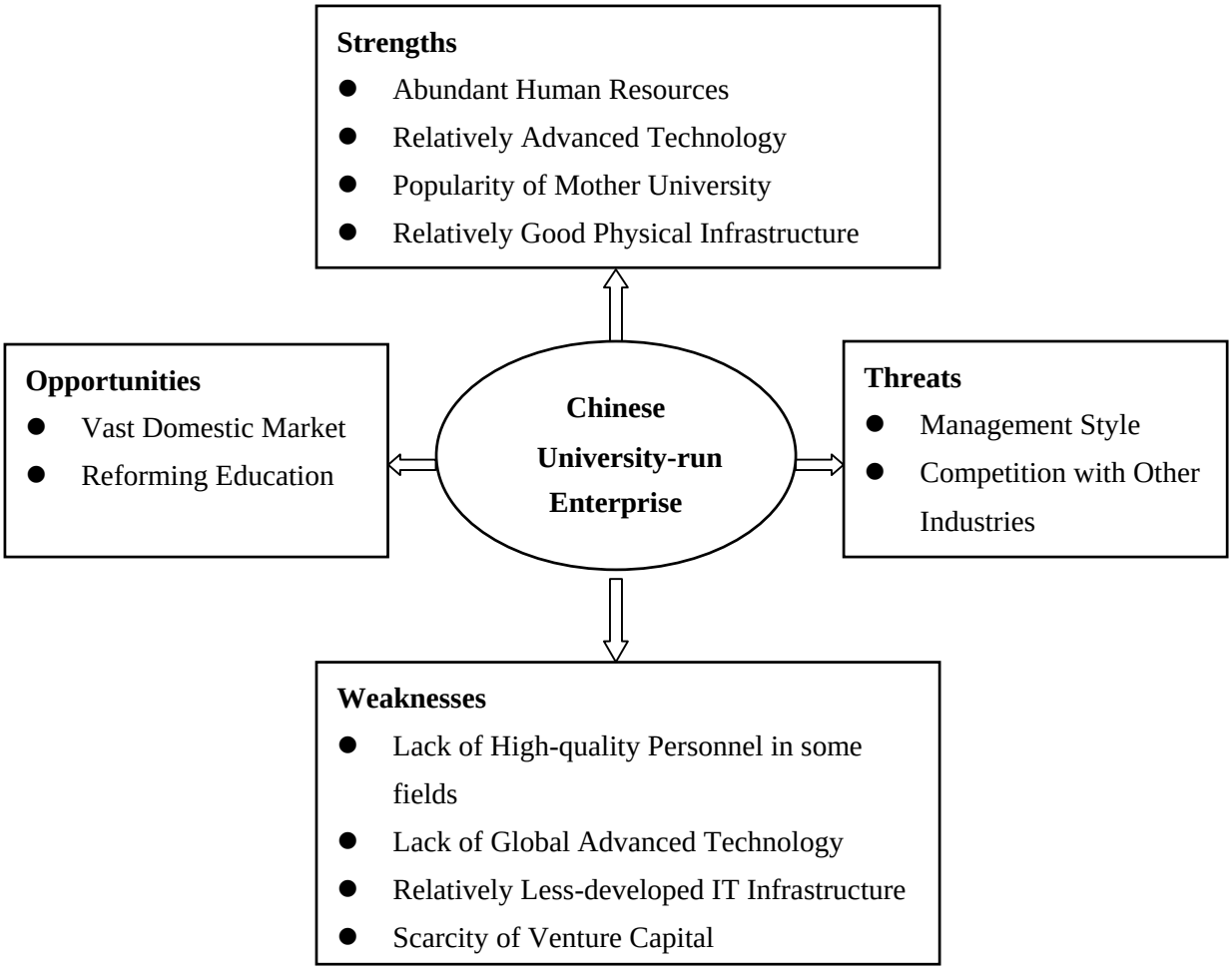

Fig. 6-3 SWOT Analysis of Chinese University-run Enterprises

1. Strengths Analysis

Universities have several management resources, such as technologies, brand, human resource, and networks. They have to choose whether to internalize the resources by starting university-run enterprises or externalize them by transferring the resources to the manufacturing firms. Given this situation, the Chinese universities have decided to start their own firms because they were highly motivated to make money through the reforms of Science & Technology scheme that began in 1985 when the government drastically cut fiscal support for academic institutions. The universities also felt they were more competent in industrializing knowledge than the outside manufacturing firms. Therefore, the comparative advantages of mother universities with strong engineering research and talented faculty and students were thought to be an important source of strength for the university-run enterprises. Academic strengths and reputation are another important contributor to the strong growth of university-run enterprises.

The main obstacles for transferring technology to outside manufacturing firms are:

(1) To reinforce the capacity of manufacturing firms

(2) To develop the related institutions, such as information service agency, patent licensing office, intellectual property right protection.

In addition, to get convenient transportation and less expensive land and facilities are important conditions for starting and running a business. Universities relatively have an advantage to keep those conditions because they have physical infrastructure that can be provided to their affiliated enterprises. They also have other advantages such as preferential policies, financing, and tax exemptions and reductions, those are given university-run enterprises by the government [3].

2. Weaknesses Analysis

Although university-run enterprises have enough educated workforce, there are not much capable personnel who can do creative activities in certain fields. There are two reasons of such situation. The first reason is that the educational system in China does not emphasize creative thinking and problem-solving skills. Another reason is that seasoned professionals with in-depth entrepreneurial, management, financial and investment experience are also in short supply. The distribution of global high technology now looks like a pyramid. For the IT industry, the U.S. is in the global leading position with most advanced technologies, especially software systems and special chip design. Japan and EU are following U.S. closely, and have to take over most of the key component markets. Lower down the value chain are Taiwan, South Korea and Singapore. At the bottom of the global production network stands China, which is targeted for developing

its IT industry. Chinese IT manufacturers in university-run enterprises and science parks are taking the role of assemblers, which makes their profit margin is small. China almost totally relies on the US in the areas of fundamental software and operating systems. Thus, Chinese firms mainly provide Chinese platforms for US products.

Although Chinese venture capital is burgeoning, especially the large share government funds, both venture capital and venture capitalists are still a scarce. This shortage reflects the fact that there are few worthwhile projects in which to invest. Available projects currently reflect a low level of technological innovations, without abundance of such new and high-level technology field, venture capital will not be available. Also equally important is the imperfect financial and legal system. A Venture Capital Law and Investment Law are still lacking in this regard. A lesser obstacle is a shortage of venture capitalists, but these two should be remedied by the first two reasons.

3. Opportunities Analysis

Stable economic growth and a large population make China a prominent and potentially lucrative global market. The large domestic market has played a key role in supporting high-tech industries. Yet, compared to leading economies of the world, China's technological level is still falls behind. However, by developing technologies that fit in with the demands of domestic market, the Chinese high-tech industries have survived and are growing. Over the past several years, university-run enterprises have maintained their growth momentum in terms of sales and profits, thus contributing significant tax revenues. Out of 5,451 university enterprises, 2,097 were classified as S & T enterprises. While the number of university-run S&T enterprises was less than half of the total, these enterprises accounted for over three quarters of the total sales in 2000. Also the growth rate of sales, profits, and tax paid by university-run S&T enterprises were higher than non-university enterprises, and as a result university-run S&T enterprises are becoming the backbone of the university-run enterprise system.

In China's new market economy, it is the market demand and supply, which plays a fundamental role in resource allocation and utilization. This is different with the past economic system, which was decided by government plan. In recognition of such a system, higher education institutions need to make their programs to meet the volume of human resource that will be required for the development of the economy. Restructuring of the Chinese higher education system through mergers of universities or setting up collaborative arrangements among several higher education institutions will break the departmentalized boundaries of different ministries. Therefore, most universities belong to local governments, not central

government ministries. As a result local universities have much more freedom in their management than others. Curriculum reform is coupled with the reform in teaching and learning process, which marked a shift of emphasis from the memorization of factual knowledge to the cultivation of students' ability to be creative. Such development allows critical thinking problem solving, information acquisition and generation, and intellectual independence that underpin creativity. Although China has made some changes to university system, proper higher education reform still has a long way to go in developing this area.

4. Threats Analysis

In order to solve the management difficulties that some university-run enterprises are facing now, it would become possible to create an environment that allow for universities to concentrate, to a greater extent, on their original duties of education and research activities. Newly emerging management mechanisms that clearly separate corporate management and university management and, in particular, recent reform experience at Tsinghua University, may hold the key to the success of the ongoing reform of university-run enterprises, and it is better to compete with other industries under such operation system, which gives clear clarity for the three functions of university [4].

6.3 Functions of University-run Enterprise

University-run enterprises achieved spectacular in the wake of a famous speech delivered by the late Chinese leader Deng Xiaoping during his visit to the southern part of China that clearly set the reform course for the country. Out of total 1,010 universities in China, about 700 were operating their own enterprises in 1995. According to the Chinese Ministry of Education's statistics in 2000, 364 universities operate 2,097 high-tech enterprises. Also, those high-tech enterprises earned RMB 36.8Billion, which is 75% of universities total revenues, and generate more than RMB 3.5Billion in profits in 2000, having 230,000 employees including 78,000 specialists in science and technology. While paying RMB 2.5Billion in taxes to the government, those enterprises brought RMB 1.685Billion in combined profits to their affiliated universities. In the mean time, they retain their mission of providing practical training to university students, with some 780,000 students engaged in research activities in those enterprises.

In the pre-reform period of 1978, China had promoted research and development centering on the fields of defense and heavy industry under the highly centralized ruling system modeling after the former Soviet Union. Under such government-led regime, R&D activities were undertaken, not by the private sector, but by research institutes under the State Council. Once embarking on the reform, however, the Chinese government began to shift away from the technology innovation system following former-Soviet style to U.S. style system like the Silicon Valley system that is newly introduced to the country. Vigorous development of China's high-tech industry, centering on the field of information technology, has been arousing much interest in Japan. In particular, Zhongguancun Village in the northwestern part of Beijing has been attracting global attention as “Chinese Silicon Valley”. The area is the home of some 30 universities, among leading universities like Tsinghua University and Peking University, and more than 200 research institutions including the Chinese Academy of Science as well as to a number of spin-off enterprises from those universities and research institutes. Some 20 years since the launch of reform in China, Zhongguancun Village has become a symbol of technological innovation area. The driving force of Zhongguancun Village is a cluster of private high-tech companies. And it is for this high concentration on establishment of high-tech enterprises including startups spun off from universities and government-run research institutions. Above all, a cluster of university-run enterprises or university spin-off companies, such as those set up by Peking University and Tsinghua University, have grown into the leading players of the Chinese high-tech industry. Still it is rare in the world that research-oriented universities themselves set up an enterprise as an affiliate as seen in China. More than 5,000

university-run enterprises exist in China, earning more than RMB 48 Billion in combined income. Most of those companies are located in Beijing, and those operated either by Peking University or Tsinghua University account for more than 30% of the income (Fig. 6-4 $ Fig. 6-5) [2].

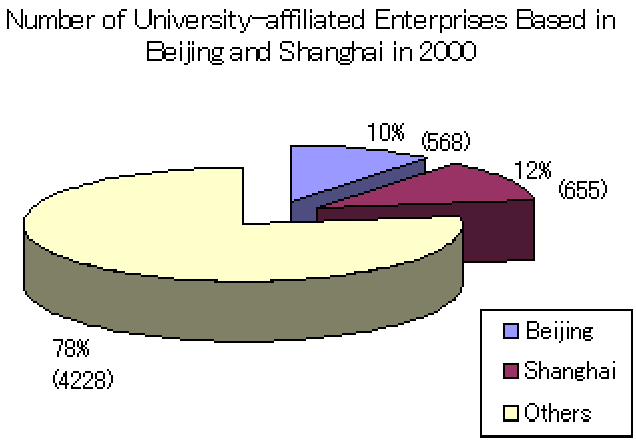

Fig. 6-4 Distribution of University-run Enterprises Based in Beijing and Shanghai

(Source: SUNAMI Atsushi,

"Industry-University Cooperation and University-affiliated Enterprises in China")

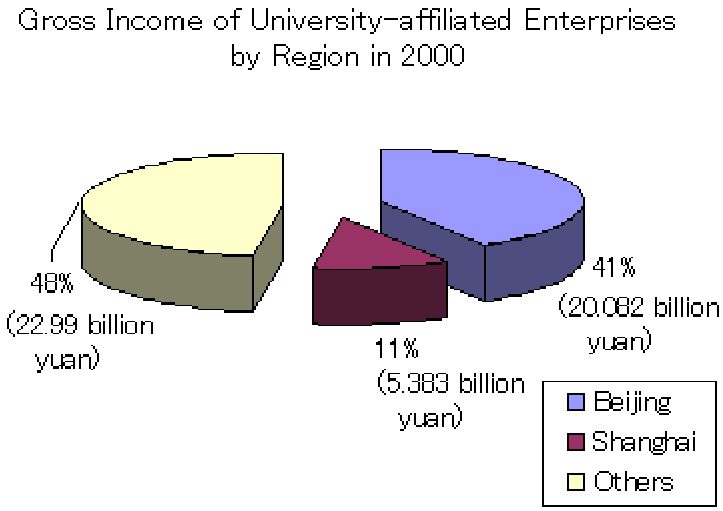

Fig. 6-5 Gross Income of University-run Enterprises Based in Beijing and Shanghai

(Source: SUNAMI Atsushi,

"Industry-University Cooperation and University-affiliated Enterprises in China")

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Chapter 7 Regional Development Scheme in China Using the Functions of University

7.1 Functions Framework of University

The process of transition of Chinese Economy from centrally planned economy to a dynamic socialist economy has led to a series of profound socioeconomic changes and had a strong impact to the universities in China. For example, many universities incubation firms have been established for promoting an active university-industry interaction and nurturing personnel who can innovate new technologies and business models. Tsinghua University holds a “Pioneer Contest” in Tsinghua Pioneer Park every year to select innovation achievements that will be incubated. This contest inspires creative personnel and achievements in the university.

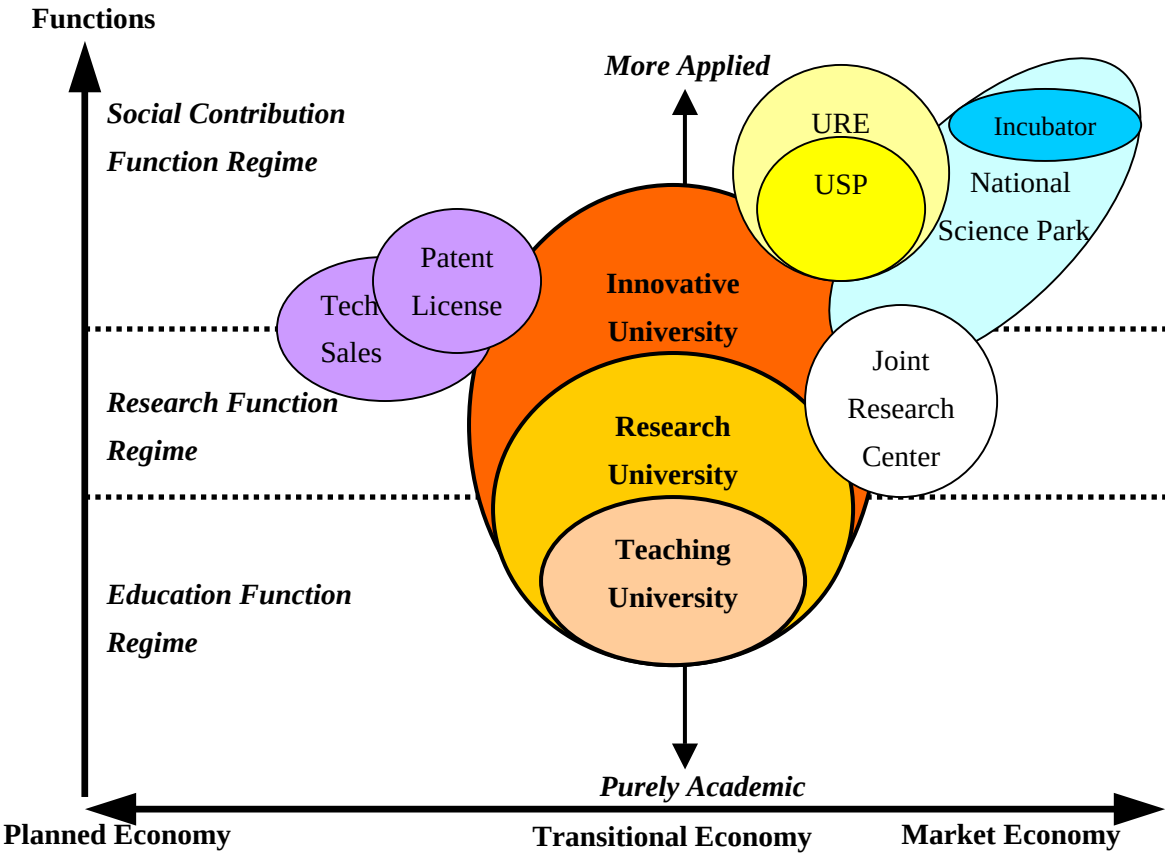


Fig. 7-1 Functions of Chinese University

(Source: compiled based on data of Jong-hak Eun,
“Evolution of the Academy-run Enterprises in China: An Organizational Approach”)

(Note: URE: University-run Enterprise; USP: University Science Park)

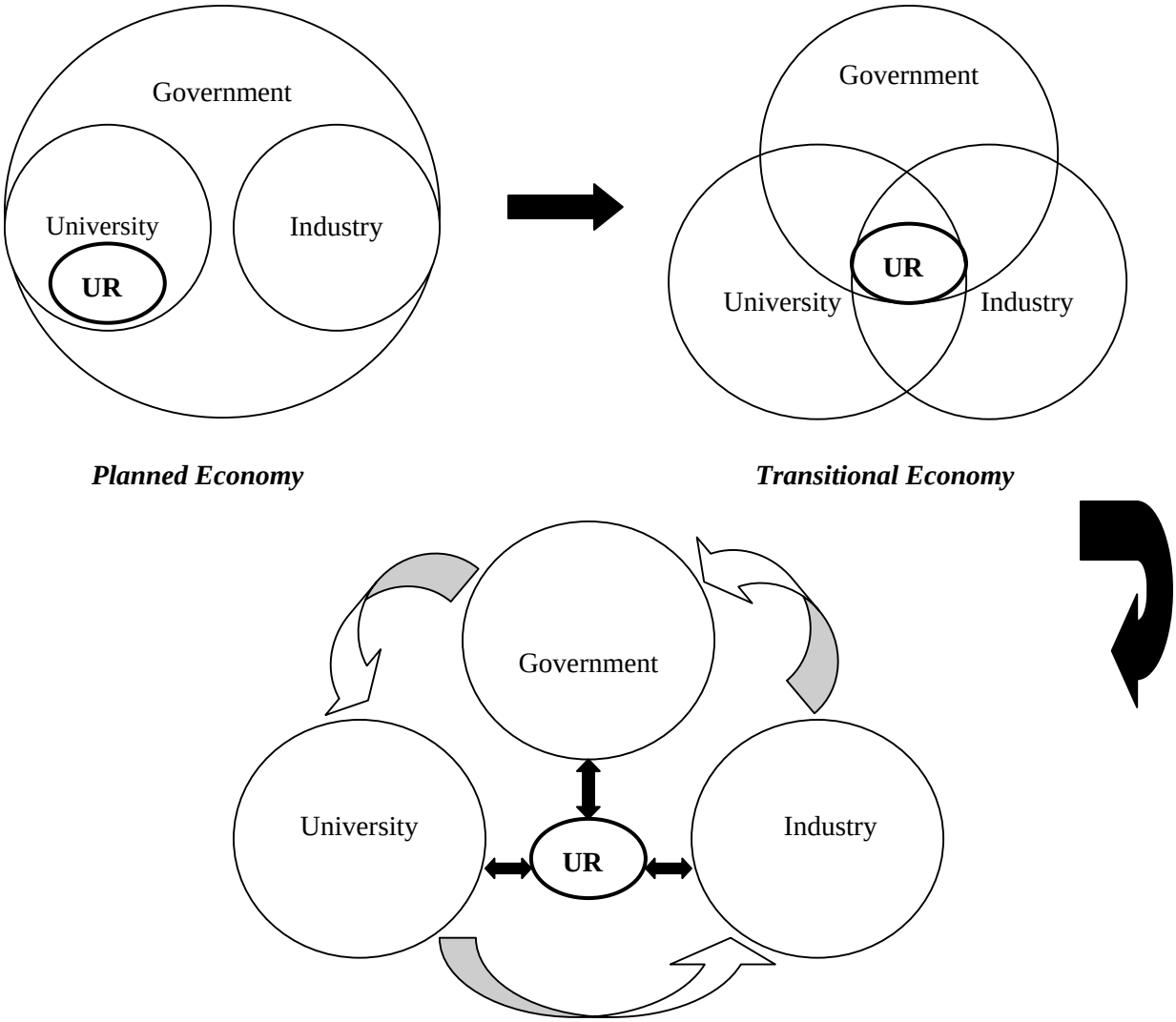
Economic globalization in the world and administrative decentralization in China have extended the autonomy of social organizations and educational institutions. New challenges have developed at every level of the education system. In the past, a university was be required to have the function of providing higher education to their students and the academic research function was be required as the second one. In recent years, university shall be required to have the third function, which is the contribution to society like a form of university-run enterprise. This function has provided strong incentives and promoting economic development with the modern economic knowledge. As shown in Fig. 7-1, S&T knowledge from university research to industries can be accomplished through alternative governance forms including: technology exchange markets, patent licensing, cooperative research and development between universities and industry, cooperative research center on or off campus, university science park and so on [1].

7.2 Relationships Framework of "University – Government – Industry"

The reform of the university-run enterprise system was started from 1994 and it was accelerated together with the progress of the university reform that was started in 1996. It is however, still pointed out that the speed of reform is too slow and remains essential problems that need to be overcome. First of all, the matters concerning the ownership of university-run enterprises are creating complicated problems over respective universities and the government has not fully solved them. Some people say that university-run enterprises are categorized as government-owned, thus, equities in those enterprises should fully belong to the government. However, the registration of those enterprises has a lot of ambiguity. Ownership problems arise in particular with those started up by the managers' own capital, such enterprises didn't receive any capital injection from a university and at no expense of the government. For instance, if certain enterprise is to be registered as a company capitalized at RMB 500,000, the founders of the enterprise may borrow that amount of money from a university they belong to, then return the money once registration is completed. Likewise, it is often the case that laboratories and other university facilities registered as assets of those enterprises are not actually used. In such a case, actual contributions from the university will not be more than technologies and human resource. In many cases, such a self-supporting enterprise should succeed and generate high profits, but the inevitable question would arise as to how to distribute its assets. With the presence of three-way interlinked, between a university and its affiliated enterprise, the enterprise and the government, the government and the university, it makes the problem extremely complex. Secondly, there is also a problem concerning the preferential tax treatments. University-run enterprises can get a series of preferential taxes including income tax. Once they are transformed into a limited liability company, they might lose some of these preferential tax benefits. In case of a limited liability company, the management shall distribute profits to the shareholders. Because the management needs to get an approval from the board to pay back the capital fund to its mother university, it makes difficult for universities to tap its affiliated enterprises for fund. In case of University of Petroleum in Beijing, its affiliated oil refinery company was recently transformed into a limited liability company. While providing practical training to university students, the company has been producing 400,000 tons of refined oil annually. But the Ministry of Foreign Trade and Economic Cooperation is expected to decide the reduction of oil refineries producing more than 1 million tons due to environmental concerns. Given its economic efficiency balanced against environmental concerns, the refinery operating by University of Petroleum will most likely be closed. No clear rules exist as to what rules to apply to university-run companies, which are operated for the purpose of research and education [2].

The transformation in the functions of university, industry, and government is taking place as independent organization and not deeply consider the role of other participants. In this new situation, in addition to its traditional role as a provider of trained persons and basic knowledge, universities can play a role as a source of technological and regional development. In accordance with changing the position from knowledge-based oriented, universities are required to reorganize their ongoing functions at the strategic level in terms of evolving university-run enterprise. They can get the government support in order to solve problems existing in the economic forces of the market. The government has selected the role of making the supporting system for the introduction of a market economy and a "knowledge-based society". University-run enterprises are concentrating not only to promote the economic development, but also to give students the opportunity to get practical study, which is one of the essential parts of education system. As mentioned above, to keep the university-run enterprises is quite beneficial for improving students' ability, because students will get a chance to use what they have studied yesterday for the real works today. This circumstance obviously gives a good influence to students increasing study motivation. This kind of education system will be acceptable one for industries side, because the demand for qualified college graduate students who have a practical mind is increasing now. Under such circumstances, industries side likes to participate for the developing training and research [3].

Recently it is a kind of new movement to make a science research institution led by a university in China. It is a kind of cooperative venture organized by members who have different functions and are interested in enhancing the local innovation capabilities such as a university, a local government authority, and a financial organization. Under certain circumstances, the university will work with industry side for establishing new firms. Government will act as supporting side for establishing new firms through governmental programs and relative regulations. The initial conditions for establishing such new firms are different in various countries. In the United States, university, industry, and government are working much independently each other. In many Latin American countries, industries and universities, formerly under strict governmental control, are gaining relative autonomy from the government. Fig. 7-2 illustrates for explaining the position of university-run enterprises in three different economical backgrounds, the planned economy, the transitional economy and the market economy. What should be recognized is that those three different types of economical backgrounds exist simultaneously in China. It is one of the key problem related to the development process of university-run enterprises [4].



Planned Economy ***Transitional Economy***

Market Economy

Fig. 7-2 Relationships Framework of "University-Industry-Government" in China

(Note: URE: University-run Enterprise)

7.3 Regional Development Scheme

Generally speaking, the economic reform in China is following the route to market mechanisms. Socialist market economy is controlled by the government under the guiding principle coming from the macro-control, which public ownership is dominant. In such transitional stage, the network of regional development by using of the functions of university will be made under the scheme of mutual collaboration among universities and research institutes, industries, government and other organizations in society. The core of this task is one of fulfilling close integration of science and technology, economy, politics and education. The functions of a university in today's economic development of China need preferential policy support from local and central governments. Chinese central government and the Ministry of S&T, Ministry of Education have the role to guide the development of the place at where university-run enterprises can do their operations together with other participants. The regional government is now aggressively reorganizing regulations in order to provide strong support to establish science parks and their activities. The people who will work in the university-run enterprises should have the strong intention for technical innovation, study ability, practical experience and rigid mind for social contribution. In fact, university-run enterprises have much stronger linkages with their mother academic institutions. These enterprises use the mother institutions' resources exclusively compared with other common firms. The preference of using mother institutions' resources is existed even in cases of national or provincial universities. Thus, the status of university-run enterprises is not actually "spin off" from their mother institutions, they are just subsidiary organizations of mother institutions. Therefore, it can not regard them as purely private firms [5].

The technology transfer from university to industry is not simple. University-run enterprises give employment priority to college graduates. Their graduates will be not only the capable human resource that is backbones of industries, but also the linkage power between industry and university. Through the cooperation of university-run enterprises, industries will be able to realize the trends of advanced science and technology, the newest ideas, production and methods. Industry can make good use of the university's graduates to have an innovation idea in order to set up innovation task after combining them with the information comes from market feedback. Industry can also request the university to do such research or sending staff, whom will involve the research carried out by the established research center. Industry can get a support for their own innovation activities from inviting college teachers and students to work as their part-time employees. On the other hand, universities can get the feedback information from the industrial manufacture and market so that it can find out appropriate innovation items

or areas and increase the research level. As a result, the two-way technology innovation chain between university and industry will become sustainable. In recent years, the rise of knowledge-based economy has led to the recognition of the essential role that technological innovation has played in economic development. With the continuing reform of china's national innovation system and growing of China's high-tech enterprises, the gap between academia and industry will become smaller. It can be seen that many universities have begun to pay attention to increase management force of these companies. It must be that the central government has strong policy to support the movement of establishing university-run enterprises, because the government recognizes that it is quite effective way for execution of regional development and decrease exiting disparities among three regions of China [6].

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Chapter 8 Regional Development Scheme for Heilongjiang Province (黑龍江省) in China

In Chapter 6, the author introduced Chinese university-run enterprises, and analyzed the advantages and disadvantages by SWOT analysis method. University-run enterprises have several management resources, such as technologies and human resources that other normal firms don't have, these advantages are beneficial to the regional development by using high technology. There are three provinces in the Northeast Region of China: Heilongjiang, Jilin and Liaoning (Fig. 8-1). In general, soils in the Northeast region are fertile and productive. Heilongjiang is well known in China for its large-scale government farm system, and its high quality of rice, soybean and sugar beet [1]. Heilongjiang Province belongs to the Central Region in China, the economic development level is listed as the 2nd position between Eastern Region and Western Region. Making the Regional Development Scheme for this province can provide a model for the development of relatively poor Western areas in China and other developing countries in Asia.

Fig. 8-1 Administrative Map of Heilongjiang Province, China

(Source: "Northeast China City Info")

8.1 General Introduction of Heilongjiang Province

8.1.1 Natural Features

Heilongjiang Province is located in North China as a part of the frigid and temperate zone. It has a common boundary with Inner Mongolia Autonomous Region and Jilin Province. Its northern border is on the southeast of the Russian Federation. Heilongjiang Province not only

has rich soil resources with a large quantity of cultivated land which takes the first biggest place in China, but also has rich and good quality water resources for agriculture, and industry consumption. Heilongjiang Province has a great deal of forest area, many kinds of biological resources and rich mineral resources such as petroleum, coal, gold and lead. Based on statistics at the end of 2000, Heilongjiang Province had 16.008 million working people. The net income per household in rural area was RMB 2,148.2, and the average income of workers in urban area was RMB 7,835 per person.

8.1.2 Population

The total population in Heilongjiang Province was 36.89 million in 2000. After 1949, in Heilongjiang Province, the sex ratio (male/female) of the total population was greatly changed. In 1990s, the trend of changes in the sex ratio of the total population was generally stable. Out of it, the number of males was 18.86 million and the number of females was18.03 million, thus the sex ratio was figured out as 104.60. Fig. 8-2 shows the age structure in the province.

(1) Aged 0 – 14 : 6.97 million (18.90%)

(2) Aged 15 – 64: 27.92 million (75.68%)

(3) Aged over 65: 2.00 million (5.42%)

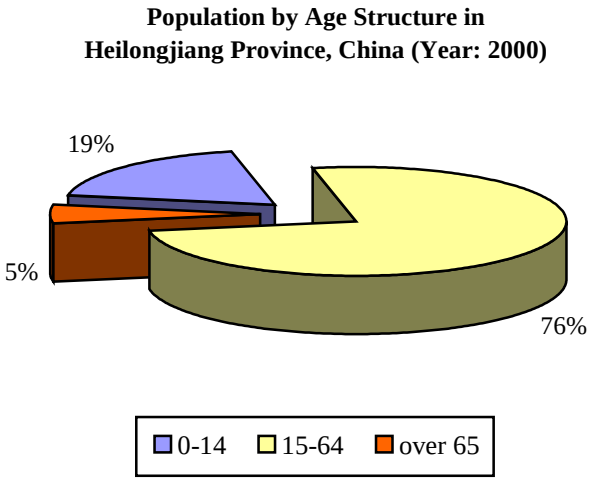

Fig. 8-2 Population by Age Structure in Heilongjiang Province, China

(Source: Compiled based on data form “CHINAGATE”)

Due to the development of the economy in the province and the development trend of urbanization, the population distribution has changed a lot. The center of distribution moved to

the east, with the increase in density being higher in urban than in rural areas. Ethnic minorities are widely distributed in Heilongjiang Province and the increase in the minority population is fast. With 48 out of 56 ethnic groups in China living in Heilongjiang Province, the province is listed as one of the provinces with multiple minorities. Family size in Heilongjiang Province varies from urban to rural areas. It can be said that the two-generation family type consists of single child and his or her parents is average in this province. But nowadays, instead of the two-generation family type, the conventional family type that gets three-generation family plus grandparents is gradually increasing.

8.1.3 Economy

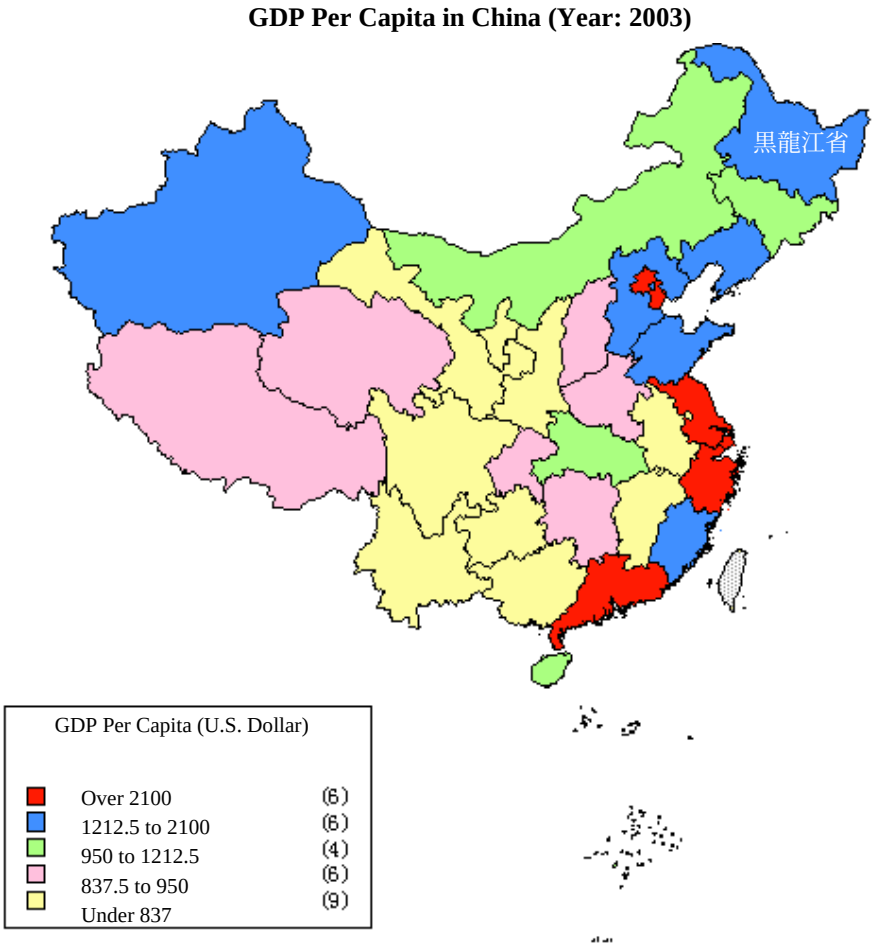

Fig. 8-3 GDP Per Capita of Heilongjiang Province in China

(Source: “China Economic Information Network”)

Fig. 8-3 shows the GDP per capita of each province and regions. The GDP per capita of Heilongjiang Province in the year 2003 was between $1,212.5 to $2,100, which can be categorized in the 2nd level of economic development in China. Like the analysis in Chapter 3, the GDP per capita of this province in 2004 was $1,680, so the economic development level of Heilongjiang Province is as similar as that of Thailand by GDP per capita. The development of this province can get the 2nd level in China due to its natural resources, like petroleum, coal. Heilongjiang Province keeps an important role in agriculture and heavy industry production in China. The agricultural industry in the province is making high productivity compared with other areas because it is continuing their effort for mechanization. Another important reason is the development level of infrastructure like railway, water supply, telephone and broadcast system, electric generation and supply system etc. Heilongjiang Province is located in upper north and faced to the border of Russia. Therefore, the province is to be developing dramatically but historically opened up late compared with other provinces. Heilongjiang Province is still rich in natural resources, but it is necessary to reconsider about the usage of resources, because it is observed that the ecological and environmental problems led by rapid economic development and increasing population. It should be stop the over-activity and unplanned exploitation of resources.

8.1.4 Education

The education level for the people in Heilongjiang Province has been improved greatly since 1949. The attendance rate of school-age children is 98.8% in this province. As shown in Fig. 8-4 and Fig. 8-5, in the year of 2000, the illiterate rate was 6% in the province, while the rate was 10% in China. 32% of people had primary school education level, 42% of people had junior high school education and 15% of people had senior high school education background in this province. The ratio of the people who got college and university level education was 5%. However, the educational level within the province is not at the same level. Actually there is a big gap between urban and rural areas. The people living in rural areas usually do not have a chance to get higher education. Two tendencies can be observed:

(1) The education level of the people who are living in the big city like Harbin and middle-size cities or industrialized areas is higher than that in rural areas.

(2) The education of females is lower than that of males.

At the end of 2000, the situation of educational organizations in Heilongjiang Province was as follows:

(1) 13,995 Primary schools: 2,831,000 pupils and 193,000 teaching staff.

(2) 3,023 Middle level schools: 2,708,000 students and 160,000 teaching staff.

(3) 22 Universities: more than 200,000 students studying and 16,000 teaching staff.

As the above figures say that Heilongjiang Province has a relatively higher educational level than other regions in China.

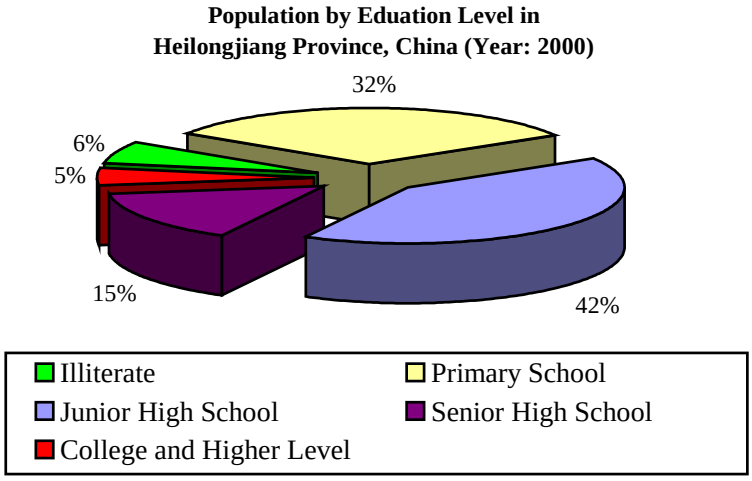

Fig. 8-4 Population by Education Level in Heilongjiang Province of China

(Source: Compiled based on data form "CHINAGATE")

(Note: Statistical figure in this chart refers to population aged 6 and over)

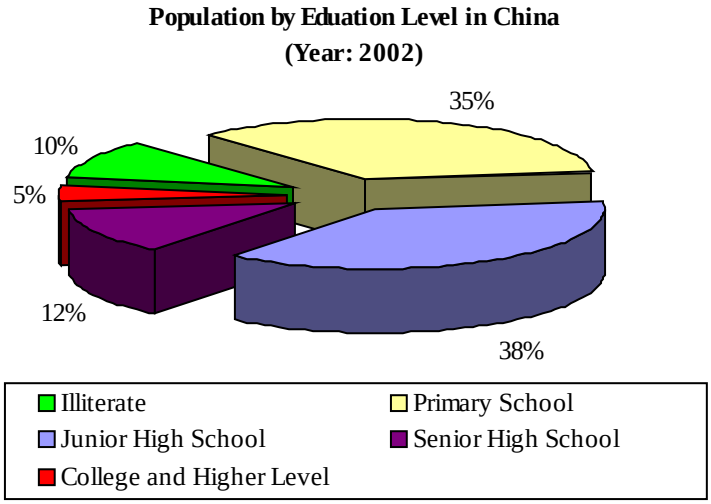

Fig. 8-5 Population by Education Level in China

(Source: Compiled based on data form "CHINAGATE")

(Note: Statistical figure in this chart refers to population aged 6 and over)

8.2 Regional Development Scheme for Heilongjiang Province

8.2.1 Capital City of Heilongjiang Province

Harbin is a thriving industrial city in Heilongjiang Province. It is not only the capital of the Province, but it is also the real center of the politics, economic, scientific, cultural and communications in the whole Northeast area of China. Harbin city occupies the area of 53,000 square kilometers, which is 11.69% of the total area in this province. The total population of Harbin is of 9.54 millions, 24.73% of the whole province and 3.8 millions people live in the urban area. Harbin is famous for its unique Russian-influenced architecture. Remnants from the days when Harbin was a crucial stop on the Russian Manchurian Railroad, the dome-shaped structures are typical construction style of pre-revolutionary Russia. The strong Russian influence to the city continues until today due to increasing trade and tourism between Harbin and Russia.

Harbin's economy booms rapidly and the comprehensive economic strength ranks 13th in China’s cities. Harbin has a solid foundation of science and technology. Approximately 370,000 professional technical personnel who are well trained in specific fields are living in this city. Harbin ranks 7th biggest city among all large and medium-sized cities in China. Harbin is one of China's main industrial bases. There are four predominant industries: pharmaceuticals, automobiles, foodstuffs and electromechanical plant equipment, with other industries including light industry, textiles, metallurgy, electronics, construction materials and chemical engineering. There is a relatively advanced industrial system in the field of technological devices as well. The plant equipment production volume at Harbin's power plant produces accounts for one-third of the country's total equipment capacity. Production technology and volumes in such fields as aerospace, automobiles, bearings, measures and cutting tools are also significant on a national scale. Leading businesses include Harbin Aircraft Manufacturing, Harbin Power Plant Equipment Corporation, Harbin Bearing Group, Harbin Measuring & Cutting Tool Group Co.Ltd., Harbin Dongan Auto Engine, Harbin Pharmaceutical Group and Harbin Beer Factory. Due to all of these advantages, the total GDP share of Harbin in Heilongjiang Province is 30.82%. Harbin is an important trade passage linking China and Russia, it has so far established economic and trade relationships with more than 100 countries and regions throughout the world, and about 40 countries have invested in Harbin [2].

8.2.2 Network for “Harbin University Science Town”

There are two high technology development zones established by central government in Harbin:
(1) Harbin Economic and Technological Development Zone
It was established in June 1991 and was approved as a state-level development zone in April 1993, by the State Council. In 2000, an export processing zone for goods bound for Russia was established within the zone. Producers within the zone benefit from the preferential measure of having 50% of the value-added tax they pay refunded. By the end of 2000, 373 foreign-invested companies had been granted permission to set up in the zone; the total value of investment was $1.68 billion, the total value of investment under discussion was $860 million, the total value of industrial production was $416.25 million and tax revenues totaled $32.5 million.

(2) Harbin High and New Technological Development Zone
It was established in September 1988 and was approved as a state-level high-technology development zone in March 1991 by the State Council. There are four universities within the zone: Harbin Institute of Technology, Harbin Engineering University, Harbin University of Science and Technology and Northeast Agricultural University. In addition, there are three advanced science and technology districts and a state-level start-up center. As of the end of 2000, there were 1,178 companies in the zone, of which 188 were foreign businesses [3].

(3) Recommending “Harbin University Science Town”
Nowadays, among 25 universities including 23 province-owned universities in Heilongjiang Province, 14 of them are located in Harbin city. All of these universities have their affiliated enterprises or firms. The “Harbin University Science Town” is suggested to be built together with the existed two high technology zones as the “New Regional Development Scheme” for Heilongjiang Province. Because Harbin is the capital city, the economic development of this city gives driving force to the whole development of this province. Fig. 8-6 shows this network, which is based on the relationships of “Government – University – Industry”. Government should provide R&D infrastructure and policy system in this network. For university, it should make good use of its advantages such as human resource and research results. In case of industry, they can provide the production environment in this network. So the functions of this network are similar to those of Science Park like Zhongguancun Village, which has been introduced in Chapter 6. In this network, more universities will participate in the regional economic development scheme, and university-run enterprises will be the backbone companies.

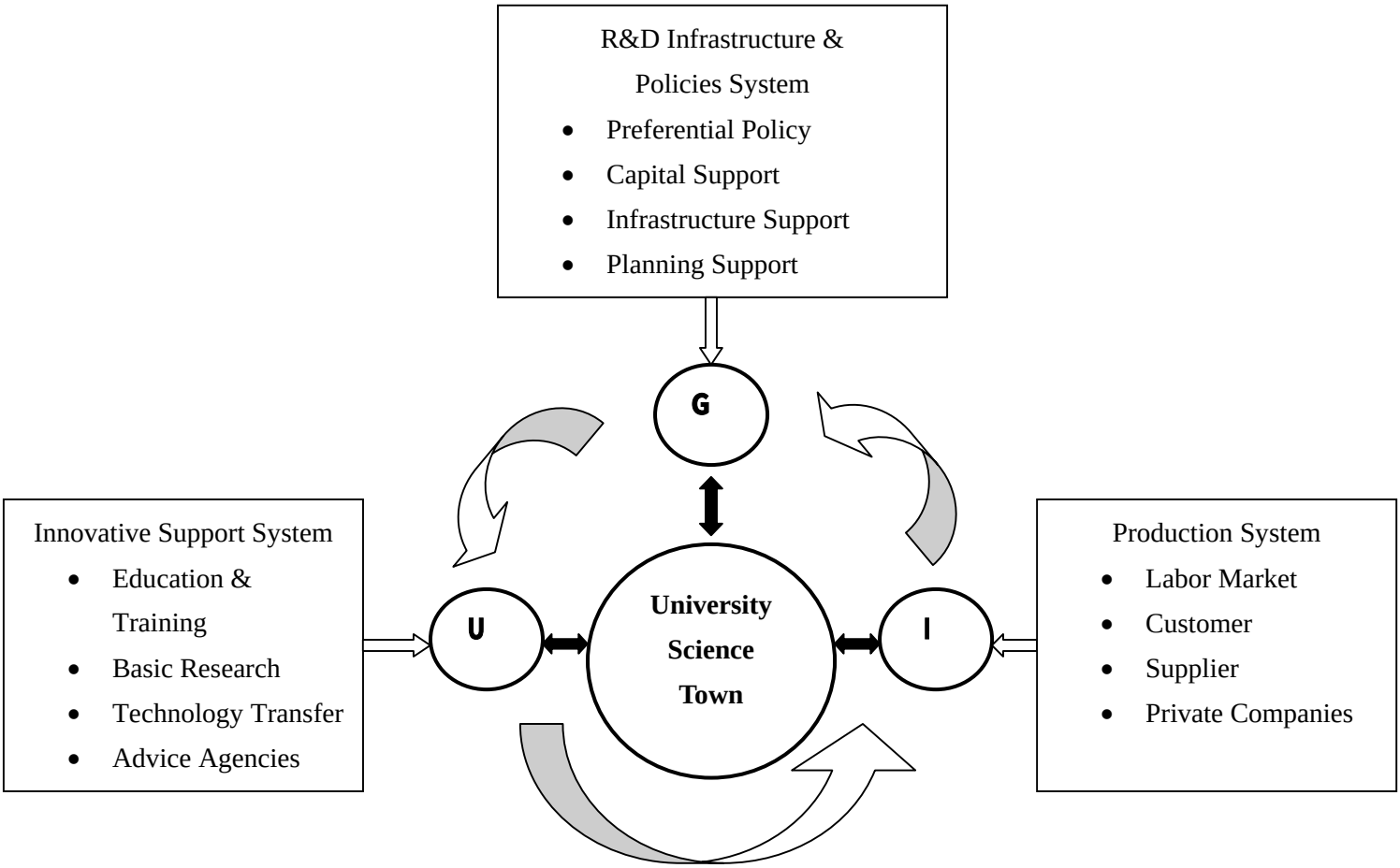

Fig. 8-6 Network of "Harbin University Science Town" using Relationships Framework of "University-Government-Industry"

(Note: G – Government, U – University, I – Industry)

In summary, for (1) it is an export-oriented zone for Russia, the main industry is foreign-invested companies. For (2) 4 universities are within this zone, the main industry is high-technology companies. For (3) the author suggests that all of the 15 universities located in Harbin should participate in the activities of this "University Science Town", and the main industry should be university-run enterprises. Therefore, under the movement of these three high-technology development districts in Harbin city, especially the recommending "Harbin University Science Town", together as a "New Regional Development Scheme using the Functions of University" in Heilongjiang Province in order to promote the further economic development of this province. In next chapter, the author will develop a quantitative analysis on economic profits of education based on the case study in Heilongjiang province so that this suggested "New Regional Development Scheme" can be proofed as an effective research model.

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Chapter 9 Quantitative Analysis on Economic Profits of Education

9.1 Theoretical Analysis for Economic Profits of Education

9.1.1 Essential Analysis

Human resource developed by educational organizations is the essential condition for a country and its development. In other words, a country can not be developed without proper education systems. For individual, to get an education is the potential benefits in general quality of life. It is also a quite important factor for getting economic return and desirable employment. For a country, on the other hand, it makes the potential benefits in economic growth and the development. From the view of economics, the outcome of education is relied on the quality of the program and resource input, such as teaching faculties, equipments and facilities. The following two matters will be essentials when it is considered setting up education system.

(1) Quantity of Human Resource

The education efficiency is becoming higher under such situation, which is less education input, and more education output. However, it is not easy to get such situation in the education activities. To set up adequate education system is the critical matter in almost all countries not only developing countries but also developed countries as well. In developing countries especially, qualified human resource is always limited compare to the demand. At the same time, making good use of limited resource shall be the essential for education.

(2) Quality of Human Resource

The outcome of education output must accord with the practical needs of present society. It is the meaning that products should satisfy the needs of customers. Here education products are human resource, and customers' needs are the demands from industries in the society. The quality of human resource can be measured by the magnitude of the contribution they make to the society through working, and the contribution of human resource can be evaluated by the amounts of products or the amount of turnover being produced through working.

As it is mentioned above, the economic profits of education is deeply related to not only the quantity of education outcome, but also the quality of education outcome. And it can be said that the quality of education outcome shall be given first priority because it is much more important than the quantity of education outcome.

9.1.2 Characteristics Analysis

It is possible to figure out that the economic profits created by material products by a sort of mathematical methods or analysis. However, it is very difficult and complicated to evaluate economic profits of education because it has the following characteristics.

(1) The profits of human resource are not like material products
The profits of material products can be seen or found out, and the profits created by material products can be calculated out. It will be the figure that the selling price minus its costs and necessary fee. However, the profits of human resource are not as same as that of material products. It is rather difficult to evaluate it because measuring the profits of human resource means to measure the capacities and capabilities of a person.

(2) Time Lag for economic profits of education
The economic profits can be clarified within certain period of time after selling goods the industry produced. However, in case of the economic profits of education, it is quite different. It will take a long time to educate one person, and keep the capacities and capabilities for creating the economic profits. The education expenses for a person both from country and family are being input continuously from primary level to a certain level of education. During this process, any income or other economical compensations can not be received from the person until he or she could work and start to contribute to the society.

As the reasons mentioned above, it is not easy to calculate correctly how much economic profits can be made from the education activities. It is rather difficult to figure out the economic profits related to different education levels. If the economic profits of education are measured with length of education period or just education levels like in ancient times in China, it is easily figure out the economic profits related to human resource but it is actually not. In addition, education can promote not only production development, and increase economic income, but also can improve the contents of peoples' life. Therefore, it is not easy to distinguish those functions of education. However, in this study, the author tries to do this difficult study in order to find out the way of figuring out the economic profits of education by using a sort of macro-quantitative analysis and micro-quantitative analysis. This kind of analysis is avoidable for clarifying the magnitude of the outcomes from the regional development scheme by university-run enterprises. Fig. 9-1 shows the structure of quantitative analysis on the economic profits of education. Fig. 9-2 is the research flow of this quantitative analysis.

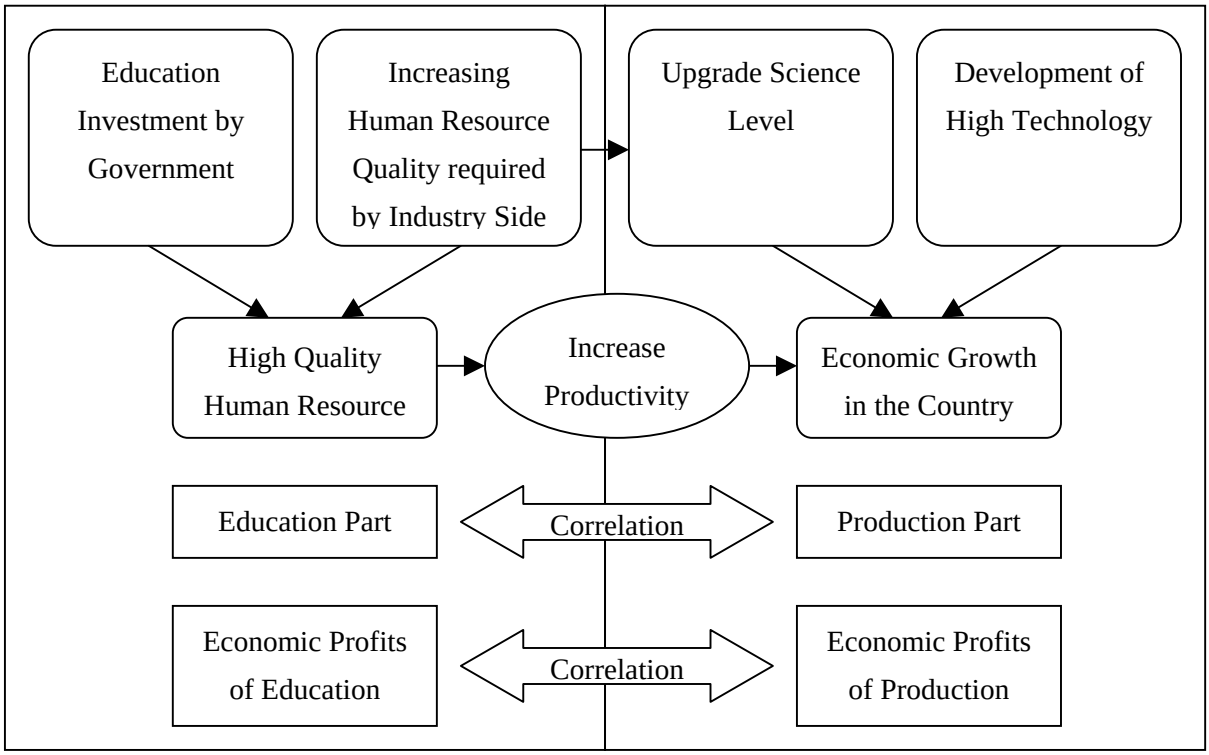

Fig. 9- 1 Structure of Quantitative Analysis on Economic Profits of Education

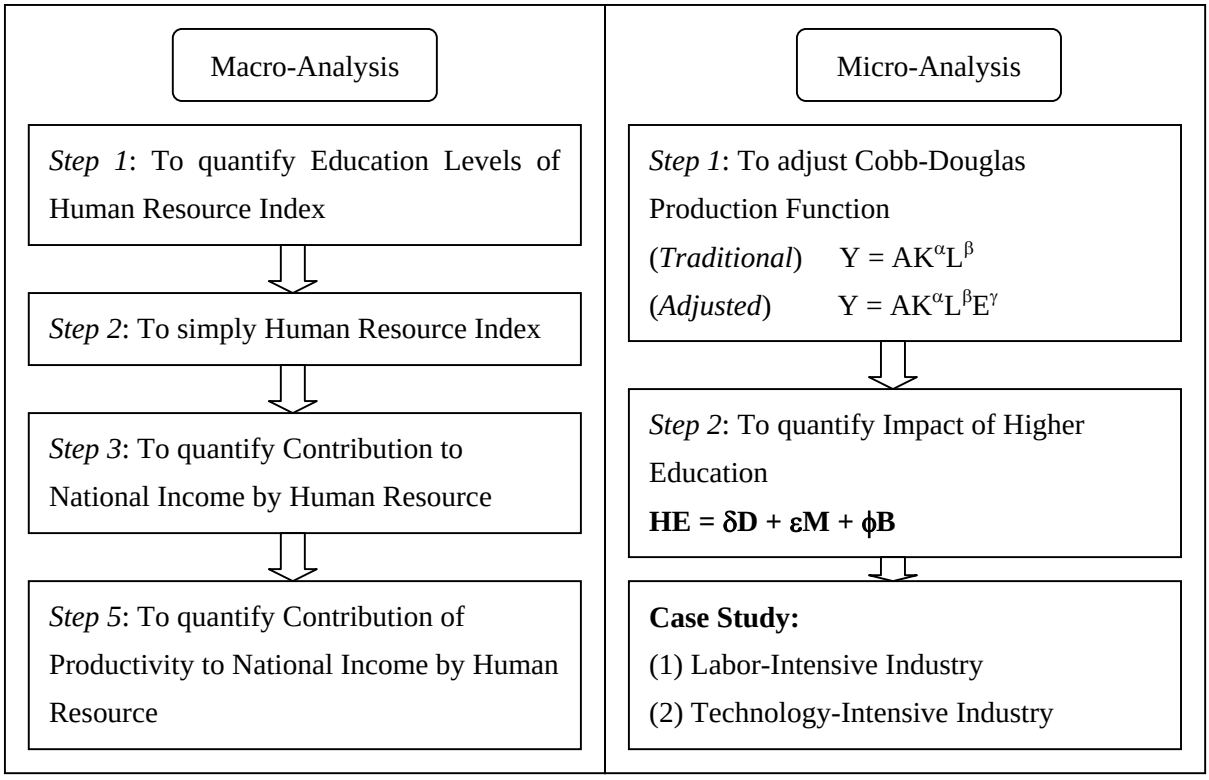

Fig. 9- 2 Flow of Quantitative Analysis on Economic Profits of Education

9.2 Macro-Quantitative Analysis on Economic Profits of Education

9.2.1 Macro-Analysis

For the implementation of the Macro-Quantitative Analysis for Economic Profits of Education, the author set up the following ways for fixing the index and formulas. It is necessary to set up the Education Levels of Human Resource Index (here in after called EHI). The index, which shall be simplified is adapted in this study to do Macro-Quantitative Analysis for the Economic profits of Education. In this analysis, as the 1st step the EHI will be set up based on the duration of different education levels. It can be used to quantify the contribution to National Income from the increased technology level of human resource through education. In this section, the case study is made in case of China and the sampling period is from the year of 1952 and 1978. The education levels in China are like Table 9-1.

Table 9-1 Education Systems in China

	Education System	Duration	Cumulative Years
1	Primary school education	6	6
2	Middle school education	3	9
3	High school education	3	12
4	Bachelor degree education	4	16
5	Master degree education	3	19
6	Doctor degree education	3	22

Step 1: To Quantify Education Levels of Human Resource Index

Table 9-2 Calculation of EHI

Education Levels	Cumulative Years	EHI
Primary school education	0^{th} – 4^{th}	L1 = 1.000
Primary school education	5^{th} – 6^{th}	L2 = $\frac{(5+6)/2}{4}$ = 1.375
Middle school education	7^{th} – 9^{th}	L3 = $\frac{(7+9)/2}{4}$ = 2.000
High school education	10^{th} – 12^{th}	L4 = $\frac{(10+12)/2}{4}$ = 2.750
Bachelor degree education	13^{th} – 16^{th}	L5 = $\frac{(13+16)/2}{4}$ = 3.625
Master degree education	17^{th} – 19^{th}	L6 = $\frac{(17+19)/2}{4}$ = 4.500
Doctor degree education	20^{th} – 22^{nd}	L7 = $\frac{(20+22)/2}{4}$ = 5.250

It is necessary to set up a sort of basic index for doing the quantitative analysis of economic profits related to the different education levels as mentioned before. The measuring basic index applied to the quantification of education levels will be selected labor force that is categorized in level 1, which is up to the 4^{th} year in primary school. Based on this index, up to 7 different Education Levels of Human Resource Index, EHI will be set up as shown in Table 9-2.

Step 2: To Simplify Human Resource Index

Table 9-3 listed the ratio of human resource with different education levels to total labor number. The Simplified Human Resource Index can be calculated by the following formula using the results of EHI showed in Table 9-2.

$$\mathbf{SHI = (NHE/NTH) \times EHI}$$

SHI : Simplified Human Resource Index

NHE: Number of Human Resource with each Education Level (in Person)

NTH: Number of Total Human Resource (in Person)

EHI : Education Levels of Human Resource Index

Table 9-3 Calculation of Simplified Human Resource Index

(Year: 1952 – 1978)

	NHE/NTH in 1952 (%)	NHE/NTH in 1978 (%)	EHI	SHI in 1952	SHI in 1978
Primary School (0^{th} – 4^{th} year)	93.6000	55.500	1.000	0.9400	0.5600
Primary School (5^{th} – 6^{th} year)	4.6400	14.600	1.375	0.0600	0.2000
Middle School (7^{th} – 9^{th} year)	0.9320	25.159	2.000	0.0200	0.5000
High School (10^{th} – 12^{th} year)	0.7370	4.041	2.750	0.0200	0.1100
Bachelor Degree (13^{th} – 16^{th} year)	0.1160	0.700	3.625	0.0040	0.0300
Master Degree (17^{th} – 19^{th} year)	0.0034	0.006	4.500	0.0002	0.0003
Doctor Degree (20^{th} –22^{nd} year)	0.0000	0.000	5.250	0.0000	0.0000
ΣSHI				Σ1.0442	Σ1.4003

Step 3: To Quantify Contribution to National Income by Human Resource

Table 9-4 listed the number of total human resource and National Income in 1952 and 1978, and it shows the results of calculation of Contribution to National Income by Human Resource according to the results of step 2 and using the following formula.

$$\mathbf{CNH = NI \times INH}$$

CNH: Contribution to National Income by Human Resource

NI : National Income

INH : Increased Number of Human Resource

Table 9-4 Calculation of Contribution to National Income by Human Resource (Year: 1952 – 1978)

	1952	1978
(1) ΣSHI	1.040	1.400
(2) Number of Total Human Resource (Thousand People)	207,290.000	398,560.000
(3) Increased Human Resource due to Education [(1) × (2) – (2)]	829.160	15,942.400
(4) Total Human Resource Contribution [(2) + (3)]	21,558.160	55,798.400
(5) INH (%) [(3) / (4)]	3.850	28.570
(6) NI (RMB ¥ 100 million)	644.000	3,010.000
(7) CNH [(5) × (6)]	24.794	859.957

Step 4: To Quantify Contribution of Productivity to National Income by Human Resource

Table 9-5 listed the contribution of increased human resource amount and increased productivity to National Income by human resource. Improved productivity includes two factors, which are improved technology level of human resource and improved technical equipments, tools and appliances. This calculation process is based on the final results of step 3.

Table 9-5 Calculation of Contribution of Productivity to National Income by Human Resource

(Year: 1952 – 1978)

	Increased Amount	Ratio in Total Amount (%)
(1) Number of Total Human Resource (Thousand People) (398,590 – 207,290)	19,130.00	100.00
(2) National Income (RMB100 Million) (3,010 – 644)	2,366.00	100.00
(3) National Income due to Increased Number of Human Resource (RMB100 Million) [(1) × (644/ 207,290)]	594.24	25.12
(4) National Income due to Increased Productivity by Human Resource (RMB100 Million) [(2) – (3)]	1,771.76	74.88
(5) Productivity due to Improved Technology Level of Human Resource (RMB100 Million) (859.957 – 24.794)	835.16	35.30
(6) Productivity due to Improved Technical Equipments, Tools and Appliances (RMB100 Million) [(4) – (5)]	936.60	39.58

9.2.2 Results of Macro-Analysis

It can be seen from the calculation results, there is 35.30% (RMB 835.16Million) of improved technology level of human resource contributed to the increased National Income from 1952 to 1978. It indicates that to increase the education level of human resource in a country contributes to the increase of National Income, this can be said the same thing to regional economic development.

9.3 Micro-Quantitative Analysis on Economic Profits of Education

9.3.1 Micro-Analysis

Cobb-Douglas Production Function is adapted in this study to do Micro-Quantitative Analysis for the Economic Profits of Education, which is based on the input-output method. It can also be applied for quantifying the contribution to output of one industry that is influenced by the increased technology level of human resource through education. In this section, the author carries out a case study about nearly 400 companies in Heilongjiang Province of China. These companies were chosen in this calculation process in order to get the final results of the importance degree of education for human resource in two kinds of industries such as Labor Intensive Industry and Technology Intensive Industry.

Labor-Intensive Industry usually refers to one industry that requires large amounts of human efforts for producing its goods. Technology-Intensive Industry is the industry that requires large sums of financial resources, high technology, especially the qualified human resource who acquires advanced production ability to produce a particular goods.

Traditional Cobb-Douglas Production Function

One mathematical production relationships that include two properties of capital and labor in industry is the Cobb-Douglas production function.

$$\mathbf{Y = AK^{\alpha}L^{\beta}}$$

In this function, “L” and “K” represent the factor inputs, “A” represents a measure of technology at time period “t”, and the exponents “α” and “β” represent production parameters or output elasticity. The fact that it is multiplicative in the inputs reflects the notion that one factor may be substituted for another. Each input being essential and making a positive contribution to output implies that these exponents be strictly greater than zero.

Adjusted Cobb-Douglas Production Function

For the last two hundred years, neo-classical economics has recognized only two factors of production: labor and capital. Nowadays, knowledge, productivity, education, and intellectual capital are all regarded as exogenous factors, which falling outside the system. New Model is based on classical Cobb-Douglas model by seeing technology and the knowledge on which it is

based as an intrinsic part in the economic system. Knowledge has become the third factor of production in leading economies.

$$\mathbf{Y = AK^{\alpha}L^{\beta}E^{\gamma}}$$

Y -- output

A -- variable of improved technology level

K -- capital input — α -- output elasticity of capital

L -- labor input — β -- output elasticity of labor

E -- education level — γ -- output elasticity of education

Step 1: Basic Data

In Heilongjiang Province of China, the figure of Labor Intensive Industry was adopted to the 3 kinds of industries such as the Food Manufacturing Industry, the Apparel Manufacturing Industry, and the Machinery Manufacturing Industry. Those basic data are shown in Table 9-6.

Table 9-6 Basic Data of Labor-Intensive Industry in Heilongjiang Province

Year	Output (RMB Thousand)	Capital Input (RMB)	Human Resource Amount	Doctor Degree	Master Degree	Bachelor Degree	High School	Others
1997	1,023,265.029	2,477,240.7	19,435	3	63	2,942	2,287	14,140
1998	1,439,949.302	3,526,596.3	24,590	4	69	3,720	2,856	17,941
1999	1,767,606.085	5,043,790.7	27,295	6	88	4,573	3,244	19,384
2000	2,525,208.058	7,605,161.9	31,138	7	101	5,128	3,678	22,224
2001	4,599,014.989	10,841,572.0	37,495	10	121	5,516	4,177	27,671
2002	6,934,906.000	14,355,843.0	44,095	11	150	7,772	5,601	30,561
2003	12,693,860.000	28,637,380.0	68,010	62	278	11,171	7,885	48,614
2004	18,320,856.000	31,718,993.0	75,047	50	169	7,253	6,849	60,726

The figure of Technology-Intensive Industry was adopted 2 kinds of industries such as the Medicine Manufacturing Industry, and the IT Manufacturing Industry. Those basic data are shown in Table 9-7.

Table 9-7 Basic Data of Technology-Intensive Industry in Heilongjiang Province

Year	Output (RMB Thousand)	Capital Input (RMB)	Human Resource Amount	Doctor Degree	Master Degree	Bachelor Degree	High School	Others
1997	2,555,405	4,305,721	9,324	50	192	3,410	1,270	4,402
1998	3,101,286	4,617,769	9,441	59	201	3,509	1,280	4,392
1999	3,288,709	4,853,723	10,749	64	195	3,877	1,379	5,234
2000	3,714,043	5,271,870	13,261	69	184	4,840	1,920	6,248
2001	5,766,167	7,618,258	20,982	74	174	8,170	2,805	9,759
2002	6,082,098	7,924,808	20,861	80	186	6,833	2,223	11,539
2003	10,929,763	14,326,285	24,851	127	335	9,390	4,824	48,614
2004	8,904,625	12,043,448	19,429	150	708	8,990	1,949	60,726

Step 2: To Transfer Basic Data into the Factors of Adjusted Cobb-Douglas Production Function

In Table 9-8 and Table 9-9, the factors represent:

Y -- Output

K -- Capital Input

L – Number of Total Human Resource

E – ΣSHI

Table 9-8 Factors of Labor-Intensive Industry in Adjusted Cobb-Douglas Production Function

Year	Y	K	L	E
1997	1,023,265	2,477,241	19,435	1.6154500
1998	1,439,949	3,526,596	24,590	1.6109875
1999	1,767,606	5,043,791	27,295	1.6564000
2000	2,525,208	7,605,162	31,138	1.6510625
2001	4,599,015	10,841,572	37,495	1.9426125
2002	6,934,906	14,355,843	44,095	1.6977875
2003	12,693,860	28,637,380	68,010	1.6522875
2004	18,320,856	31,718,993	75,047	1.4243750

Table 9-9 Factors of Technology-Intensive Industry in Adjusted Cobb-Douglas Production Function

Year	Y	K	L	E
1997	2,555,405	4,305,721	9,324	2.2929375
1998	3,101,286	4,617,769	9,441	2.3136500
1999	3,288,709	4,853,723	10,749	2.2595250
2000	3,714,043	5,271,870	13,261	2.2820125
2001	5,766,167	7,618,258	20,982	2.0634750
2002	6,082,098	7,924,808	20,861	2.0935375
2003	10,929,763	14,326,285	24,851	2.4005875
2004	8,904,625	12,043,448	19,429	2.5502375

Step 3: Final Results of Adjusted Cobb-Douglas Production Function

In Table 9-10, factor "A" is the final result through the calculation of adjusted Cobb-Douglas Production Function, which refers to improved technology level.

Table 9-10 Final Results of Adjusted Cobb-Douglas Production Function

	Labor-Intensive Industry	Technology-Intensive Industry
α	0.447492	0.898145
β	1.321125	0.307312
γ	0.106965	0.159569
A	0.002600	0.160369

Step 4: Statistical Test of Multiple Linear Regression Model

Multiple Linear Regression Model is based on statistical method, this kind of model must satisfy the requirements of mathematical theory. So it needs to be tested after calculating the parameters. The statistical test of Multiple Linear Regression Model includes Testing the Simulation Level and Testing the Overall Significance.

1. Testing the Simulation Level

It refers to test the simulation level between original data and calculated results like the following formula.

$$R^2 = \frac{\sum (\hat{Y}_i - \bar{Y})^2}{\sum (Y_i - \bar{Y})^2}$$

$0 < R^2 < 1$, the nearer the result to 1, the higher the simulation level of the model is. According to the formula, the simulation levels of these two kinds of industries are indicated in Table 9-11.

Table 9-11 Final Results of Simulation Level Test

	Labor-Intensive Industry	Technology-Intensive Industry
R^2	0.988801	0.995185

The author also uses the following charts (Fig. 9-3 & Fig. 9-4) to show such high simulation level in the Multiple Linear Regression Model.

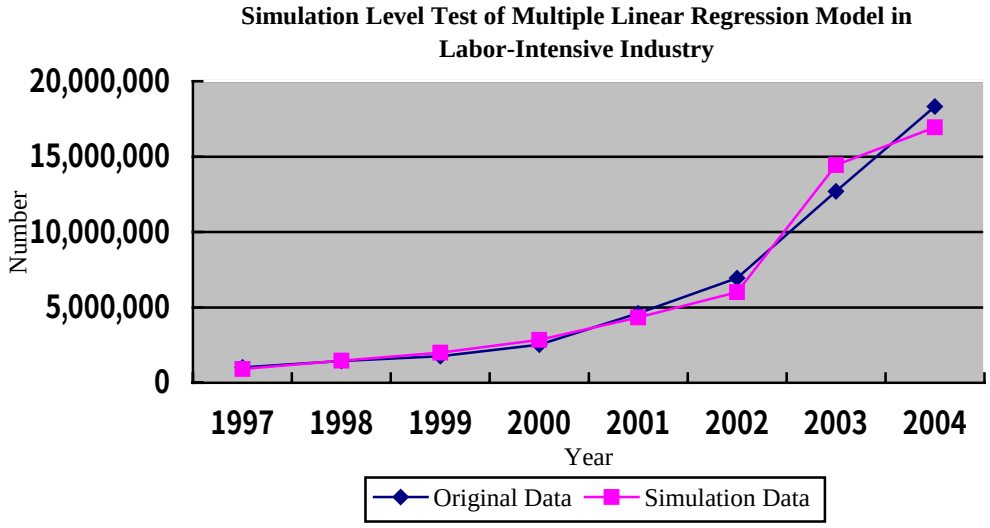

Fig. 9-3 Simulation Level Test of Multiple Regression Model in Labor-Intensive Industry

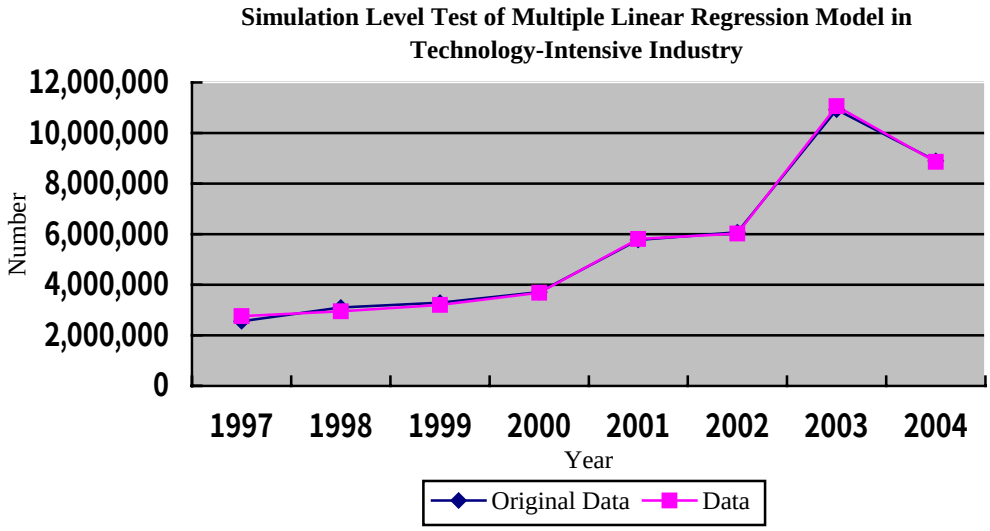

Fig. 9-4 Simulation Level Test of Multiple Regression Model in Technology-Intensive Industry

2. Testing the Overall Significance

It refers to test the overall significance level of the Multiple Linear Regression Model based on the following formula.

$$F = \frac{R^2 / k}{(1 - R^2)/(n - k - 1)}$$

If $F > F_{\alpha}(k, n-k-1)$, the model can pass the overall significance test. According to the formula, the simulation levels of these two kinds of industries are indicated in Table 9-12.

Table 9-12 Final Results of Overall Significance Test

	Labor-Intensive Industry	Technology-Intensive Industry
F	117.7251	275.5779
$F_{0.05}(3,4)$	6.59	6.59

Therefore, in accordance with the above two statistical test methods of Multiple Linear Regression Model, the calculation results passed the Test of Simulation Level and the Test of Overall Significance. It indicates that in economics study, the economic profits of education can be explained by the mathematical methods of micro-analysis under 95% trust possibility.

9.3.2 Results of Micro-Analysis

The calculation results show that the improved technology levels in different kinds of industries are quite different from the calculation results. In Labor-Intensive Industry, “A” equals to 0.002600, while in Technology-Intensive Industry, “A” equals to 0.160369. Since the factor of education has been calculated in this adjusted Cobb-Douglas Production Function, it indicates the importance degree of education to human resource in industry. The economic profits led by education in this function are the improved technology level, which can improve the productivity in the industry. Increasing the amount of capital or machinery “K” can replace some labor “L” but not all of the labor in a production process. Increasing amounts of labor can reduce the need for some material inputs “M”. In addition, where all factors of production are allowed to vary in quantity, proportional increases in all factors of production may lead to unbounded increases in output [1].

9.4 Quantitative Analysis on Impact of Higher Education

9.4.1 Calculation for the Impact of Higher Education

Step 1: Basic Data

In Heilongjiang Province of China, the figure of Labor-Intensive Industry was adopted 70 Machinery Manufacturing Industries (Table 9-13). The figure of Technology-Intensive Industry was adopted 84 IT Manufacturing Industry (Table 9-14). The detailed data are shown in Fig. Appendix-21 and Fig. Appendix-22.

Table 9-13 Number of Employees with Higher Education in Labor-Intensive Industry

Business Contents	Doctor	Master	Bachelor
A Boilers Manufacturing	0	0	8
B Boilers Manufacturing	0	1	4
:	:	:	:
A Vehicle Fittings Manufacturing	0	0	12
B Vehicle Fittings Manufacturing	1	3	18
:	:	:	:
A Air Conditioner Manufacturing	0	0	25
B Air Conditioner Manufacturing	1	1	13
: :	: :	: :	: :

Table 9-14 Number of Employees with Higher Education in Technology-Intensive Industry

Business Contents	Doctor	Master	Bachelor
A Basic Software Company	3	3	6
B Basic Software Company	1	3	4
:	:	:	:
A Applied Software Company	0	0	12
B Applied Software Company	1	3	18
:	:	:	:
A Software Service Company	9	58	192
B Software Service Company	0	14	245
: :	: :	: :	: :

Step 2: Calculation Process

Usually with the education of bachelor degree, master degree and doctor degree are included in higher education. The following formula is based on such assumption. Table 9-13 is the final results of this part.

$$HE = \delta D + \varepsilon M + \phi B$$

HE -- Higher Education

D -- Doctor Degree

M -- Master Degree

B -- Bachelor Degree

δ -- output elasticity of Doctor

ε -- output elasticity of Master

ϕ -- output elasticity of Bachelor

Table 9-15 Final Results of the Impact by Higher Education

	Labor Intensive Industry	Technology Intensive Industry
δ	0.002442	0.585285
ε	0.044695	- 0.037650
ϕ	- 0.000320	- 0.002480

9.4.2 Analysis on Impact of Higher Education

According to this calculation analysis, for Labor Intensive Industry, the most important human resource is the employees with master degree (ε = 0.044695), while for Technology Intensive Industry, people with doctor degree are necessary for the development of this kind of industry (δ = 0.585285).

References:

[1] WANG Peigen, “Higher Education Economics”

Chapter 10 Adaptability of "New Regional Development Scheme" to Other Developing Countries

It is necessary to do analysis on the potentiality of applying the "New Regional Development Scheme using the Functions of University" to other developing countries. The analysis shall be done based on the comparative analysis of the economic development level between the three regions in China and other developing countries. The author will do this analysis about Asian countries like Malaysia, India, Vietnam, Bangladesh and Cambodia. Fig. 10-1 shows the structure of Adaptability of "New Regional Development Scheme" to Other Developing Countries. As shown in this figure, developing countries will be categorized into 3 parts similar to the situations of the 3 regions in China. In this chapter, the detailed analysis will be expressed in accordance with this structure chart.

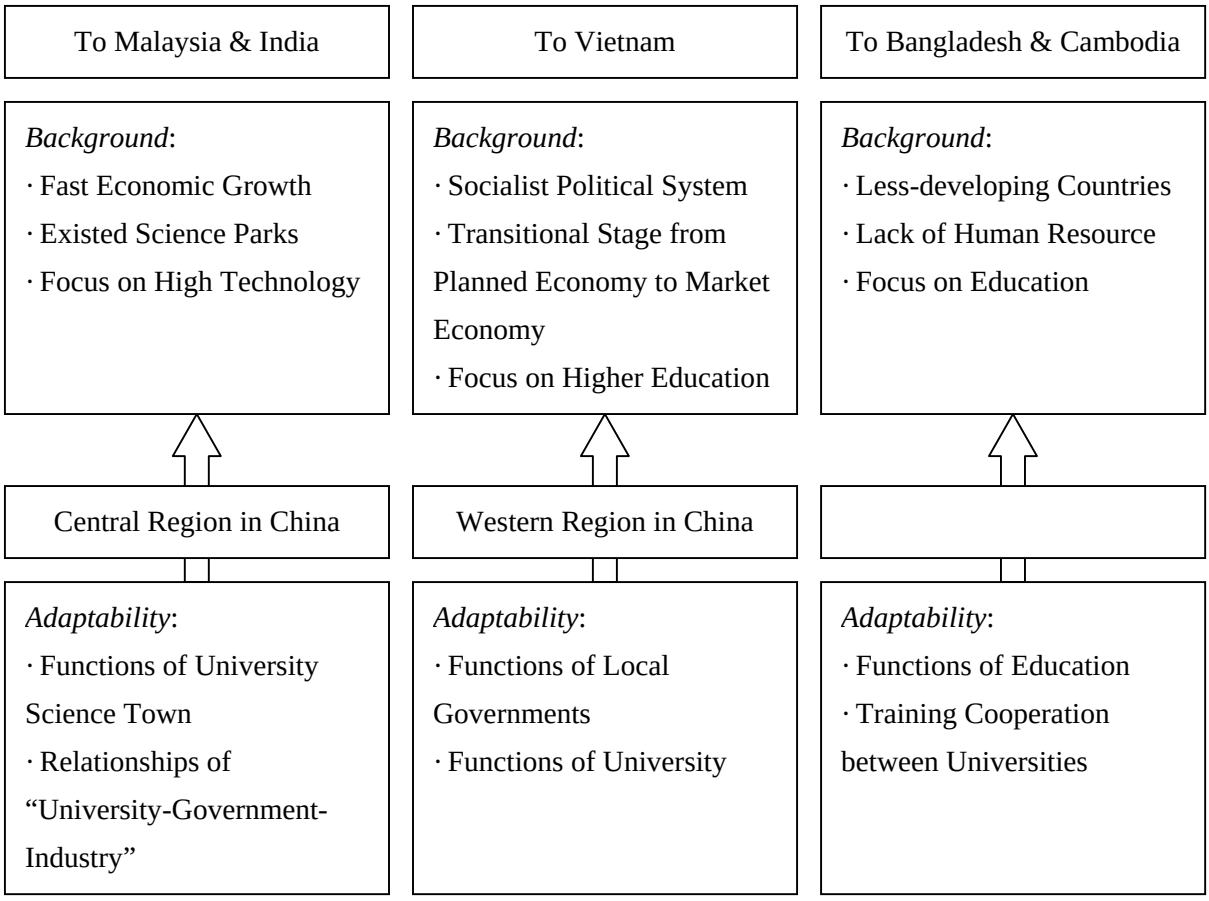

Fig. 10-1 Adaptability of "New Regional Development Scheme" to Other Developing Countries

10.1 Comparative Analysis on Science Parks in Asia

A science park is a property-based initiative. In most cases, it has direct operational links with a university or other higher educational or research institution, designed to encourage the formation and growth of knowledge-based business and other organizations on site. It has a management function, which is actively engaged in the transfer of technology and business skills to the organization on site. Developing countries in Asia have been seeking to enhance their scientific and technological capacity in order to underpin their economic growth. Most have adopted a highly targeted approach, initially focusing on information and communications technology. Given the large number of science parks in Asia and the diverse cultural and economic backgrounds exhibited by these countries, it is understandable that there are wide differences among these countries in their efforts to develop science parks. In the following, countries with science parks are divided into four groups based on the orientation of their science parks.

1. Japan and South Korea

Along the process from basic research to the manufacturing of tangible products, Japan and South Korea focus more on the research. Both countries put emphasis on basic and applied research in their effort to develop science parks. Also, it seems that science parks in both countries are more domestically oriented. There is no deliberate effort to attract foreign companies to settle in these parks. Japan's science city, Tsukuba, has 48 national research and educational institutes and more than 10,000 researchers, representing 30% of all national research agencies and 40% of their researchers. Also, more than 200 private research facilities are now established or planned in Tsukuba. In additional to Tsukuba, many more science parks have been planned in Japan. These science parks are designed as both innovative R&D centers as well as high-technology production centers. In a similar way, South Korea has developed its own Taedock Science Town, which now keeps more than 1,000 Ph.D. level researchers and they are working in 14 research institutes. The Town is also the home of three technical universities. It has become the "very center of science and technology in Korea." Five more science towns have been planned in Kwangju, Pusan, Taegu, Chunju, and Kangleung. Development work has started in some of these new science towns.

2. Singapore and Thailand

Science parks in Singapore and Thailand also have their top priority on research, but they put much more emphasis on industrial R&D rather than pure academic research. In Singapore's Science Park I, there are over 120 multi-national companies and local R&D firms in the park.

Except for some small-scale activities, manufacturing is not allowed in the park. Companies interested in high-tech manufacturing can be located in TECH place I and II along the close by Ang Mo Kio Ave. The first science park in Thailand was opened in 1997. Similar to Singapore's approach, the park is designed to promote industrial R&D with the possibility of limited light production. Singapore's science park is internationally oriented with many multinationals located in the park. However it can be said that Thailand's science park is still in the development stage. It is interesting to note that no special incentives like tax deduction are offered in Singapore's science park. The reason why special incentives not given must be the demand for entering the park has exceeded the capacity of acceptance. Thailand's science park on the other hand, is planning to offer tax incentives and other special services to attract firms to locate in the park.

3. China, Taiwan, and Malaysia

In these countries, science parks are oriented towards the development of high-tech industries, much closer to the end of manufacturing when compared with previous two groups. Taiwan's Hsinchun Science Based Industrial Park has achieved great success in nurturing high-tech industries since founding in 1980. As of 1993, totally 148 companies allocated in the park and most of them are categorized in computer, semiconductor, and telecommunication industries. The IC industry was created and has become the dominant industry in the park. China's effort in establishing science parks is unique both in terms of its scale and speed. Because science parks in this country have big scale and making with high developing speed. The main objectives of these science parks are:

(1) To promote the commercialization of high-tech R&D results

(2) To make industrial bases for high-tech industries and experimental sites for structural reform of China's innovation system.

Therefore, parks in all these countries are very hospitable to foreign companies. All of them offer various tax deductions and other financial incentives to attract foreign investment and technology.

4. India

India's effort in developing science parks offers a unique case. In the middle of 1980s, Indian government started to develop Science and Technology Entrepreneurs Parks (STEPs). These parks are aimed at transferring high-tech R&D results from academic institutions to the industrial enterprises by encouraging entrepreneurship and attracting venture capitals. On the other hand, a more spontaneous effort by universities, professional associations, government agencies and business community has made Bangalore, "India's Silicon Valley", a great success.

Table 10-1 shows the comparative analysis on science parks in Asia. In summary, all of these science parks are concentrating on developing S&T and ensuring the rapid transfer of R&D results to high-tech industries, but the involvement of universities in science parks is quite limited comparing with Europe and U.S. In the future, the developing trend is the gradual weakening of the role played by central government and the stronger role played by local government and private sectors. Policies and incentives may vary from one park to another within the same country in order to make further development [1].

Table 10-1 Comparative Analysis on Science parks in Asia

<table>
<tr><th>Country</th><th>Start Year</th><th>Number</th><th>Differences</th><th>Similarities</th><th>Future Trends</th></tr>
<tr><td>Japan</td><td>Early 1970s</td><td>111</td><td rowspan="2">(1) emphasis on basic and applied research
(2) more domestically oriented</td><td rowspan="9">(1) developing S&T and ensure the rapid transfer of R&D results to high-tech industries
(2) leading role played by central government in promoting the development of science parks
(3) involvement of universities in science parks is quite limited comparing with Europe and U.S.</td><td rowspan="9">(1) gradual weakening of the role played by central government and the stronger role played by local government and private sectors
(2) Policies and incentives may vary from one park to another within the same country
(3) growth of incubators within these science parks</td></tr>
<tr><td>South Korea</td><td>1980s</td><td>2</td></tr>
<tr><td>China</td><td>Mid 1980s</td><td>100</td><td rowspan="3">(1) emphasis on manufacture
(2) incentive policies to attract foreign investment and technology</td></tr>
<tr><td>Malaysia</td><td>1980s</td><td>1</td></tr>
<tr><td>Taiwan</td><td>1980s</td><td>1</td></tr>
<tr><td>Singapore</td><td>1980s</td><td>1</td><td rowspan="2">(1) emphasis on industrial R&D
(2) more internationally oriented</td></tr>
<tr><td>Thailand</td><td>1980s</td><td>1</td></tr>
<tr><td>India</td><td>Late 1980s</td><td>13</td><td>Transferring high-tech R&D results from academic institutions to the industrial enterprises by encouraging entrepreneurship and attracting venture capitals</td></tr>
</table>

(Source: Compiled based on data of “Science parks in Asia”, http://www.unesco.org/pao/s-parks/asia/asia.htm)

10.2 Adaptability of the "New Regional Development Scheme" to Malaysia and India

In this section, the author will make an analysis regarding activities of China, Malaysia and India, these three developing countries in Asia have quick economic development speed in recent years.

10.2.1 Science Parks in China

There are University Science Parks and National Science Parks in China. China's first University Science Park is Northeast University Science Park, which was established in 1989. Now there are 44 national-level and 124 local-level University Science Parks throughout China. University Science Park has partly been inspired by the legends of Stanford Science Park, Cambridge Science Park. They are typically created by the joint efforts of local government and university. Most of them are located in or adjacent to the university campus and administered by a commercial entity established by the university or through a joint venture between local government and the university. The administration of University Science Park not only manages the real estate of the park, but also provides incubation fund services. Companies in this park can enjoy preferential policies. University Science Park not only have played an important role to incubate spin-offs created by faculty or students from universities, they have also become a magnet to attract other high-tech companies.

Zhongguancun Science Park located in Beijing is the first and the largest national Science Park in China. It is located in the national-level high-tech development area, which was developed by Beijing Municipal government in 1988. It is nationally the largest concentration area of intellectual resources, human resource and information resources. It consists of five zones such as Haidian Zone, Changping Zone, Fengtai Zone, Yizhuang Zone and the Electronics City. There are 6,690 high-tech enterprises in this park at present. By the end of 1999, there were more than 1,100 enterprises of wholly foreign fund, joint venture and Sino-foreign co-operation, which is 17.7% of the total enterprises. The investment by foreign-funded business has accumulated to $3.26 billion. 138 research institutions are based in the park, there are 56 member universities, including Peking University and Tsinghua University. This Science Park will be built into a national innovation base, an incubating base for the commercialization of scientific achievements and technology industry, a training base for innovating talents of high quality, an experimental zone for executing the strategy of rejuvenating the nation through science and technology [2].

10.2.2 Science Parks in Malaysia

Malaysia has relatively good geographic position in Asia and has a well-educated, skilled and diverse population. Malaysia also shares with Singapore a history of being a former British colony and hence English remains a frequently-used language, particularly in business. The economy of Malaysia is driven by exports, including electronic equipment, petroleum and liquefied natural gas, chemicals, palm oil, wood and wood products, rubber and textiles. Malaysia now keeps the technologies of Information and Communications Technology (ICT) hardware including integrated circuits and disk drives, the ICT sector is dominated by foreign corporations. Malaysia has planned its economic development and sought to attract foreign companies with low labor costs, tax incentives and infrastructure for technology-based firms. In deciding on economic development strategies, the government of Malaysia has established plans for the development of technology and R&D.

The development of science parks is one of the initiatives to promote the development of technology-based industries in Malaysia. The Malaysian government has been urged to adjust its incentives to recognize that biotechnology companies can be involved in the exploitation of existing patents and technology as well as R&D. The Government has also been urged to start the pioneer status incentive for biotechnology companies when they start to make a profit. The government also gives tax deduction for the initial investment by the investment companies. The intention of being a major ICT economy in Asia has been driven in part by the need to compete with neighbor country Singapore. It has been able to draw some strategic investments away from Singapore. The advantage of Malaysia has over Singapore is its lower operation costs, but this could be offset by the weaker Malaysian currency.

10.2.3 Science Parks in India

India is a federal country comprising 28 States and seven Territories. English is the most important language for national, political, and commercial communication. While Hindi is the national language and primary tongue of 30% of the population, there are fourteen other official languages. Agriculture remains an important component of India’s economy. The economy has shown strong growth with average 6% annually since 1990. India has large numbers of well-educated and fluent English-speakers to become a major exporter of software services and software workers. The software and ICT services industries have enjoyed an average annual growth rate of 50% and generated about $15 billion in exports during 2003 to 2004. Following the growth and success of the ICT sector, it is now a world leader in software and ICT services,

there is now a shift in focus to biotechnology. It is widely recognized that ICT has contributed to its economic growth in the 1990s. However, the Central Government has recognized the need to develop other markets. Hence, India's Tenth Plan focuses on biotechnology-based national development.

The Central Government has recognized the need to develop human resources by increasing the number of national fundamental science research institutions from one to four. There has also been a change to the status of regional engineering colleges to that of national institutes of technology and for the funding of these institutions to be taken over by the Central Government. As a result, nineteen engineering colleges have become national institutes, and a further one hundred similar colleges are also in the process of being upgraded. Central Government grants are available to assist technology development, but these tend to be small and are sometimes targeted to government institutions or research bodies. The Technology Development Fund is the main source of Central Government support. Enterprises, co-operatives and research agencies can apply for assistance in the development and application of technology-based products or services. Start-up companies seeking to develop agricultural product processing, ICT or certain engineering products are eligible to apply. Major biotechnology-related Institutes funded by the Central Government include the Center for Cellular and Molecular Biology. This center has spawned a number of industry collaborations and technology spin-offs and has worked with the private sector to develop India's first recombinant DNA vaccine for hepatitis B. The Central Government has also funded biotechnology Centers in industrial parks, often with central government, local government and private sector investment. The Science and Technology Entrepreneurs Park (STEP) Program was initiated in 1984 to provide young S&T graduates with entrepreneurship education, training, research, finance and management. STEP seeks to promote close linkages between universities, academics and R&D institutions and industry. Research institutions, which act as STEP hosts, must develop their own areas of specialization that reflect the industrial development in the region. The features of the STEP Program include income tax holidays, customs duty exemption on imports, central excise duty exemption and central sales tax reimbursement on procurement within India, import approvals, high speed data communication links, accelerated depreciation and other benefits. The Software Technology Parks of India (STPI) Scheme provides assistance to software developers and IT-enabled services for export. A similar Electronics Hardware Technology Park Scheme assists businesses undertaking manufacture of electronic hardware equipment or components and other items for export. In 2003 to 2004 STPI-supported companies exports were valued at $14.6 billion, a growth of 32% on the previous year, representing about 80% of India's software exports. In addition, Central Government tariff and duty concessions are available to

technology-based firms through Free Trade Zones, Export Processing Zones and concessions for 100% Export Oriented Units. While some science and technology parks have tended to concentrate on low-margin service work attracting cost-conscious foreign companies, the newer parks including the Biotech-IT Park, will emphases fostering the creation of high-margin patented products more quickly and at lower cost.

In a sum, India's comparative advantages include:

- Low labor costs
- Each year India produces about 2.5 million graduates in ICT, engineering and life sciences, about 650,000 postgraduates and nearly 1,500 PhDs in the biosciences and engineering.
- India's large population provides a huge domestic market for technology-based products and services.
- India's considerable biodiversity is potentially attractive to multinational companies to obtain samples and conduct field research.
- A legal system based on English common law.

10.2.4 Adaptability to Malaysia and India

1. Strengthen the Functions of University Science Town

Science and technology parks in Asia are successfully facilitating the advancement of knowledge-based industries. The new clusters established, and the growth in links between park occupants and universities is impressive. Without these parks, such developments are not likely to have occurred. The parks have provided a focus, not only for the major players such as the semiconductor manufacturers, but also for a wide range of supporting industries. The clustering of these industries has created significant competitive advantages. Asian developing countries are now placing a new emphasis on parks, which focus on biotechnology and life sciences, with the aim of achieving a strong position in particular areas such as medical devices in Shanghai, agricultural biotechnology in Malaysia, and biomedical software in India. Most parks seek to attract one or two large foreign multinational firms, which in turn attract supplier firms and national firms. Most parks also operate business incubators that assist new businesses to get established, obtain approvals, assist in providing or raising capital, undertake business planning, get access to university researchers and equipment, recruit staff, etc.

The growth of knowledge-based industries in Asia is assisted by a range of support measures provided by different levels of government, including some specifically designed to attract

foreign corporations. Governments across Asia are creating new research institutes and strengthening their universities. While the number of trained researchers in most Asian developing countries falls short of demand, the region's science and technology parks have played a key role in attracting skilled staff from other countries. The attractive salaries, work conditions, research equipment and lifestyle offered in Asia's science and technology parks is drawing increasing numbers of foreigners. Universities in Asia are under pressure to provide more graduates with training relevant to the focus of the science and technology parks and the needs of firms that work in those parks. The relationship between the parks and universities or other training institutes is a key feature of Asian science and technology parks. Cooperation between researchers, industries and governments in Asia is growing. The presence of multinational companies in the parks is leading to increased science and technology cooperation with Europe and North America. Singapore is involved in parks in China and India. Science and technology parks are helping to attract foreign direct investment in Asia. Science and technology parks in Asia attract firms that provide jobs for skilled production workers and increasingly, for researchers, who design products to satisfy the particular needs of Asian markets. Foreign direct investment in high technology manufacturing is helping Asian developing countries to increase high technology manufacturing. Staff trained in a multinational plant may move on to work for local companies or set up their own businesses, which in turn, provide job opportunities for further skilled workers.

High technology firms are major contributors to economic growth. These firms are helping Asian countries to achieve a higher standard of living. More significantly, some Asian developing countries that attracted the low value added elements of high technology production have now developed a significant capacity in the high-value elements such as R&D, design, engineering etc. Until recently, one of the major barriers for western companies considering locating production in Asia has been the lack of enforcement of intellectual property rights. This barrier is now starting to disappear. Some technology-related breaches of intellectual property rights continue, but most of the countries in Asia are now generating their own intellectual property and are anxious to protect it. Many science and technology parks provide relevant advisory services or access to such services [3].

2. Strengthen the Relationships of "University-Government-Industry"

University-Government-Industry relationships have emerged as a key force in the economic development of China. A growing number of scientists in central government-owned and province-owned universities are involved in close working relationships with commercial firms. The relationships offer potential benefits to both parties, and are encouraged by many

government preferential policies. From the perspective of academic researchers, collaborating with industry provides an additional source of research funding, access to proprietary technology and research tools, and an opportunity to develop and bring technologies to the market. For companies, collaboration provides them with access to scientific talent and cutting edge science that the company could not duplicate on its own. Companies generally provide financial and other resources in return for university research, testing, and educational or training services. However, government should help to decide on what percentage of University-Industry Relationships focus on (1) basic research (2) applied research and (3) product performance testing. Without baseline information, the task of determining how faculty may change their research agendas due to industry relationships, while controlling for other forces that also shape those agendas.

Academic scientists can benefit from industry relationships in several ways. They seek industry funding to support research that might be widely cited and used in applied or technical fields. Widely cited research in turn contributes to the scientist's income and prestige. Industry relationships also provide real-world experience for academic scientists and their students, possibly resulting in the practical use of products developed from their labs. These relationships may also provide financial support and extramural experiences such as internships and future employment opportunities to graduate students. Collaborations between universities and industries can lead opportunities for the collaborating scientists and elevate the university's prestige. Many professors find that corporate research sponsorship imposes a smaller administrative burden than government grants. Academic scientists may also gain access to matching government grants when they engage in such collaboration.

University-Government-Industry relationships are increasing, varied, and promise to be a fixture in science and technology development for the foreseeable future. In doing so, it will be important to seek specific information on project size, scope, objectives, clarity of purpose and risk of failure. With the knowledge of such key relationships, the attributes of University-Government-Industry most likely to foster desired university and industry benefits can be identified for public and private decision makers [4].

10.3 Adaptability of the "New Regional Development Scheme" to Vietnam

10.3.1 Introduction of Vietnam

The conquest of Vietnam by France began in 1858 and was completed by 1884. It became part of French Indochina in 1887. Vietnam declared independence after World War II, but France continued to rule until its 1954 defeat by Communist forces under Ho Chi MINH. Under the Geneva Accords of 1954, Vietnam was divided into the Communist North and anti-Communist South. Two years later, North Vietnamese forces overran the South reuniting the country under Communist rule. Despite the return of peace, for over two decades the country experienced little economic growth because of conservative leadership policies.

Vietnam is an agricultural country and the agricultural products are vital to the whole country. The revenue from the agricultural area is also a considerable part of the government budget. In addition, local authorities are pioneering in rural development, especially in the nationwide movement of "famine abolishment and poverty alleviation", traditional heritage preservation, and environmental protection. Vietnam is a densely-populated, developing country that in the last 30 years has had to recover from the ravages of war, the loss of financial support from the old Soviet Bloc, and the rigidities of a centrally-planned economy. Substantial progress was achieved from 1986 to 1997 in moving forward from an extremely low level of development and significantly reducing poverty. Growth averaged around 9% per year from 1993 to 1997. The 1997 Asian financial crisis highlighted the problems in the Vietnamese economy and temporarily allowed opponents of reform to slow progress towards a market-oriented economy. GDP growth of 8.5% in 1997 fell to 6% in 1998 and 5% in 1999. Growth then rose to 7% in 2000-2005 even against the background of global recession. Since 2001, however, Vietnamese authorities have reaffirmed their commitment to economic liberalization and international integration. They have moved to implement the structural reforms needed to modernize the economy and to produce more competitive, export-driven industries. However, reduction of government-owned enterprises has fallen behind schedule. Vietnam became a member of the WTO in 2005. Among other benefits, accession allows Vietnam to take advantage of the phase out of the Agreement on Textiles and Clothing, which eliminated quotas on textiles and clothing for WTO partners on 1 January 2005. Vietnam is working to promote job creation to keep up with the country's high population growth rate. However, high levels of inflation have prompted Vietnamese authorities to tighten monetary and fiscal policies [5].

10.3.2 Adaptability to Vietnam

China and Vietnam have similar political and cultural roots, but different reform policies and economic performance. In recent years, both countries have sought to modernize their economies by restructuring their economic systems, while all preserving socialist countries under the strong single party. China and Vietnam have experienced tremendous growth but have neither liberal political structures nor well functioning legal systems. In Vietnam, legal reforms are often a delayed reaction to market trends and improvements in enterprise performance have usually preceded changes in the legal framework. Similarly, in China economic development has not been significantly hampered by the lack in some circumstances of effective enforcement of rights. Vietnam was considered one of the provinces in China until 939 A.D., and was subsequently ruled for many centuries following Chinese traditions. The links between socialism and traditional concepts also allowed the leadership to invoke traditional sanctions for socialist policies. Nowadays, Vietnam has followed China's lead by enacting several reforms [6].

1. Strengthen the Functions of Local Governments
The local administrative system in Vietnam consists of 3 levels:
(1) The provincial/municipal level
(2) The provincial/municipal district level and its equivalent of provincial cities/towns
(3) The communal level and its equivalent of district towns and city wards
For the villages, there is no official level of administration, but selected officers are entrusted by the higher level of authority to take charge of public management regarding certain aspects of the local matters and link the authority to the local community. There are 57 provinces and 4 municipalities, almost 15 provincial cities, 70 provincial towns, around 600 districts, and more than 10,000 communes, district towns and city wards, belonging to the three different local levels. The local administrative system covers 80% of the national population [7].

From the mid-1980s, the Vietnamese government has worked out the most difficult but correct decision of transforming from a centrally planned mechanism into a government-regulated market mechanism, and develop a multi-sector economy with the policy of opening and integrating into the world economy. The top priority, subsequently has turned into the socio-economic and democratic development, facilitating all the rank and file and levels of authorities to participate in and contribute to national development. Above all, the 1992 Constitution has come into being to reflect a strong commitment to the determined reform. Other changes have also been initiated on restructuring administrative apparatus, coordination between the levels of government, public service structural reframe, human resource development, and improved

financial management and accounting practices. From this point of view, it is the heart of the issue that local authorities should be given full competence to fulfil their responsibility as self-governed bodies. The central government is requested to provide them with sufficient resources based on their social, economic and cultural features, on potentials and advantages as well as shortcomings of each territorial area, so that the given responsibility and authority will be optimised for better exploitation and utilization of resources, good delivery of public services, and great contribution to national growth. The central government, in this context, should hold the leading role in formulating a relevant dimension and scope of decentralization, and a rational degree of delegation to different levels, and in developing a mechanism to guide, monitor and control the lower levels, while ensuring a sound and effective system of coordination and operations. Decentralization between the central government and local authorities in terms of tasks, competence, budget and personnel is recently applied in the Vietnamese reality of management. Regulation making power is in the hands of the government and ministries, together with the planning, institution-building, strategy designing for the sectoral and national development, coordinating the plans of different localities, and monitoring and supervising and assisting as well as inspecting the implementation of the local units. Meanwhile the implementation is to be done by the local authorities to stimulate the participation of local population. The central government can only make institutional interventions, but never interfere into the concrete activities of the local bodies.

2. Strengthen the Functions of University

The Chinese educational system was used until around 1954 when Vietnam was divided. At this point, South Vietnam used the United States' system, while the North had mass education and trained with a basis on theories by Karl Marx and Vladmir Lenin. The purpose of the North's system was to train people for existence in a Communist society. In 1975, Vietnam was reunified and the Communist system spread throughout the country. In spite of this, education and training in technology is considered to be as important as that of teaching Communist ideals. Before 1954, literacy was very poor, but after revamping the educational system, literacy is now at 94% with people 15 and over. Almost all children receive primary education, which is free and compulsory for the first five years, but less than half of those children go on to receive the secondary education. The reason for this is because adequate facilities are not to be found, especially in the mountainous areas [8]. Vietnam is directly involved in formal education and training activities, either as students or teachers. Education is an important part of the society. It is a major preoccupation of government and is a highly valued and respected activity in Vietnamese society. The Vietnam education and training sector is large, present in almost every village and touches virtually every family. There are almost 18 million students in the education

system and over 0.5 million teachers and instructors. The structure of the education system is 5-4-3 i.e., five years of primary education (grades 1-5) followed by four years of lower secondary (grades 6-9), and three years of upper secondary (grades 10-12). Higher education programs last between two and six years.

Higher education is not common in Vietnam. In 1995, only 5% of college-age people were expected to get higher education, but there are some major universities to be found in the larger cities like Hanoi, Ho Chi Minh City and Hue. In higher education and vocational/technical education, with the exception of universities, the role of provincial governments in running educational institutions is at least as large as the role of the central government. Higher education in Vietnam is similar to that of the former Soviet Union with a multiplicity of small mono-disciplinary institutions with limited linkage between teaching and research. The present structures and procedures have been inherited from the era of central planning when higher education was segmented by economic sectors with many specialized institutions, each with little autonomy of its own, reporting to a particular line ministry. Fig. 10-2 shows the rapid increase in tertiary education enrolments, which has more than doubled each year, far outstripping the modest increase in primary education and even the quite rapid increase in secondary school enrolments.

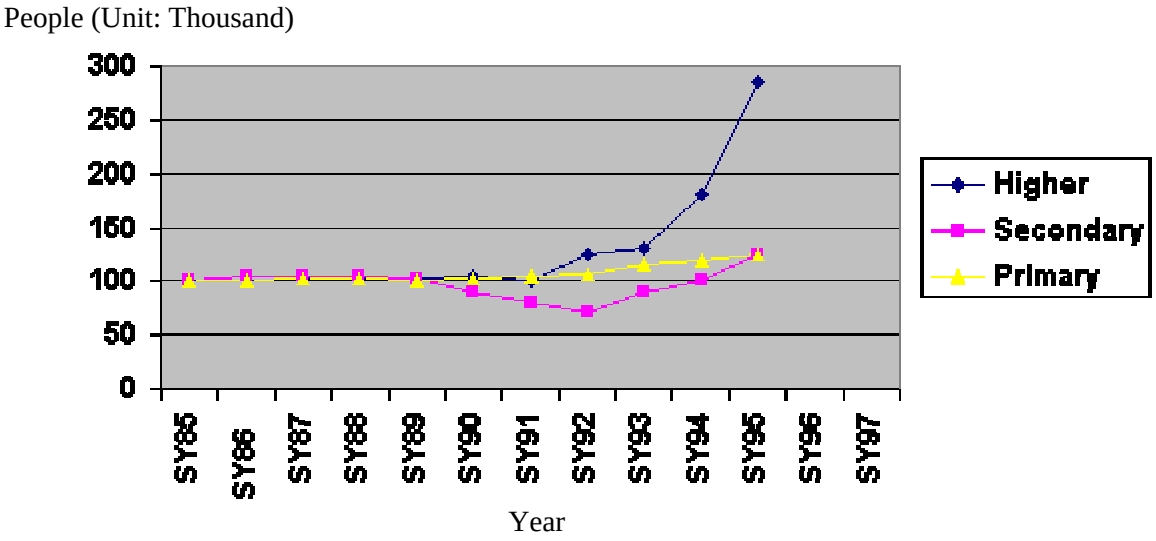

Fig. 10-2 Enrollment in Higher Education Relative to Primary and Secondary Education

(Source: Kristy Kelly, "The Higher Education System in Vietnam")

There are three broad types of universities in Vietnam, two of which are more traditional forms meaning that they rely on classroom lectures as their principal medium of instruction.

(1) The first of this type are the “specialized universities”, each of which focuses on a single area of study, such as economics, engineering, fine arts, or law.
(2) The second of this type are the “multi-disciplinary universities”, including five newly established national and regional universities in some of Vietnam's largest cities.
(3) The third and newest category of university education in Vietnam is the “open university” system in Hanoi and Ho Chi Minh City.
The system in which specialized and professional education was offered in a comparatively large number of small institutions is changing. Now Vietnam has shifted her policy from operating a completely centrally planned economy. Because of changing the policy, graduates are no longer assigned jobs and guaranteed employment upon graduation. In order to respond to the demands of the market economy and to increase the efficiency and quality, the government has started to reform the education system. In the interests of strengthening the education system in the universities and improving the functions of research at this level, a fundamental reorganization of the institutional basis of higher education is taking place. There are two types of new universities such as national universities and regional universities. Two national universities and three regional universities have already been established. At present, the national universities offer bachelor, master and doctoral programs, while the regional universities offer bachelor, master and other college-level programs [9].

One of the goals of education is to meet the needs of the standardized public service by providing and upgrading its human resource with modern managerial knowledge and skills. A well-qualified and dignified highly responsive human resource, sufficient in quantity and quality, so it is imperative to set up the education development strategy to meet the requirements of building an effective and modern public administration. Asian countries have developed plans to guide their economic growth. The plans often contain commitments by both government and the private sectors and provide some policy directions. They also provide focus and help direct industrial activities into sustainable development. Government agencies in the region appear to employ well-qualified staff, often with industry and academic experience. Many have expertise in the industry sectors in which they work. The commitment of these individuals to sustainable economic growth and to national industry development goals is notable [3].

10.4 Adaptability of the "New Regional Development Scheme" to Bangladesh and Cambodia

10.4.1 Introduction of Bangladesh and Cambodia

1. Introduction of Bangladesh

East Bengal, the region that was to become East-Pakistan and now Bangladesh was a prosperous region of South Asia until modern times. It had the advantages of a mild, almost tropical climate, fertile soil, ample water, and an abundance of fish, wildlife, and fruit. The standard of living compared favorably with other parts of South Asia. As early as the thirteenth century, the region was developing as an agrarian economy. It was not entirely without commercial centers, and Dhaka in particular grew into an important center during the Mughal Empire. The British, however, on their arrival in the early seventeenth century, chose to develop Calcutta as their commercial and administrative center in South Asia. The development of East Bengal was thereafter limited to agriculture. The colonial infrastructure of the eighteenth and nineteenth centuries reinforced East Bengal's function as the primary producer, chiefly of rice and jute for processors and traders in Calcutta and beyond. Post Independence Bangladesh had to face the devastation wrought by earlier economic exploitation during the Pakistan era as well as destruction of critical infrastructure during the war. After many years of economic problems, Bangladesh has started to rebound with steady growth in recent years [10].

Bangladesh is an agricultural country, with some three-fifths of the population engaged in farming. Jute and tea are principal sources of foreign exchange. Agriculture has in the past been wholly dependent upon the vagaries of the monsoon. Monsoons have always meant poor harvests and the threat of famine. Among the remedial measures adopted has been the construction of a number of irrigation projects designed to control floods and to conserve rainwater for use in the dry months. The most important are the Karnaphuli Multipurpose Project in the southeast, the Tista Barrage Project in the north, and the Ganges-Kabadak Project, to serve the southwestern part of the country. Economic planning has encouraged double and triple cropping, intercropping, and the increased use of fertilizers.

Education arena in Bangladesh is not so developed. Literacy rate is low and there is a significant disparity between female and male literacy rates. The education system is divided into 4 levels--Primary (from grades 1 to 5), Secondary (from grades 6 to 10), Higher Secondary (from grades 11 to 12). Alongside national educating system, English medium education is also provided by some private enterprises. There is also Madrasa system, which emphasizes on Arabic medium

Islam-based education. This system is supervised by the lone Madrasa Board of the country. In 1998 there were about 52,000 primary schools 11000 secondary institutions. The five years of lower secondary education concludes with a Secondary School Certificate (SSC) examination. Students who pass this examination proceed to two years of Higher Secondary or intermediate training, which culminate in a Higher Secondary School (HSC) examination. Five education boards lead by the Ministry of Education deal with education up to HSC level. Under-graduate level is finished with HSC. Then graduation level dealt by universities begins. Universities also offer Master's and Doctorate degrees. There are 11 government universities and approximately 20 private universities in Bangladesh. Specialized universities are Bangladesh University of Engineering and Technology (BUET), Bangladesh Agricultural University and Bangabandhu Shaikh Mujib Medical University [11].

2. Introduction of Cambodia

Cambodia is bordered by Laos on the north, by Vietnam on the east, by the Gulf of Thailand on the south, and by Thailand on the west and north. Phnom Penh is the capital and largest city. Cambodia has 20 provinces and four municipalities. Cambodia is one of the world's poorest nations, its economy and its political life still suffering from the civil war that racked the country during the latter part of the 20th century. Conditions are ideal for the cultivation of rice, by far the country's chief crop. Livestock raising and extensive fishing supplement the diet. Rice and rubber are traditionally the principal exports of Cambodia, but exports fell sharply after the onset (1970) of the civil war, which put most of the rubber plantations out of operation. By the 1990s, however, rubber plantings had been undertaken as part of a national recovery program, and rubber and rice were again being exported. The fishing industry has also been revived, but some food shortages continue. Until recently, inadequate transportation hampered exploitation of the country's vast forests, but by the mid-1990s timber had become the largest source of export income. Mineral resources are not abundant, but phosphate rock, limestone, semiprecious stones, and salt support important local mining operations. The country's industries are based primarily on the processing of rubber and agricultural, fish, and timber products. Cambodia is connected by road systems with Thailand, Laos, and Vietnam; waterways are an important supplement to the roads [12].

Modern education progressed very slowly in Cambodia. The French colonial rulers did not pay attention to education. It was not until the late 1930s that the first high school opened. However, after gaining independence from France, the government of Prince Norodom Sihanouk made substantial progress in the field of education in the 1950s and 1960s. Elementary and secondary education was expanded to various parts of the country, while higher learning institutions such

as vocational institutions, teacher-training centers and universities were established. Unfortunately, the progress of these decades was obstructed by the civil war following the overthrow of Prince Sihanouk in the 1970 and then destroyed by the Khmer Rouge regime. After coming to power with Vietnamese help in 1979, the government of the PRK attempted to redevelop the education system. Although significant progress was made, the process of educational redevelopment was hampered by war and lack of resources, human as well as material. In the 1990s, after the Paris Agreements and the UN sponsored elections, there were significant changes in the educational system. The school system today has pre-school for children aged 3 to 5 (but only in some areas), Primary education in grades 1 to 6, and Lower Secondary education from grades 6 to 9. After grade nine is an exam to pass to enter Upper Secondary school (grades 10 to 12). After grade 12 is an exam to graduate with a diploma. Previously there was then a separate entrance exam for the university level, but now the exams already sat are studied for highest scores in certain topical areas to decide which students will be allowed to continue to university. There is also a non-formal education system that includes literacy classes for adults. There are still enormous problems with education service delivery, including a large gap in education quality between urban and rural or remote schools (MEYS 1999). The daily realities for both teachers and students in the Cambodian education system are thus very challenging. Teachers face inadequate salaries and the need to charge students fees for services. Students face inadequate facilities, large classroom size, sometimes travel times to nearby villages or towns, and high costs for their families [13].

10.4.2 Adaptability to Bangladesh and Cambodia

1. Strengthen the Functions of Education

There are significant social and economic differences between developed and developing countries. Many of the underlying causes of these differences are rooted in the long history of development of such nations and include social, cultural and economic variables, historical and political elements, international relations, geographical factors. The differences in the scientific and technological infrastructure and in the development of science and technology in the two groups of countries are the most important causes of differential social and economical levels. An essential prerequisite to a country’s technological progress is early recognition of necessity of a good educational system. This was one of the key factors that contributed to Japan’s economic success [14].

By satisfying the needs of the society, the creation of intellectual property will become a powerful engine to expand economic benefits and create improvements for society.

These conditions include developing a system which produces high quality intellectual property, appropriate protection for intellectual property rights, practical application of intellectual property on a wide scale, and establishment of a cycle of constant reinvestment in intellectual property which can become a growth driver continually leading to increased benefits. The mission of the university is to foster creative research and education and to contribute to human progress through independent and free thinking as the basis of knowledge. The results of education, learning and research, its intellectual property constitutes the university's irreplaceable asset. In the 21st Century, the university is required to be more accessible than in the past, to connect to society, and to contribute in the areas of science, technology, culture and industry [15].

2. Strengthen the Training Cooperation between Universities in two Countries

The support and coordination for University Cooperation in International Development is to provide advice and services for universities and other institutions interested in playing an institution-level role in cooperative activities not only for international development, but also to provide support for the promotion of practical education and research through cooperation in international development.

The involvement of Training Cooperation between Universities in two Countries has been depended on the role of individual faculty members and researchers. To promote active involvement at the institution level, encouraging and assisting universities to take an organized approach and to enter into contracts with aid agencies and development consulting firms. This will ensure a more secure base for cooperation, benefiting the university staffs and researchers as well as aid agencies and other interested parties in developing countries. Such assistance cooperation includes:

(1) Providing advice for establishing systems at universities
(2) Providing training courses and seminars
(3) Disseminating information internationally
(4) Providing consulting for project acceptance
(5) Maintaining and providing access to the University Database for International Development Cooperation [16]

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Conclusions

1. General Findings

(1) Technology and knowledge are now the key factors of production

Knowledge is the basic form of capital. Economic growth is driven by the accumulation of knowledge. Technology can raise the return on investment, which explains why developed countries can sustain growth and why developing countries, even those with cheaper labor can not attain growth. Investment can make technology more valuable and vice versa. It is important in providing an incentive for companies to invest in R&D for technological innovation.

(2) Enhancing human resource is critical for GDP growth

In order to make investments in technology, a country must have sufficient human resource. Human resource is the formal education, training and on-the-job learning embodied in the workforce. There are different kinds of knowledge. “Tacit knowledge” is knowledge gained from experience, rather than that installed by formal education and training. In the knowledge economy tacit knowledge is as important as formal, structured and explicit knowledge. According to New Growth economics a country’s capacity to take advantage of the knowledge economy depends on how quickly it can become a “learning economy”. Learning means not only using new technologies to access global knowledge, it also means using them to communicate with other people about innovation. In the “learning economy”, individuals, firms, and countries will be able to create wealth in proportion to their capacity to learn and share innovation.

(3) Intellectual capital is a firm’s source of competitive advantage

To become knowledge driven, companies must learn how to recognize changes in intellectual capital in the worth of their business. A firm’s intellectual capital include employees' knowledge, know-how, and processes, as well as their ability to continuously improve those processes, these are sources of competitive advantage [1].

2. New Findings

(1) Regional disparity in economic development level of provinces in China

The cross century period is an important phase in China’s economic and social development. Giving priority to the development of education is the basis of the two major national strategies of improving the quality of people and rejuvenating the nation by relying on science and education and realizing sustained development. However, China has difficulty in developing the central and western regions, because as China’s domestic market opens up, the eastern region

already has well-developed infrastructures are attracting businesses to expand their markets. With the continuing improvement of scientific technology, the functions of knowledge resources and knowledge assets have shaken the traditional theory of regional economy, which was based not only on natural resources but also on invention or market. Even so, it is not likely that the disparity will disappear altogether because China has had great regional disparities since ancient times. Thus, the priority will be to control the disparity, keeping it from widening, so that it will not threaten political stability.

(2) Quantitative analysis on economic profits of education

(a) Macro-Analysis based on Education Duration Year (Table Conclusion-1)

Table Conclusion-1 Relationships between National Income and Human Resource

National Income & Human Resource	Importance Degree (%)
Due to increased number of human resource	25.12
Due to increased productivity by human resource	74.86
Productivity due to improved technology level of human resource	35.30
Productivity due to improved technical equipments	39.58

(b) Micro-Analysis based on Adjusted Cobb-Douglas Function (Table Conclusion-2)

Table Conclusion-2 Importance of Coefficients in Labor-Intensive Industry and Technology-Intensive Industry

Importance	Labor-Intensive Industry	Technology-Intensive Industry
Coefficients	Labor	Capital
Coefficients	Master	Doctor

(3) Adaptability of “New Regional Development Scheme” to other developing countries

The “New Regional Development Scheme” in this study can be applied to the Mid-Developing Countries, which are under the similar economic or political background such as Malaysia India and Vietnam.

3. Recommendations

(1) Proposing social contribution function of university in form of University-run Enterprise

(2) Proposing “University Science Town” using the functions of university in Harbin city of China

(3) Proposing “New Regional Development Scheme” for Heilongjiang Province in China

As analyzed in this paper, there are historical reasons that fostered the emergence and evolution of these university-run enterprises over the past two decades. They have made significant contribution to the growth of China’s high-tech industry. The operation mechanism of Chinese university-run enterprise has special characteristics, which are government support, relying on university resources, market mechanisms, and industry movement. To summarize, government appropriation for Chinese universities has been far from adequate over a long period of time. Research funding from industry has become a major source of income for universities. Given that research funding from industry accounts for almost half of the total research income, the university naturally encourages its faculty to develop closer ties with industry, or even to become entrepreneurs themselves. In addition, the endorsement of the central government and the fact that university-run enterprises have become a priority of university administration also have played important roles. These factors may help to explain why university-run enterprises have become so popular in China, but not in other developing countries.

4. Future Study

In the future research, the author will make the “New Regional Development Scheme using the Functions of University” for other provinces in China, and to make the “Interregional Development Scheme” for China. For the part of quantitative analysis, the author will try to develop CGE Model (Computable General Equilibrium) for further analysis on the economic profits of education. The above future works can help to adapt the Scheme to other countries.

References:

[1] The Allen Consulting Group, “The Role of Science and Technology Parks in Asia’s Economic Growth”

Appendix

Chapter 1 Introduction of China

Population Distribution in China (Year: 2003)

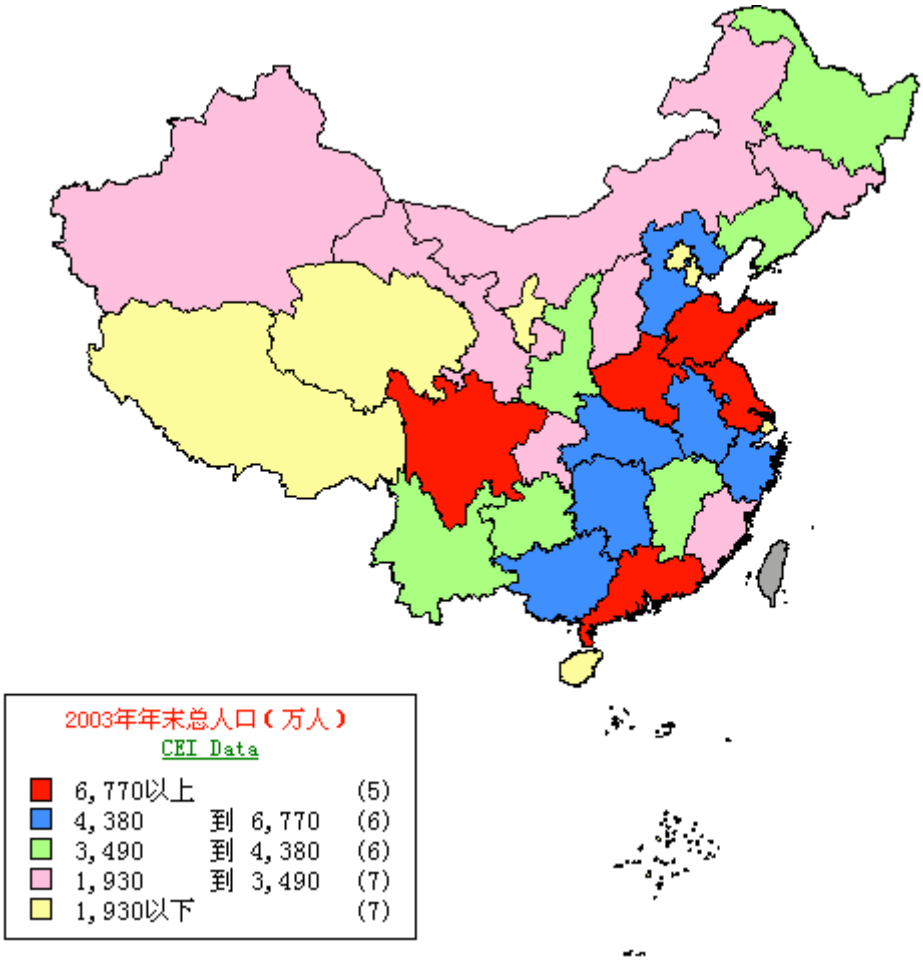


Fig. Appendix-1 Population Distribution by Province in China

(Source: "China Economic Information Network")

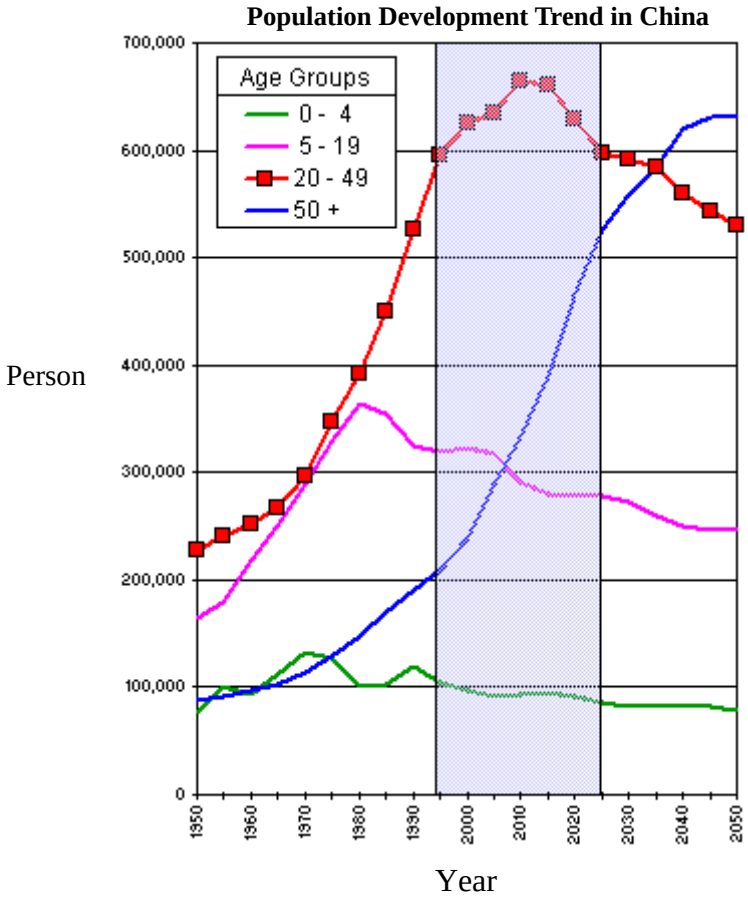


Fig. Appendix-2 Population Development Trend in China (Unit: Million People)

(Source: Gerhard K. Heilig, "Can China Feed Itself? –
A System for Evaluation of Policy Options")

Data Analysis (Fig. Appendix-2):

1. The number of young adults of reproductive age (20 - 50) will reach its maximum of more than 660 million around 2010. This explains why the period between 1995 and 2025 (shaded light blue) is the most critical for the country's future population growth.
2. China is becoming Aging Society.

Evaluation for Economic Development of China by GDP

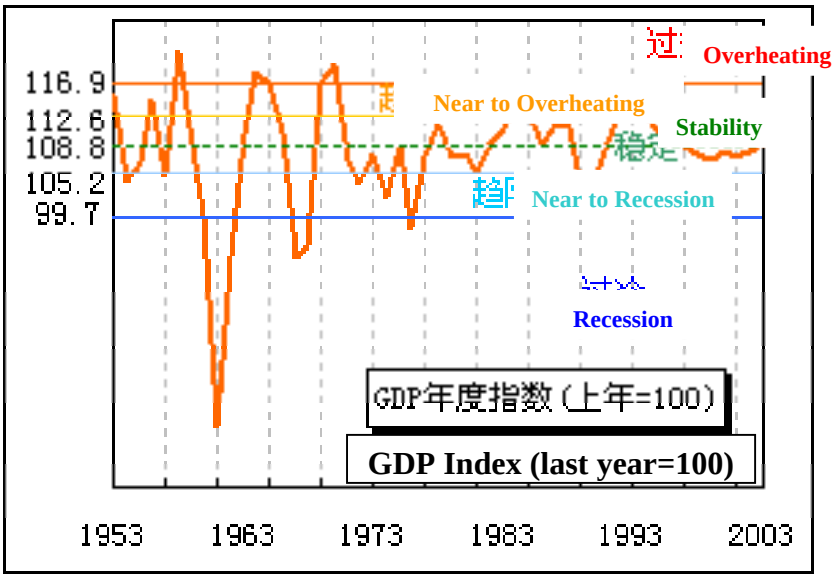


Fig. Appendix-3 Economic Development of China by GDP

(Source: "China Economic Information Network")

Data Analysis (Fig. Appendix-3):

1. This chart shows 5 standards for evaluating the economic growth: Near to Overheating, Near to Recession, Recession, Stability, and Overheating. There are 3 times of economic overheating and economic recession respectively in development history since the founding of People's Republic of China in 1949.

2. Chinese economy at present is near to overheating according to this chart.

Table Appendix-1Contents of Further Economic Reform in China

Time	Reform Items	Reform Contents
1994	System of Tax Distribution	*18 tax categories into central and local taxes and the sharing of tax revenues between central and local authorities *2 taxation authorities were set up wherein the central and local governments levy and manage taxes separately
	Merger of Exchange Rates	Dual exchange rate was changed into a single managed floating exchange rate system
1995	Modern Enterprise System	Distinct property rights, clearly defined rights and duties, separation of government administration from enterprise management and scientific management
1998	Proactive Financial Policy	Government got involved in market economic operation through a purposeful investment policy
	Prudent Monetary Policy	Maintain the stability of the RMB and interest rates
1999	Debt-to-Equity Swaps	Put forward a concrete plan, condition and scope for debt-to-equity transfer
2000	Rural Tax-for-Free	Reduce burdens on farmers
	Urbanization	Raise the level of urbanization and transfer rural population
	Development of Western Region	Implement the policy measure for the development of the western region
2001	Administrative Examination and Approval System	Establish an administrative examination and approval system compatible with the social market economic system and realize institutional innovation through reform
2002	QFII	Management of domestic securities investment by Qualified Foreign Institutional Investors (QFII)
2003	Rejuvenate Northeast China's Industrial Bases	Put forward guidelines, main tasks, policy measures for the rejuvenation
2004	Green GDP	GDP reflects the influence on resources environment

(Source: compiled based on data of 'People's Daily Online')

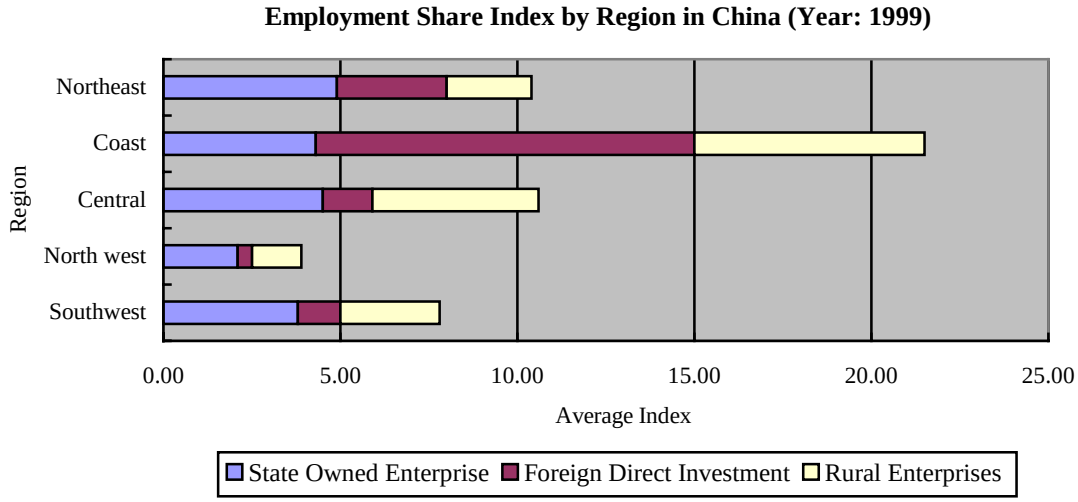


Fig. Appendix-4 Regional Disparity by Employment Share in China

(Source: compiled based on data of Sylvie Demurger, Jeffrey D. Sachs, Wing Thye Woo, Shuming Bao, Gene Chang and Andrew Mellinger, "Geography, Economic Policy and Regional Development in China")

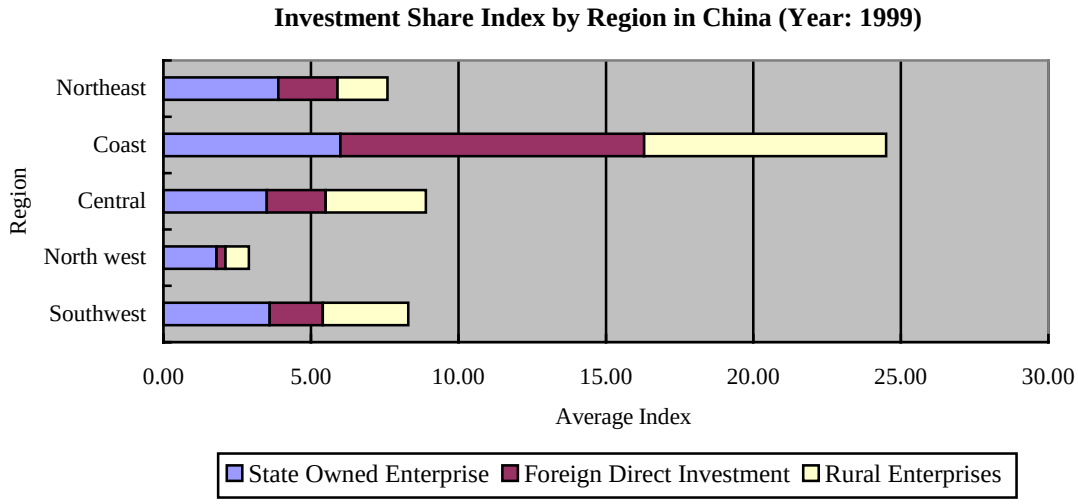


Fig. Appendix-5 Regional Disparity by Investment Share in China

(Source: compiled based on data of Sylvie Demurger, Jeffrey D. Sachs, Wing Thye Woo, Shuming Bao, Gene Chang and Andrew Mellinger, "Geography, Economic Policy and Regional Development in China")

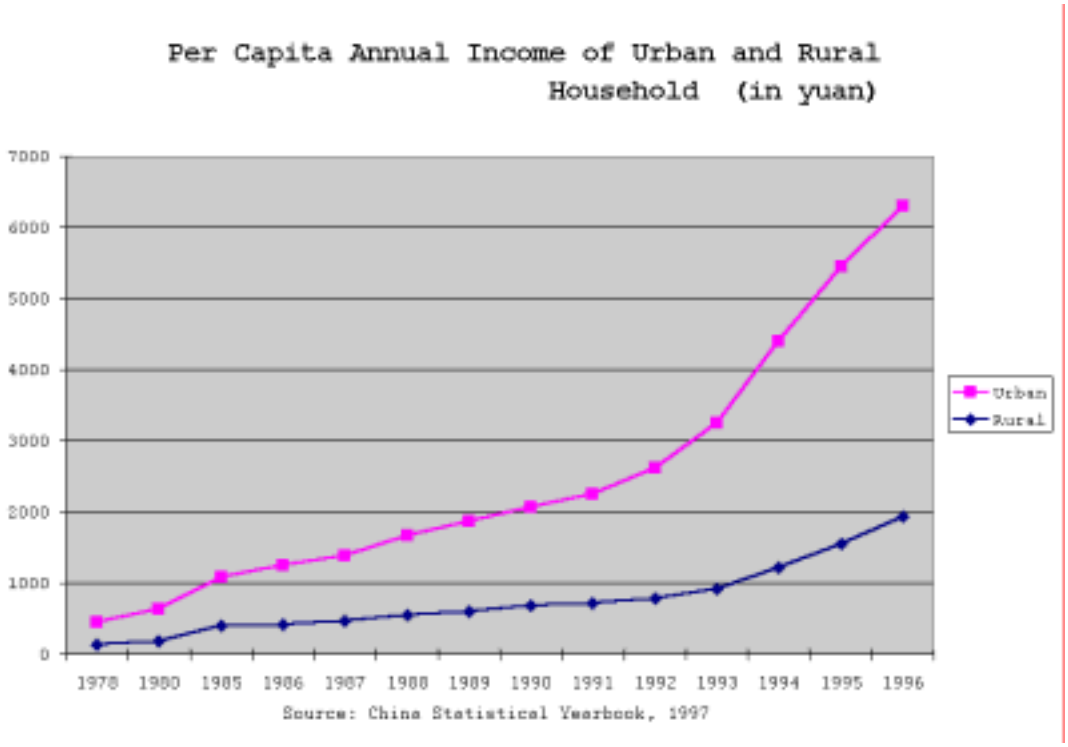


Fig. Appendix-6 Disparity of Urban-Rural Income in China

(Source: Taejoon Han, "China: a shared poverty to uneven wealth?")

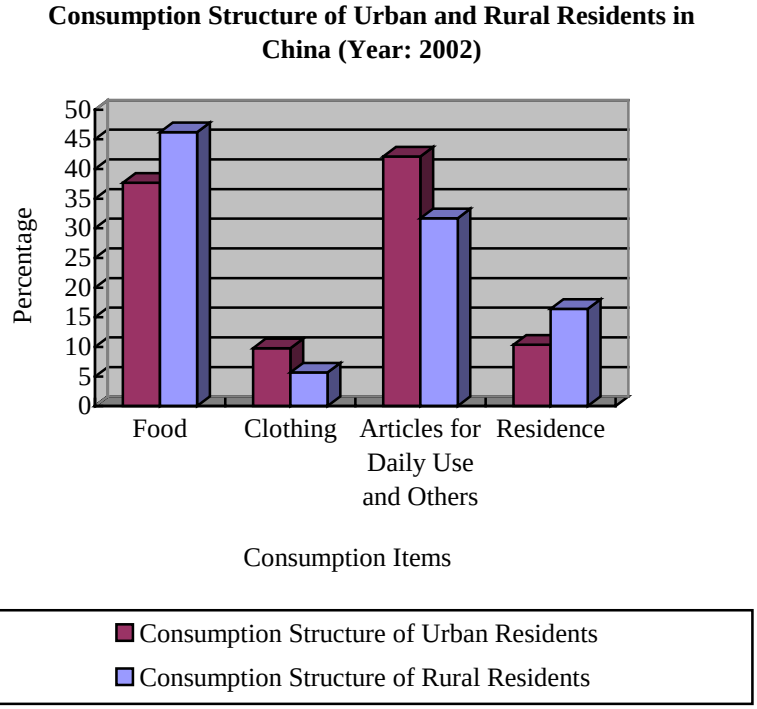


Fig. Appendix-7 Disparity of Urban-Rural Residents by Consumption Structure in China

(Source: compiled based on data of "China Statistical Yearbook 2003")

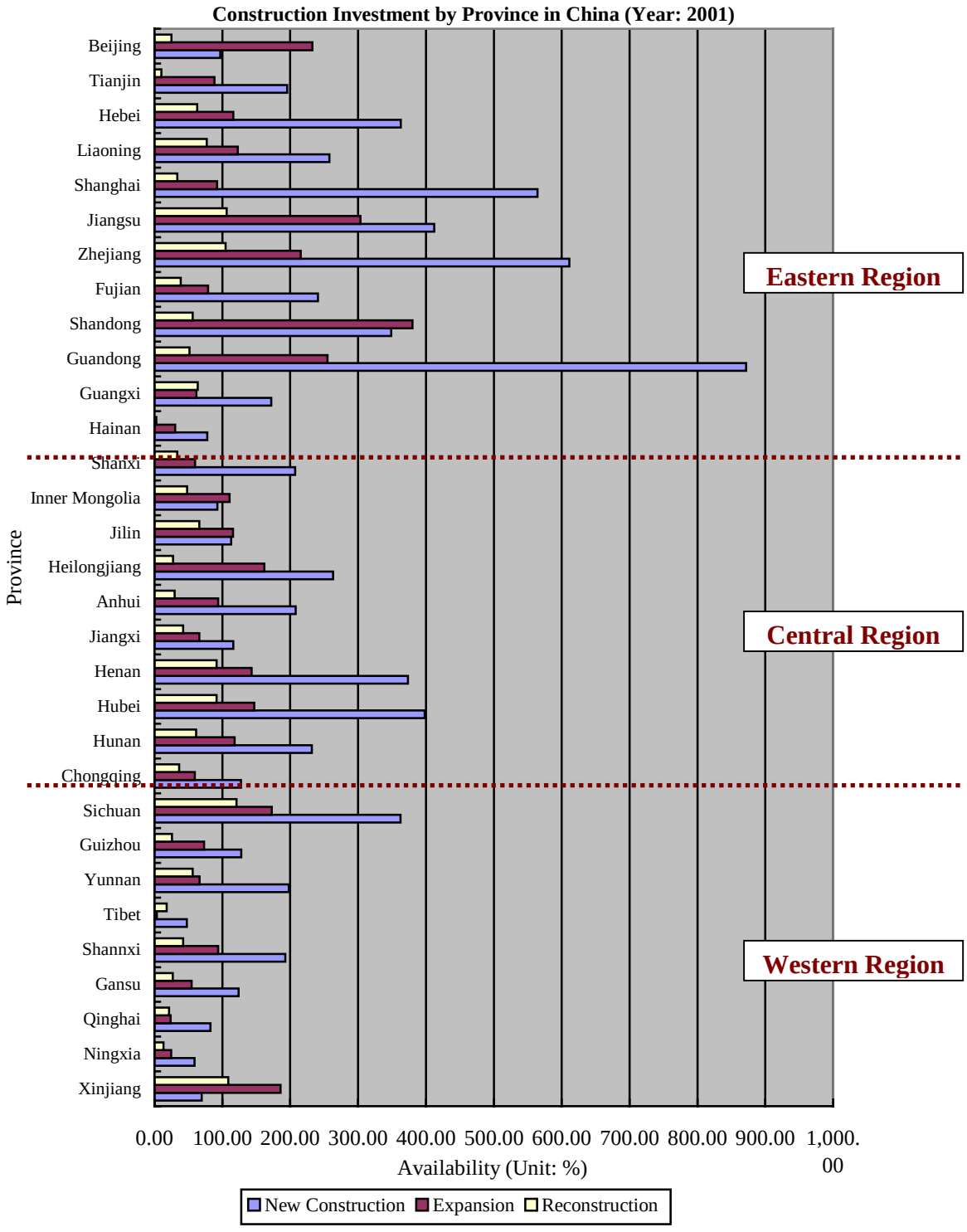


Fig. Appendix-8 Regional Disparity by Construction Investment in China

(Unit: RMB 100Million)

(Source: compiled based on data of "China Statistical Yearbook 2002")

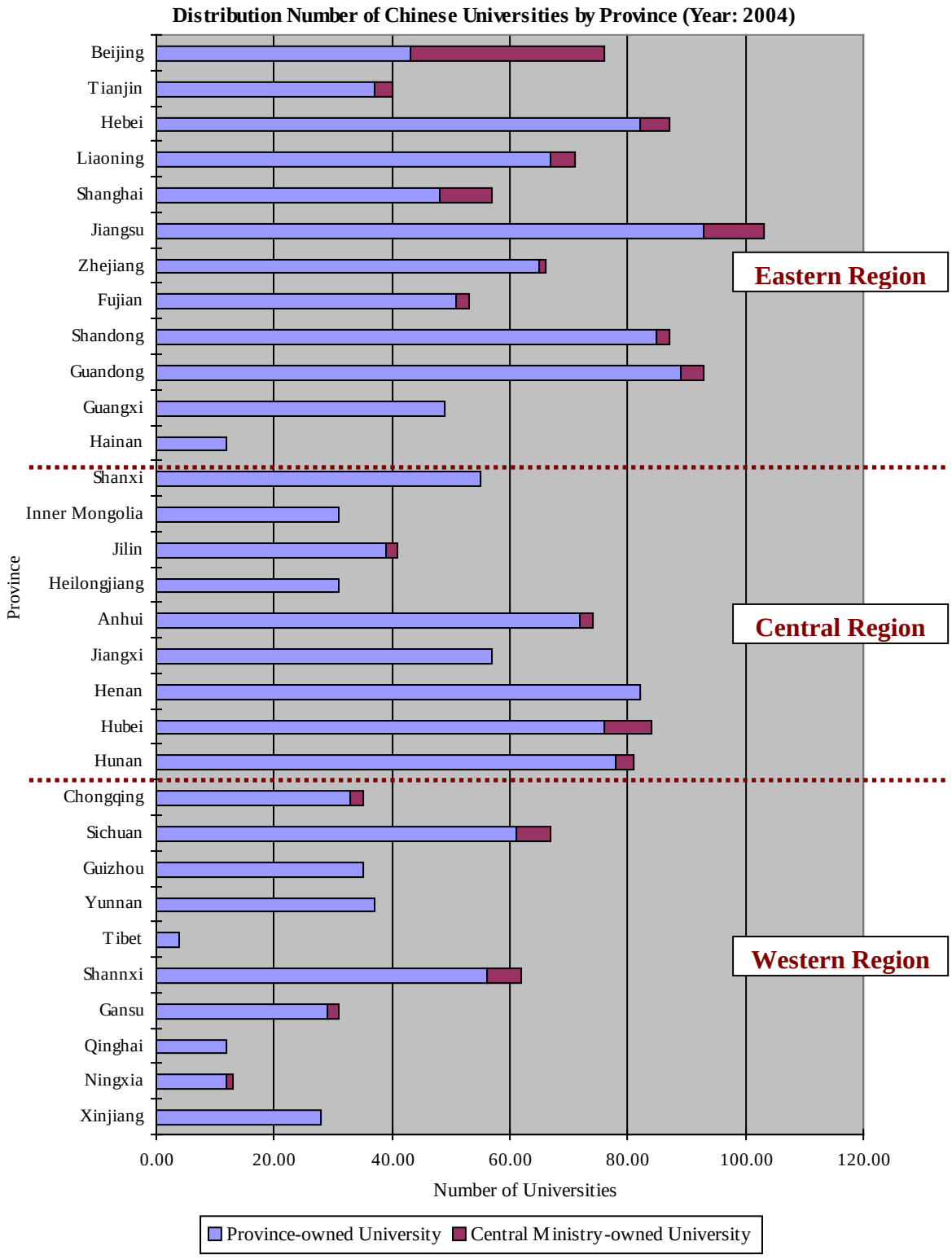


Fig. Appendix-9 Regional Disparity by University Distribution in China

(Source: compiled base on data of 'China Education and Research Network')

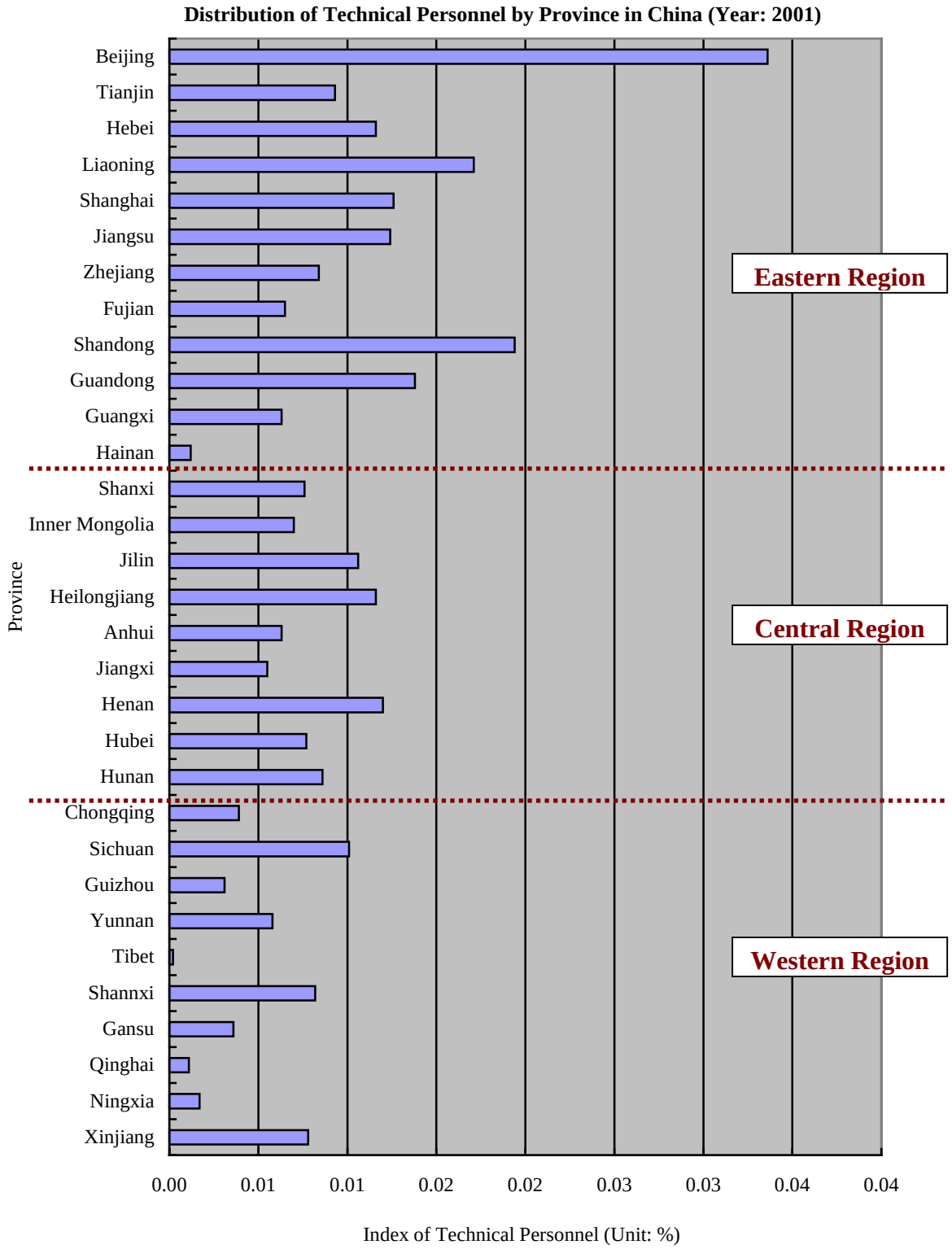


Fig. Appendix-10 Regional Disparity by Distribution of Technical Personnel in China

(Source: compiled base on data of "China Statistics Bureau")

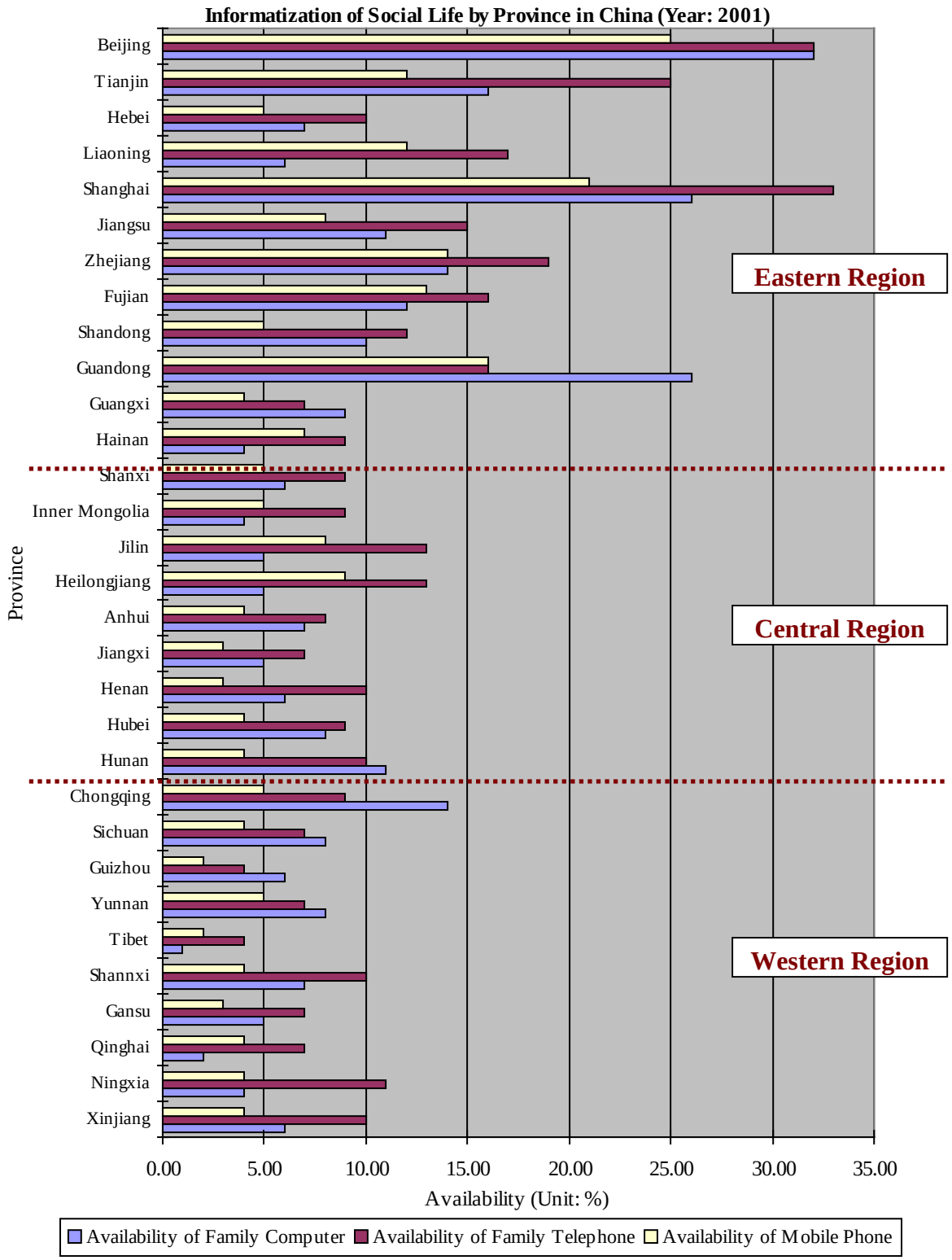


Fig. Appendix-11 Regional Disparity by Informatization of Social Life in China

(Source: compiled base on data of 'China Statistics Bureau')

Table Appendix-2 Brief Historical Review of Regional Preferential Policies in China

Time	Preferential Policies	Location
1979	3 Special Economic Zones (***SEZ***)	Guangdong
1980	1 Special Economic Zone	Fujian
1984	14 Coastal Open Cities (***COC***)	Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Guangxi
	10 Economic and Technological Development Zones (***ETDZ***)	Liaoning, Hebei, Tianjin, Shandong, Jiangsu, Zhejiang, and Guangdong
1985	1 Economic and Technological Development Zone	Fujian
	3 Coastal Open Economic Zones (***COEZ***)	Pearl River Delta, Yangtze River Delta, Fujian
1986	2 Economic and Technological Development Zones	Shanghai
1988	Open Coastal Belt (***OCB***)	Liaoning, Shandong, Guangxi, Hebei, Hainan
	1 Special Economic Zone	Hainan
	1 Economic and Technological Development Zone	Shanghai
1990	Pudong New Area	Shanghai
1992	13 Bonded Areas in Major Coastal Port Cities (***BA***)	Tianjin, Guangdong, Liaoning, Shandong, Jiangsu, Zhejian, Fujian, Hainan
	10 Major Cities along the Yangtze River (***MC***)	Jiangsu, Anhui, Jiangxi, Hunan, Hubei, Sichuan
	13 Border Economic Cooperation Zones (***BECZ***)	Jilin, Heilongjiang, Inner Mongolia, Xinjiang, Yunnan, Guangxi
	All Capital Cities of Inland Provinces and Autonomous Regions (***CC***)	
	5 Economic and Technological Development Zones	Fujian, liaoning, Jiangsu, Shandong, Zhejiang
1993	12 Economic and Technological Development Zones	Anhui, Guangdong, Heilongjiang, Hubei, Liaoning, Sichuan, Fujian, Jilin, Zhejiang
1994	2 Economic and Technological Development Zones	Beijing, Xinjiang

(Source: Sylvie Demurger, Jeffrey D. Sachs, Wing Thye Woo, Shuming Bao, Gene Chang and Andrew Mellinger, “Geography, Economic Policy and Regional Development in China”)

Table Appendix-3 Brief Historical Review of Rural Development Policies in China

Time	Background	Reform Contents	Reform Results
Land Reform (1949 – 1953)	Founding of People's Republic of China	Feudalistic system of land ownership was abolished	Previously landless families in rural areas got access to their own land
Collectivization (1954 – 1956)	Reconstruction	Small-scale farmers into cooperatives	Farmers received salaries from the collective according to labor input, skills, and political loyalty
Agricultural Communes (1957 – 1961)	"Great Leap Forward" Revolution	∗Introduce village industries ∗Agriculture was organized into communes with large-scale production units and detailed central planning and control ∗Initiate the admission of students from farmers and working class	Village industrialization was promoted most rapidly, farmers were ordered to produce steel, while harvests rotted in the fields, which was the direct result of great famine disaster
Damage Control (1962 – 1965)	Great Famine	Eliminated the central planning and control structure in the agriculture sector and replaced it with a more local authority	∗Situation in rural area improved ∗Farmers' motivation was low and mismanagement wide-spread
Culture Revolution (1966 – 1976)	Culture Revolution	Urban intellectuals were sent to re-education camps in rural areas	Productivity remained low and the agricultural output increased only slightly
Family farming (1978 – 1984)	Economic Reform (1st Phase)	∗Central planning was gradually abolished ∗Agricultural communes was eliminated ∗Reduce the number of agriculture commodities in the state procurement system ∗Introduce township and village enterprises	∗Unprecedented increase in agricultural production but also an astonishing diversification in commodities ∗Farmers were greatly motivated to increase productivity ∗Unprecedented development took off in China's rural areas
Price and Market Liberalization (1985 – 1989)	Economic Reform (2nd Phase)	Price and Market Liberalization	The still existing state procurement system with its production quotas, which forced the farmers to allocate much of their production to products with low profit margin
Structural Improvements (1990- Present)	Economic Reform (Recent Phase)	Further liberalize the agricultural markets and reduce the number of commodities in the state-controlled procurement system	Unprecedented increase in agricultural production

(Source: compiled based on data of "Rural Development or Sustainable Development in China: Is China's Rural Development Sustainable?")

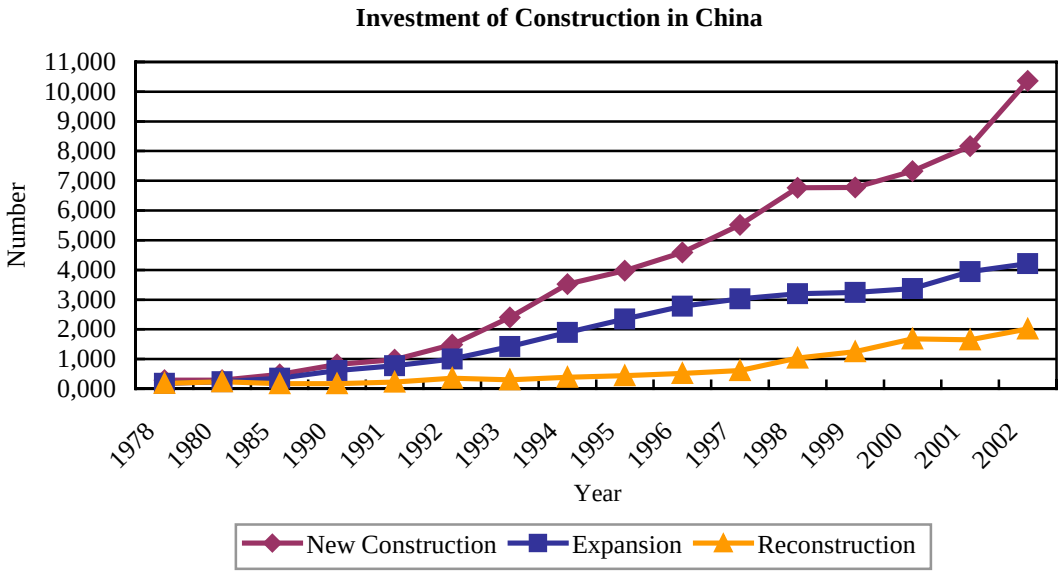


Fig. Appendix-12 Construction Investment in China (Unit: RMB 100Million)

(Source: compiled based on data of "China Statistical Yearbook 2003")

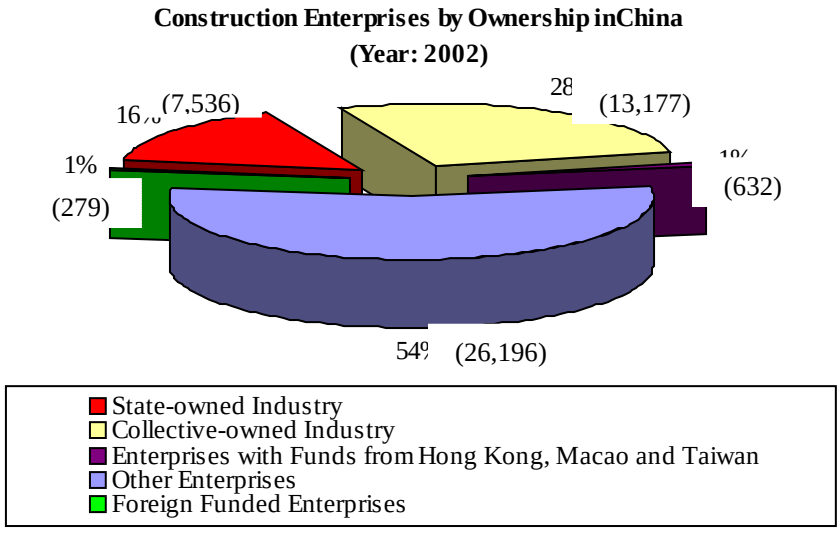


Fig. Appendix-13 Construction Enterprises by Ownership in China

(Source: compiled based on data of "China Statistical Yearbook 2003")

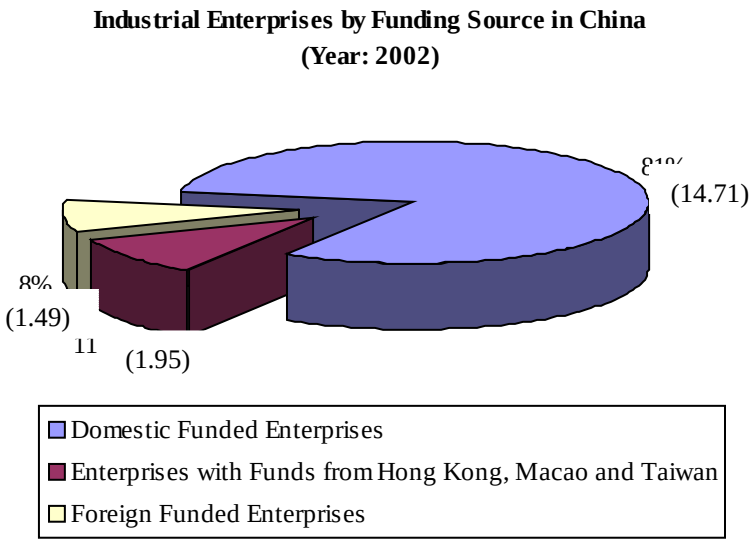


Fig. Appendix-14 Industrial Enterprises by Funding Source in China (Unit: 10,000 Units)

(Source: compiled based on data of "China Statistical Yearbook 2003")

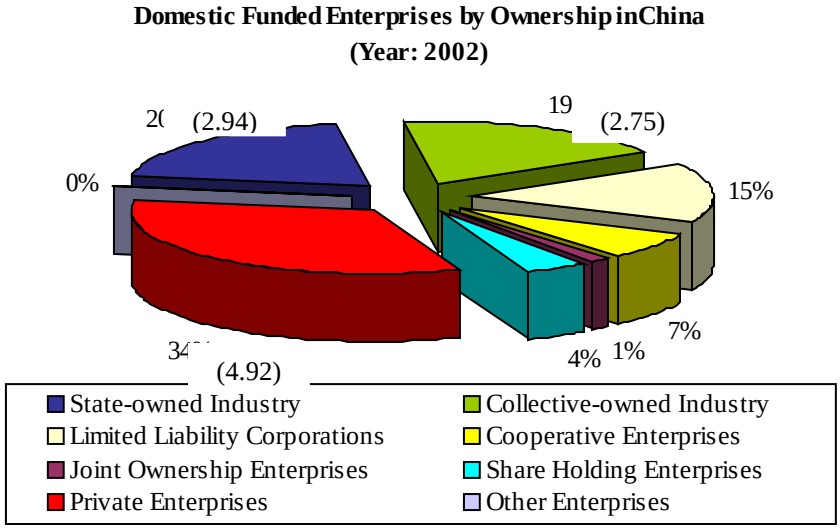


Fig. Appendix-15 Domestic Funded Enterprises by Ownership in China

(Unit: 10,000 Units)

(Source: compiled based on data of "China Statistical Yearbook 2003")

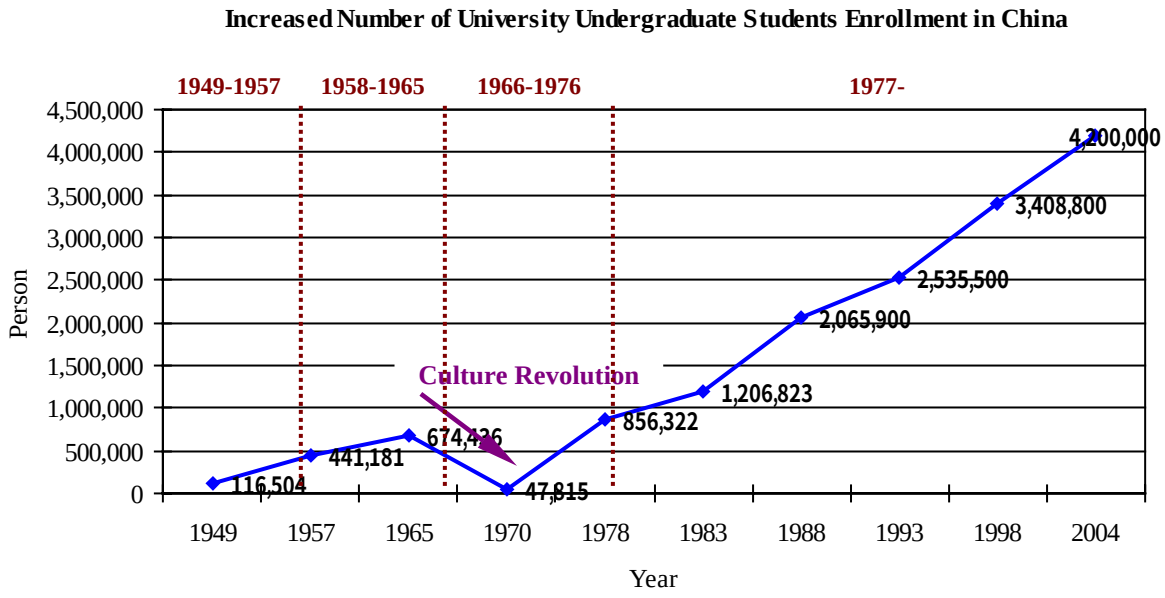


Fig. Appendix-16 Increased Number of University Undergraduate Students Enrollment in China

(Source: compiled based on data of "China Review")

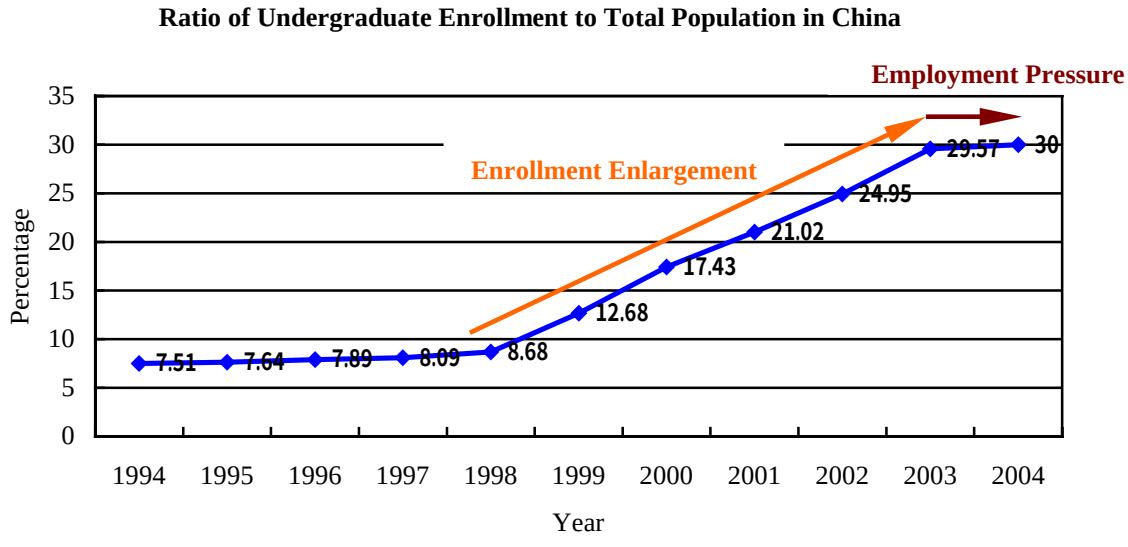


Fig. Appendix-17 Development of Undergraduate Enrollment to Total Population in China (Unit: Per 10,000)

(Source: compiled based on data of "zhongsou.com")

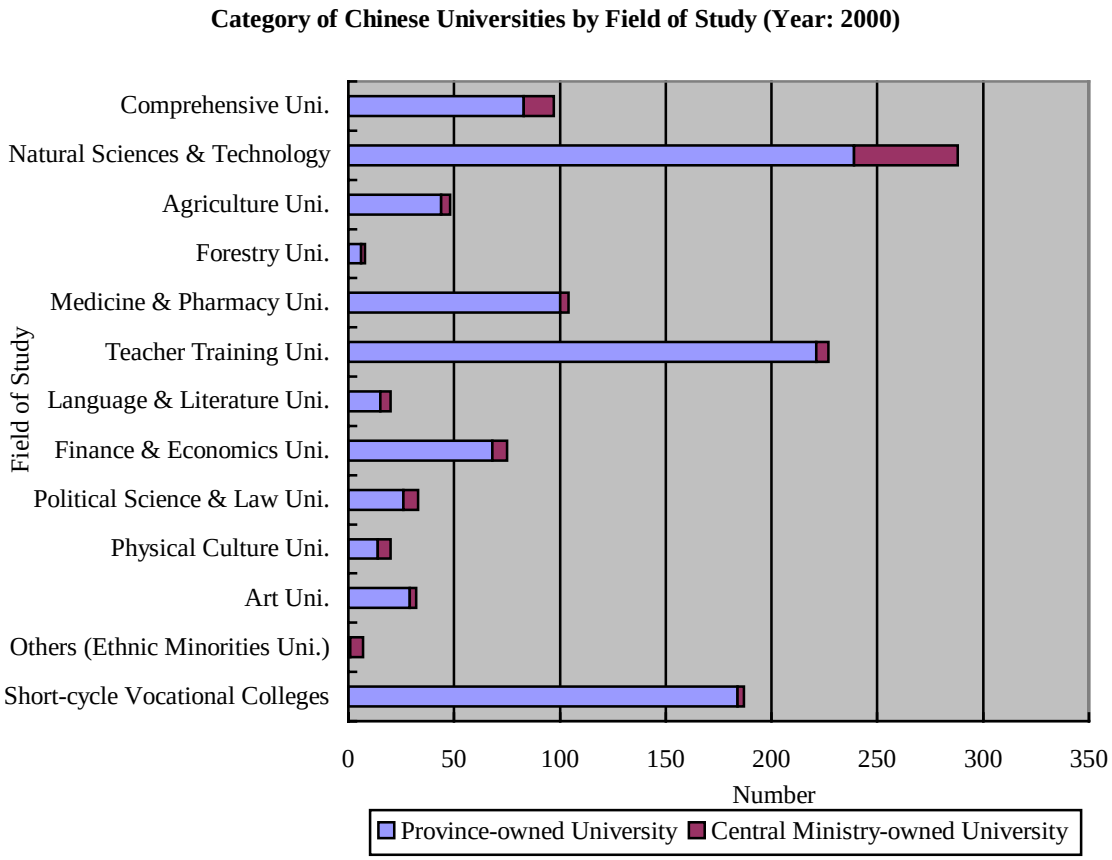


Fig. Appendix-18 Category of Chinese Universities by Field of Study

(Source: compiled base on data of "China Education and Research Network")

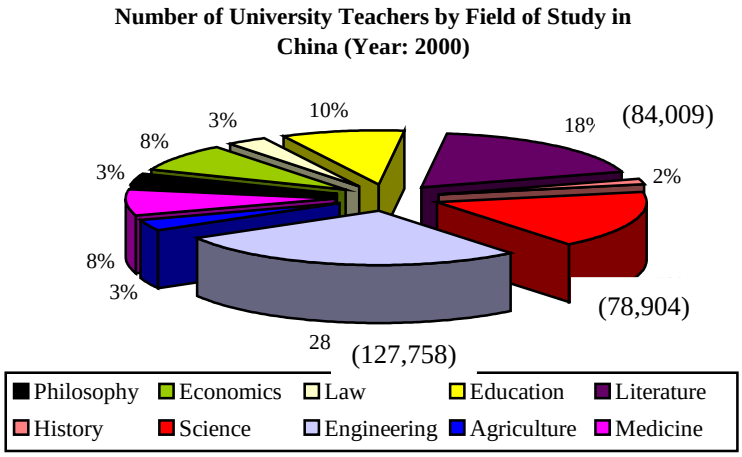
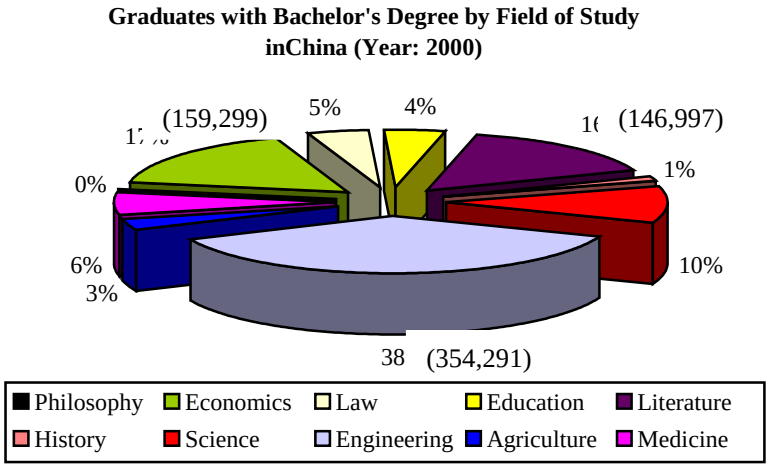
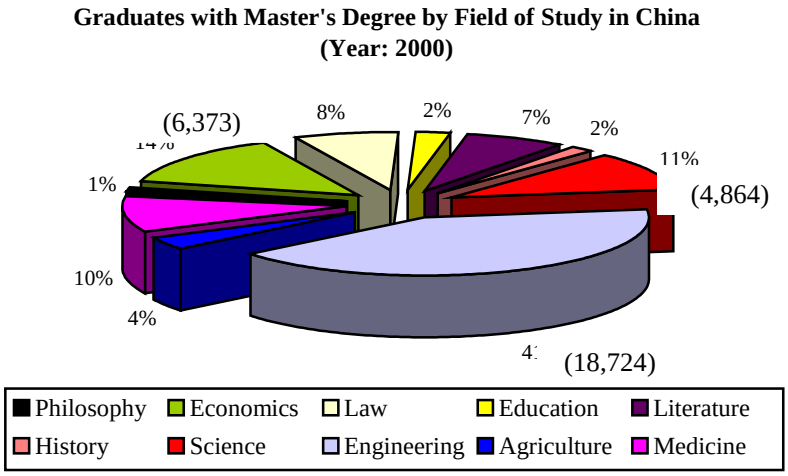


Fig. Appendix-19 Number of Full-time Teachers by Field of Study in Chinese Universities

(Source: compiled base on data of 'China Education and Research Network')





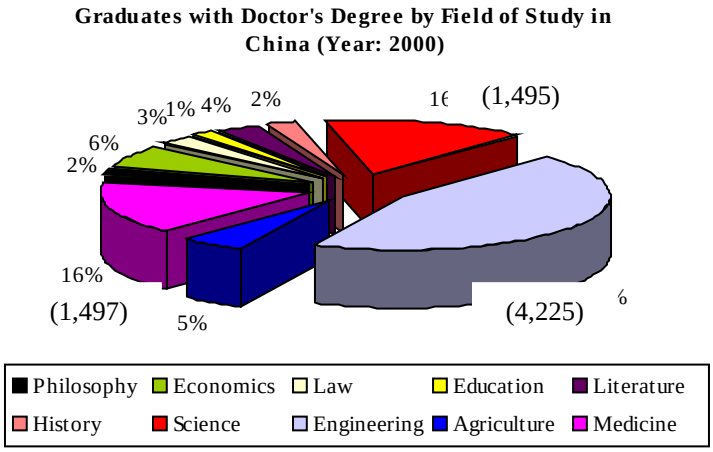


Fig. Appendix-20 Graduates with Bachelor, Master, Doctor's Degree by Field of Study in China

(Source: compiled base on data of "China Education and Research Network")

Table Appendix-4 University-run Enterprises of Beijing University in China (Year: 2004)

Enterprises	Business Contents
Founder Group	IT High-tech (e.g. software, network)
Beida Jade Bird Group	IT High-tech (e.g. software, network)
Pulead Technology Industry Co. Ltd	High-tech (e.g. anode and cathode materials for lithium battery)
Peking University Resource Group	High-tech (e.g. high-tech products)
Beijing WEL Peking University Biotech Co. Ltd	Natural Medicine & Modern Chinese Medicine
China Bioway Biotech Group	Bio-tech (Biological Medicines)
Peking University High-tech Co. Ltd	Biotech (Biological Medicines)
Peking University Science Park	Science Park
Beida Online	Internet
Beijing University Internal Hospital	Hospital
Peking University International Hospital	Hospital
Resource Hotel	Hotel

(Source: compiled based on data of “Beijing University Homepage”)

Table Appendix-5 General Statistics of Chosen Labor-Intensive Industry

Industry (in code number)	Total Production Profits	Total Capital	Doctor	Mater	Bachelor
12705774-1	8,923,550	16,299,886	10	10	11
71841755-0	60,000	59,191	0	0	49
62570681-2	164,560	361,839	0	1	160
12802473-0	762,751	2,041,982	0	2	1,402
12808324-7	124,315	167,770	0	2	198
70294981-9	15,063	15,115	0	0	15
74417699-X	22,610	38,042	0	0	88
75632584-1	5,200	10,526	0	0	8
71845020-3	7,000	13,043	0	0	8
74415085-3	5,616	4,029	0	0	8
12706766-7	12,585	21,150	0	0	12
74416031-6	16,905	30,957	0	0	25
12704969-6	281	767	0	0	4
12704774-6	76,338	52,258	0	0	50
74417077-4	17,000	11,518	0	1	5
72368027-3	8,493	6,495	0	0	7
12817920-6	5,085	6,157	0	2	2
74419882-2	180	440	0	1	4
73461864-3	1,078	6,945	1	0	4
71842662-5	154	5,663	0	1	18
12802606-6	1,041	4,732	0	1	14
73138726-1	6,196	6,015	0	0	16
72773170-1	23,430	24,665	0	0	32
42400791-9	11,956	85,409	1	29	197
71204697-1	89,320	24,169	0	5	75
71840348-2	199,000	73,354	0	5	82
52268170-4	1,278	1,030	0	0	4
73461104-6	1,973	1,244	0	0	7
73860876-8	3,250	10,062	0	1	17
72772029-5	8,651	8,559	0	1	13
73134297-9	935	4,234	0	0	9
74417656-x	4,294	5,262	0	2	8
74416218-4	853	1,104	0	2	4
76315930-0	3	430	0	3	8
42412718-7	85	0	0	0	4
72773858-3	6,974	2,760	2	2	5
60610413-8	12,764	22,541	0	1	13
71667421-1	33,776	20,308	0	0	13

73694238-3	853	1,925	2	2	6
71666336-0	670	2,710	0	1	71
60633905-X	896	5,156	0	1	8
74444170-6	12,749	11,930	0	0	11
12933309-2	1,000	13,704	0	0	15
71106753-5	2,100	2,632	0	0	3
73367362-4	172	352	0	0	8
70289191-X	6,102	16,622	0	0	5
75866723-9	18,602	4,974	1	1	13
73364497-0	4,000	5,201	0	0	8
12826721-4	37,800	34,640	1	3	18
71108883-8	743,858	622,823	0	0	584
70285447-3	443,920	472,272	0	1	309
12851256-6	2,236,725	5,588,426	6	24	2,418
12821246-7	13,160	28,050	0	0	18
12922265-9	61,000	97,097	0	0	38
75238290-2	28,400	20,000	0	0	49
70266413-5	35,890	25,680	0	0	12
12977352-2	28,600	56,861	0	0	64
60653819-8	59,560	50,149	0	0	77
73966596-7	158,703	290,114	0	3	127
75530143-4	12,000	21,780	1	1	21
70281499-x	15,820	7,528	0	0	11
12704230-7	57,369	327,238	1	5	440
71846302-0	7,095	30,312	0	1	25
82728399-3	53,911	105,833	0	1	90
71209925-6	83,440	115,879	5	5	86
72771387-x	13,330	9,600	0	0	9
73862100-6	8,792	8,411	0	1	13
73138380-x	1,111	4,054	0	1	3
75633264-6	1,103	1,307	0	0	2
76316462-8	0	11,260	0	0	3

Table Appendix-6 General Statistics of Chosen Technology-Intensive Industry

Industry (in code number)	Total Production Profits	Total Capital	Doctor	Master	Bachelor
72772904-6	4,050	970	0	0	15
12802760-8	96,870	238,818	9	58	192
12802280-7	2,240,000	3,258,798	32	328	1,754
60611127-4	53,914	65,890	0	14	245
73460976-3	235	910	1	1	7
60716092-4	5,930	9,909	5	0	4
74415869-5	290	1,206	0	1	4

74950815-6	1,246	1,560	3	3	6
12808299-x	0	55,261	0	1	74
73135561-4	0	713	1	6	2
73864643-0	0	11,434	1	2	27
74953190-3	0	1,247	0	2	8
71845442-3	2,512	52,012	0	1	17
73864152-5	0	453	0	0	11
74418142-2	1,192	1,219	0	3	23
71845067-6	987	1,758	2	2	3
74953003-8	2,627	3,786	0	8	11
74417172-6	1,034	11,931	0	3	10
75630577-9	0	844	0	2	14
72367498-1	0	6,773	0	0	37
76316234-x	0	1,040	0	0	1
75533575-7	3,424	7,548	0	3	60
74952674-1	9,645	11,516	0	1	18
75631642-7	87	2,934	0	2	9
72772306-6	211	277	0	1	4
73134076-2	410	1,210	0	0	15
73135515-5	0	71	1	0	4
72367478-9	0	199	0	0	5
72367731-4	0	745	0	1	5
72773844-4	0	1,447	1	2	23
60717549-9	19	1,012	0	0	3
75632562-2	1,411	1,744	0	1	13
73459246-3	1,546	1,232	1	0	4
75634659-7	5,117	6,632	0	4	26
70285469-2	32,860	20,130	0	2	79
74418087-6	0	500	0	0	5
70284078-4	150	34,846	0	1	5
76318004-6	0	499	0	1	2
72770550-3	2,400	3,327	0	1	4
76316311-5	0	757	0	1	1
73368095-5	2	26,092	0	0	3
75633640-1	0	797	0	0	5
76316480-4	13	982	0	0	5
74419245-5	310	614	4	1	9
73462335-4	126	611	0	1	5
72772644-3	528	1,010	0	0	7
12808571-x	3,121	5,340	0	0	47
12817358-4	540	13,979	0	0	3
70284604-3	0	6,211	0	0	13
72368897-x	455	214	0	1	3

73134783-3	0	1,354	0	1	4
74950467-3	0	4,000	0	0	3
72369386-7	291	243	0	0	3
75631515-x	0	1,527	1	3	11
76318026-5	0	407	0	0	14
76905857-8	0	0	2	10	16
76318472-5	0	0	3	2	10
75630531-4	0	0	0	0	0
71847177-6	0	767	0	0	4
73864206-9	18	713	0	1	15
74967349-3	0	922	1	7	9
60633858-3	0	6,287	0	1	14
75238748-X	0	1,100	0	0	9
73368680-4	0	1,651	0	1	9
73367866-0	0	3,697	0	0	7
71108669-9	0	7,152	1	16	69
72689364-5	0	3,693	0	6	50
71667523-0	0	5,184	1	4	28
60655391-0	0	20,079	0	8	160
74969558-8	0	1,580	0	0	13
73125697-4	0	67,689	0	0	13
75534879-3	0	1,287	0	0	40
75532299-9	0	404	0	1	4
71108593-6	0	1,608	0	2	18
75534307-9	0	8,892	0	0	5
75531913-2	0	2,418	0	2	5
72365801-7	0	185	0	2	28
74418344-4	300	500	0	0	12
71847588-1	0	0	0	5	19
74417634-0	1,049	2,399	0	2	21
76317825-3	0	140	0	0	2
76315523-8	36	660	0	2	4
74417635-9	18,942	5,175	0	0	23
71843859-7	50	88,306	2	3	17

List of Published Papers

Published Journal Papers

Title		Author	
Regional Development Scheme in China Using the Functions of University		Chen GUO and Shunji KUSAYANAGI	
Journal	Vol.	Page	Published Date
JSCE Journal of Construction Management	12	369-376	Oct/2005
Title		Author	
New Movement of Provincial Universities Under the Concept of Regional Development Scheme in China		Chen GUO, Shunji KUSAYANAGI	
Magazine	Vol.	Page	Published Date
1st International Conference on Construction Engineering and Management		947-951	Oct/2005

Published Conference Papers

Title ：Evaluation for Large-scale Construction Projects in China
Author：Guo Chen and Shunji KUSAYANAGI
Name of Conference：The Ninth East Asia-Pacific Conference on Structural Engineering and Construction（Venue：Bali, Indonesia） Published Date: 16-18 December/2003

Title ：Social Environment Evaluation of Three Gorges Project in China
Author：Guo Chen and Shunji KUSAYANAGI
Name of Conference： JSCE Conference on Construction & Project Management
(Venue：**高知工科大学**, Japan) Published Date: 15 May/2004

Title ：The Functions of University in Today's Economic Development of China
Author：Chen Guo and Shunji KUSAYANAGI
Name of Conference：The Sixth JSCE International Symposium on Construction & Project Management（Venue：Saitama Univ., Japan） Published Date: 31 Jul/2004

Title ：New Movement of Provincial Universities Under the Concept of Regional Development Scheme in China
Author：Chen GUO and Shunji KUSAYANAGI
学会名称：The 3rd Civil Engineering Conference in The Asia (Young Engineer Session)
(Venue：Seoul, Korea) Published Date: August/2004

Title ：An Innovation System in China: University-Run Enterprise
Author：Chen GUO and Shunji KUSAYANAGI
Name of Conference：The Seventh JSCE International Symposium on Construction & Project Management（Venue：Waseda Univ., Japan） Published Date: 30 Jul/2005

Acknowledgement

First of all, I give my appreciation to my advisor Professor KUSAYANAGI Shunji for his continuous support in the three-year Ph.D. program. Professor KUSAYANAGI not only gave advice to my research, but also taught me how to be a useful human resource to the society. He showed me ways to approach research problems and need to be persistent to accomplish my goal. He is most responsible for guiding me complete the writing of this dissertation as well as the challenging research that lies behind it. He taught me how to write academic papers, made me a better performance and had confidence in my defense presentation. My adviser always reminds me that my research should be useful and serve good purposes for all mankind. His sentence of "Knowledge and wisdom are both the essentials for the qualification of a Ph.D. candidate" always kept in my mind.

Secondly, I thank the other four professors who as my vice advisers guided my study. Prof. NASU Seigo taught me how to develop my research model. Prof. KANO Gota helped me to structure the analysis of Industry part in my research. Prof. MURAKAMI Masahiro advised me how to make clear about my research objectives and conclusions in my paper. Prof. TERABE Shintaro used his questions to make sure my research contents. These professors' knowledge, scientific theory and practical experience helped me to fulfill my Ph.D. dissertation finally.

Thirdly, thanks also to Mr. KATSUMATA Rikuo, who gave me many useful lectures regarding my research model and dedicated his precious time for all my complicated records. Other two teachers Mr. Kris R. Nielsen and Mrs. Patricia D. Galloway, they talked about my ideas and marked up my papers.

Last but not least, I want to say "Thank you very much" to my family members. My parents Mr. GUO Dongliang and Mrs. FU Cuiqin for giving me life in the first place, for educating me with aspects from both arts and sciences, for unconditional support and encouragement to pursue my interests. My younger sister Ms. GUO Lin for sharing my experience of life, for listening to my complaints and frustrations. Although they are living in China, they always care about my life and study in Japan during the past three years. Especially thank to my husband Mr. ZHENG Xiaoming, who quit his job in China and came to Japan in order to support me finishing the degree. Without his encouragement and constant support, I could not have finished my Ph.D. degree. My husband's "believing in me" is the inspiration for achieving my life targets.