NATIONAL MINORITIES AND ECONOMIC DEVELOPMENT

IN POST-REFORM CHINA

by

GEORGE N. SHARIK

(Under the Direction of Dr. Chor-Pang Lo)

ABSTRACT

Within the borders of The People's Republic of China (PRC) are 55 officially recognized ethnic minority groups. While attempting to modernize and encourage economic development, the government of the PRC has faced many obstacles. This has resulted in hugely uneven levels of economic development across the differing regions of the PRC. The various ethnic minorities are concentrated in the periphery of China and are significantly less developed than the core. The goal of this study is to examine some of the measures of development to determine which factors are involved in regional inequality and to suggest how these differences may be influenced by economic, geographical, or other factors outside of current government policy. The analysis utilized various measures of equality, including the development of an index of inequality for measuring the distribution of various factors. Panel data analysis and focus on four representative minority provinces provided further opportunities for evaluation.

INDEX WORDS: China, Minorities, Regional Development, Inequality Index

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DEDICATION

This work is dedicated to the memory of Jasmine Zhang:

> And don't look for me in a human shape.
> I am inside your looking. No room
> for form with love this strong.
>
> Beat the drum and let the poets speak.
> This is a day of purification for those who
> are already mature and initiated into what love is.

— Maulana Jalal al-Din Rumi,
as translated by Coleman Barks
(The Essential Rumi, 1995. HarperSanFrancisco, page 138).

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I wish to remember here my group of international friends at Morehead State University during the enchanting time that we shared each other's cultures and personalities. Among these many friends were Cem & Yildiz, Apolo, Ragin, Chee, Jet, Samantha, Lubya & Mya, Angela & Mohammed, and Haldun & Özlem. All of you are sorely missed!

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Om namo Bhagavata Vasudevaya.

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CHAPTER 1

INTRODUCTION

The People's Republic of China (PRC) is a multinational state of approximately 1.2 billion people. At 96% of the population, the Han ethnic group comprises the majority of the population. Within the borders of this huge country are 55 officially recognized ethnic minority groups. Some of these minorities number in the thousands while other groups include millions of people. This phenomenon is further complicated by the fact that the distribution of these ethnic groups is usually in the peripheral areas of the PRC where they are often isolated in relatively concentrated communities.

Historically, these peoples have often been violently repressed. Promising a political system that would "conform with the highest interests and enjoy the support of the overwhelming majority of the people," Mao Zadong established a government pledging to correct past wrongs (Foreign Languages Press, 1966). In bringing the present era of Chinese government to fruition, the founding members of the Communist movement found willing allies in the various ethnic groups.

Many of these unique groups have demanded the right to retain their own cultural identities and political self-determination. As a result, Beijing has found distinctive solutions to some of these demands in creating various levels of autonomy.

The Purpose of this Study

While attempting to modernize and encourage economic development, the government of the PRC has faced many obstacles. This has resulted in uneven levels of socio-economic development between regions and between urban and rural populations. Because areal inequities exist, the question arises if such inequities impact the minorities in China. If so, are the minorities groups impacted by inequity more so than the majority Han population? The goal of this study is to examine some of the available measures of development to determine in what way these differences in development exist and to suggest how these differences may be influenced by such geographical factors as location, current development, natural resources, and strategic importance. We shall also attempt to track the effect of economic reforms of 1979 on the minority populations of the Peoples' Republic of China.

The major hypothesis of this study is whether the economic reforms begun in 1979 have significantly contributed to the development of minorities in China. Given that we accept this hypothesis, we also posit that educational levels of minorities have improved, investments in infrastructure have contributed to economic development, and other measures of development, such as life expectancy and literacy, have also improved. We shall also examine four minority provinces perceived to be representative of two differing minority regions and likely experiencing divergent processes of development. Given a relatively positive outcome, we shall also attempt to construct a model of development for the minority provinces of the PRC.

As part of this enquiry, this thesis shall explore the origination of minority ethnicity within the borders of the PRC. Since the majority of ethnic minorities exist on the periphery of the cultural hearth of the Han population, we shall examine those environmental factors that may have helped to define ethnic identity. This will be followed by an economic history of the PRC followed by analysis and discussion of the various measures currently available for determining levels of human development for the examined regions of minority concentrations. This thesis will then close with the conclusions of this study and suggested explanations for the observed results.

CHAPTER 2

FORMATION OF THE ETHNIC MINORITIES

Formation of the Earliest Ethnic Groups

The history of China has been largely cyclical. These cycles of stability and chaos have given rise to the Dynastic Cycle theory of Chinese development (Dillon, 1998, 87). According to this explanation, each dynasty fell as a result of excessive exploitation of the peasantry once the people were denied food sufficient for survival. Yet, rarely have these periods of chaos and rebellion been the result of the failure of Chinese agriculture. On the contrary, with few exceptions, agricultural production has been adequate to feed the relatively large populations throughout the history of China.[1] So faithful has this observation proven that an alternate explanation eventually arose to compete with the popular Dynastic Cycle theory. Ch'iao-Ting Chi (1963) developed the Key Economic Area theory by observing that development occurred in certain key areas in China (more often through great public works for water-control) and this development eventually spread to surrounding regions. The foundation for these economic areas was cultivation. Water control provided a steady source for irrigation and an improved transport for goods through a growing network of canals. Once the food supply was stable, economic specialization and the development of Chinese culture were possible.

Eventually, surrounding regions were incorporated into Chinese society and governmental authority grew geographically.

According to the classic text by K. C. Chang (1976), the Loess Plateau at the confluence of three great rivers, Huanghe (Yellow River), Fenhe, and Weihe, gave birth to the first agriculture in China. The period from 6000-1000 BCE was the "warmest and wettest in the last 18,000 years" (Keightley, 1999, 33). The combination of environmental factors created what Chang termed the "climatic optimum" in which cultivation could develop (Chang, K. C., 1976, 25). It is largely believed that agriculture arose in China independently of the other Neolithic civilizations (Ho, 1975, 87-89).

Agriculture in China began approximately 5000 years BCE, probably through the use of swidden, or slash-and-burn techniques. In studying the paleo-environment through the fossil record and early written records, it is possible to trace the beginnings of the earliest "proto-Chinese" agriculture (Figure 2.1). Cultivation by the earlier Yangshao people (5000-3200 BCE) was achieved without the use of flood plains or irrigation characteristic of Nile, Indus River, and Mesopotamian agricultural practice. The innovations found throughout the history of Lungshanoid agriculture (3200-1850 BCE) provided the peoples of early China with an ever-increasing food sufficiency. Lungshanoid agriculture was conducted along the tributaries of the Huanghe (Yellow River) sufficiently high enough from the rivers as to protect them from floods, where the first village communities of farmers appeared (Ho, 1975, 54). As technology and understanding increased, more efficient means of cultivation

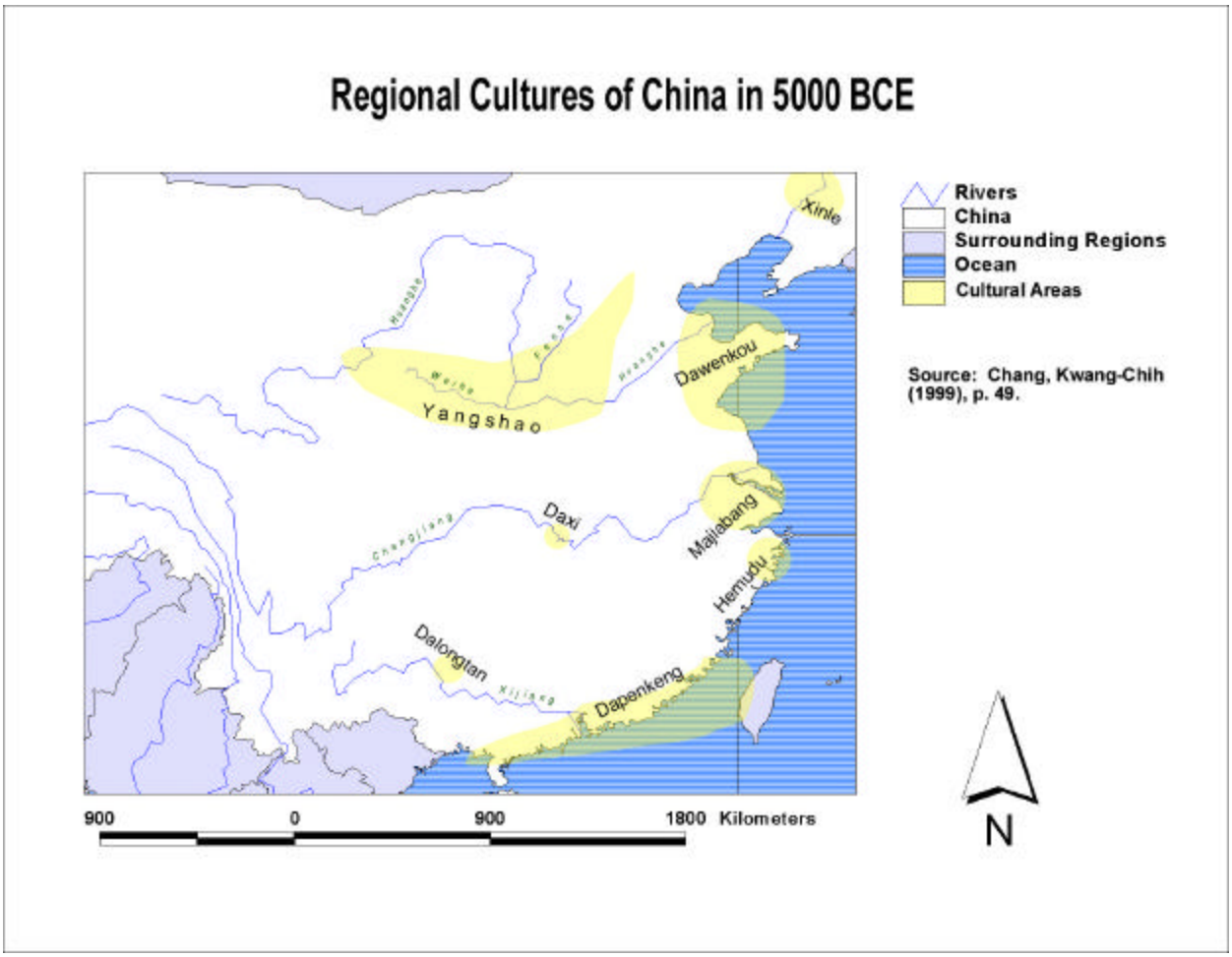


Figure 2.1. The earliest regional cultures centered around the development of agriculture in Neolithic China.

and a larger number of species were domesticated. The advance in technology allowed for the growth of population and permanent settlement in north China. Other early regional cultures such as the Xinle (7000-5000 BCE) on the northeast plain and the Dapenkeng (5000-2500 BCE) along the southern coast may have also independently initiated agriculture, contrary to the previously accepted theory of diffusion from the loess region (Chang, Kwang-Chih, 1999, 52-59). Later public works projects in water-control further expanded the cultural influence and ascendancy of the key economic areas (Chi, 1963, 35). Often, water control projects provided an economic means of stabilizing and incorporating adjacent territory under early Chinese administration (*Ibid*, 99-107).

Ethnicity probably developed along with agricultural development, leading to the first ancient ethnic groups. Of these, the Xia, Shang, and Zhou were homelands of the differing peoples that eventually ruled as the earliest dynasties. The Zhou were known collectively as *Xia* and possibly also known as *Hua*. During the Spring and Autumn period (770-481 BCE), *Hua-Xia* came to be used as a term for the "cultivated" peoples of these areas (Wilkinson, 2000, 95). Those living outside of these areas were considered barbarians (Figure 2.2).

The early Chinese States Period (2206-403 BCE) saw the development of the Hua-Xia ethnic core, with three sub centers in the loess plateau, North China Plain, the middle and lower Yangtze River, and the northern Southeastern Coast. From the Spring and Autumn Period to the Southern and

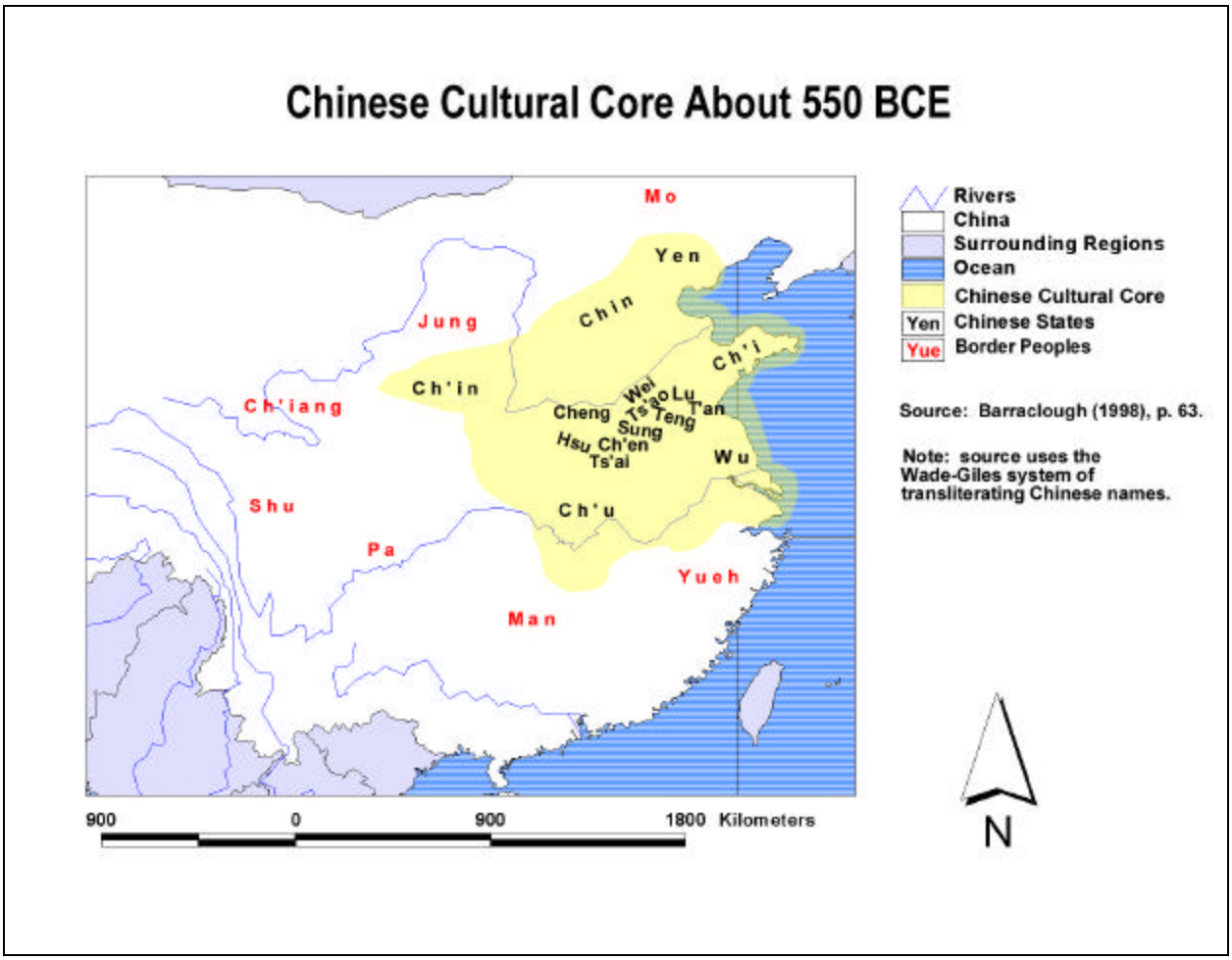


Figure 2.2. The early Chinese States period saw the development of Chinese and other cultural identities.

Northern Dynasties (403 BCE–589 CE), the Hua-Xia cultural identity developed as agriculture and commerce continued to develop. North of the Great Wall, various nomadic tribes were widely distributed. During the Qin dynasty, many of these tribes were assimilated and many Han migrated south (Zhao, 1992).

In the period from 589 to 1279, the Han became largely unified while some Turkic groups intermingled with the Han populations within the boundaries of the Great Wall. Later, general societal breakdown led to the continued development of ethnic groups such as the Mongols, Tibetans, Hui, and Jin (ancestors of the Manchu). The Yuan Dynasty (1279-1369) marked the first period of dominance by a minority people (Mongols) (Zhao, 1992). The last dynasty, the Qing Dynasty (1644-1911), was minority rule by the Manchu.

The Ethnic Groups of Modern China

Currently, the government of the PRC officially recognizes 55 minority groups. In addition to the officially recognized groups, there are a number of other minorities desiring recognition and the benefits that such recognition brings (Lemoine, 1989). Known in Chinese as “min-zu”, these nationalities must have its own language and reside historically and presently in a territory sharing a common heritage and identity (Wu, 1989). Major modern ethnic groups (Figure 2.3) include the Zhuang, the largest ethnic group in China (population was 15,555,820 in 1990[2]) with a core region in Guangxi Zhuang Autonomous Region. The Zhuang are descendants of the ancient Yue (Zhao, 1992) and are now nearly assimilated with the Han. Another major ethnic group include Manchu (population 9,846,776 in 1990) whose core region is

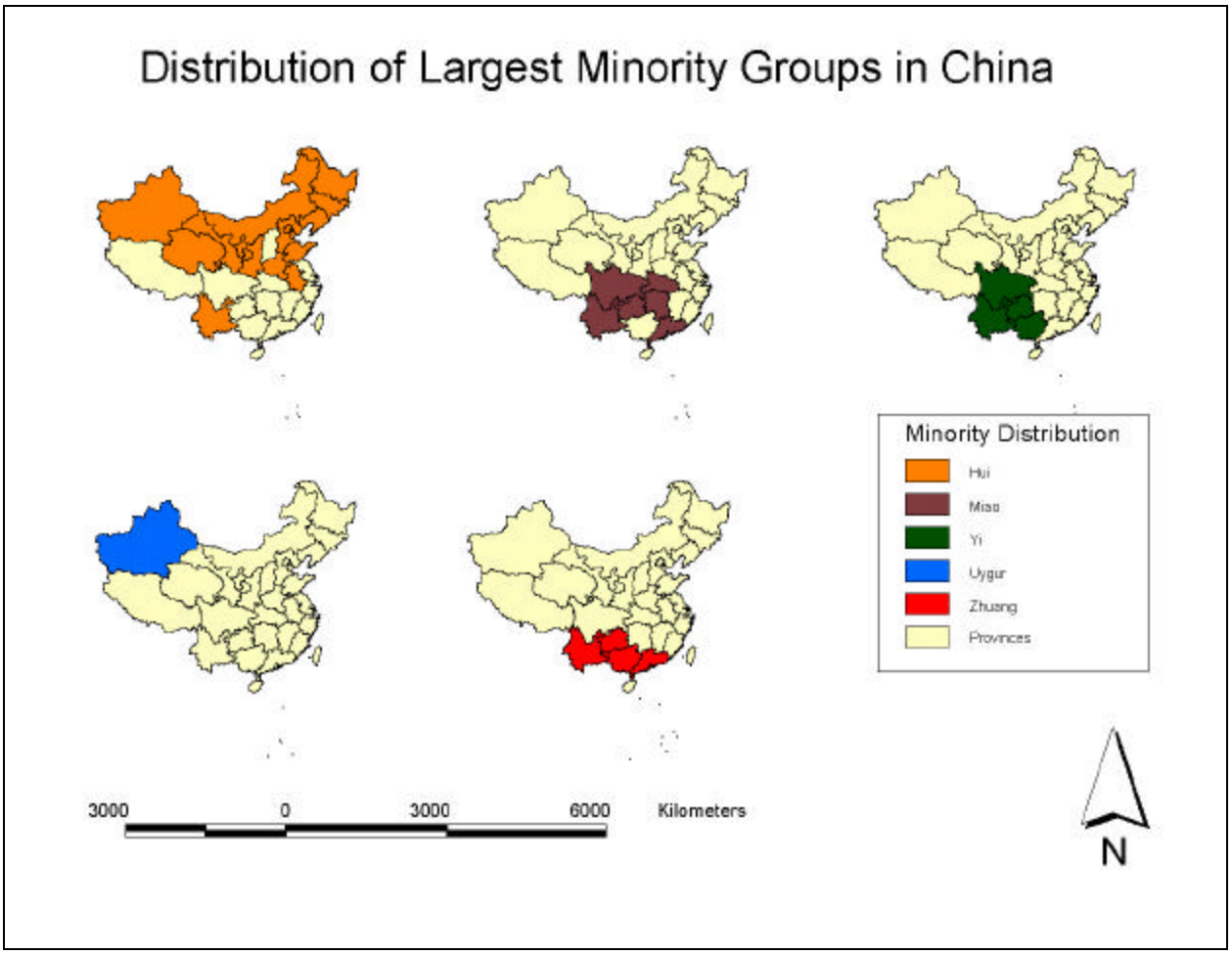


Figure 2.3. Except for the Hui, distributions of the five largest minority groups are concentrated either in Xinjiang (Western China) or in the provinces of Southwestern China.

northeastern China and is the second largest ethnic minority. The Manchu were the final imperial rulers, during period of the Qing dynasty (1644-1911 CE). Descendants of the Qing aristocrats and soldiers, were scattered throughout China. They are now in a state of near total assimilation and face few, if any, of the issues to be considered in this paper. The Hui (population 8,612,001), whose core region is in the Ningxia Hui Autonomous Region, is the third largest ethnic minority in China. They have adopted Chinese language and culture but maintain Muslim customs. The Miao (population 7,383,622) are the fourth largest ethnic minority, originally from central China (according to tradition) but are now found scattered across hills of Guizhou, Yunnan, Hunan, and Indochina (China Statistics Press, 2000[3]). The Uygur (population 7,207,024) are the leading ethnic group of Xinjiang Uygur Autonomous Region and are the fifth largest ethnic group in China. The Uygur are descendents of Turkic peoples, keeping their own languages and Muslim customs. The Yi (population 6,578,524) are sixth largest minority and are centered in Liangshan Yi Autonomous Prefecture (Sichuan province) and in the borderlands between Sichuan, Yunnan, and Guizhou provinces.

Other important minorities include the Zang (or Tibetans, population 4,593,072), the Mongols (4,802,407), the Tujia (5,725,049), the Bouyei (2,548,294) and others too numerous to mention in this present study. The map provided above in figure 2.3 indicates the general locations of the largest of these minorities.

In considering the relationships between the land and the people

inhabiting the land, it behooves us to consider what regional geographers may call natural realms. Eastern monsoon China occupies 45% of China's area, 89% farmland, and contains 95% of the total population. Northwest China consists of the Eurasian desert and grassland in its eastern section. It comprises 30% of China's area, 10% of its farmland, and 4% of the population. The Tibetan Plateau is the highest and largest plateau of China, occupying 25% of it's area and less than 1% of farmland and population.

Many writers have considered the effect of the environment on shaping the people and species inhabiting a particular area. In fact, it seemed inevitable in the thinking of a century ago that environment and evolution would act in cooperation to produce both inferior and superior races (Livingstone, 1992). Ellen Churchill Semple, a disciple of Ratzel, opened one of her books with the statement, "man is the product of the earth's surface" (Johnston, 1997). While environmental determinism was once a highly regarded ideology with incalculable consequences for modern history, the actual relationships between people and environment seems far more complex.

While environment has had some effect on the peoples of a region, people also shape the landscape. Wagner & Mikesell (1962) discuss the difficulty in defining cultural areas by degrees of cultural homogeneity. Rather, they suggest that the use of cultural landscape would be an effective means for classifying cultures. Examination of cultural artifacts as religion, technology, and linguistic communities may serve to indicate an areal distribution of specific cultures. Such distributions may define cultural landscapes that may,

in turn, constitute regions. In so doing, cultural geographers select differences in features between various landscapes for study. While Wagner & Mikesell state that the study of the physical geography of specific cultural landscapes is important, they reject environmental determinism as a major influence in cultural development. Rather, the physical environment serves as an indicator of the influence of humankind and humanity's requisite culture upon the environment.

A more recent examination of cultural geography includes a far broader examination of the factors involved in the relationships between humanity and the environment. Norton (2000) incorporates social construction, historical context, and perspectives borrowed from other disciplines such as ecology, behavior, and anthropology. Such a holistic approach is indeed indicated when considering the development and continued existence of minorities within a larger culture. Minorities within mainland China have both benefited as well as suffered as a result their positions on the periphery. A further examination of their current socio-economic development may yield greater insight into their continuing survival.

CHAPTER 3

AREAS OF FOCUS CONSIDERED FOR THIS PROJECT

The Ethnic Areas Considered

Due to the innovation of agriculture early in the history of China, minorities developed on the periphery of ethnically Han China. Early agriculture could not spread to the periphery due to climatic or other restricting conditions. Thus, agriculture became the division separating the Han from their neighbors. This reality is clearly seen even today on a map of minority percentages of the provinces (Figure 3.1). Minorities in China exist in a wide range of conditions and circumstances. To facilitate comparison of these differing realities, this review will concentrate on two representative areas of high minority concentrations: Guizhou, Guangxi, and Yunnan in the southwest, and Xinjiang in western China (Figure 3.2).

Not only are these two areas in differing geographic locations, but each of these regions in China represent what are likely to be differing developmental processes and histories. Although both regions possess unique cultures and identifications, both regions seem to relate differently to the current government and the Han majority. This study attempts to compare and contrast these differences in an attempt to understand how the socio-economic geographic processes in these two regions have contributed to their current standings as minority regions.

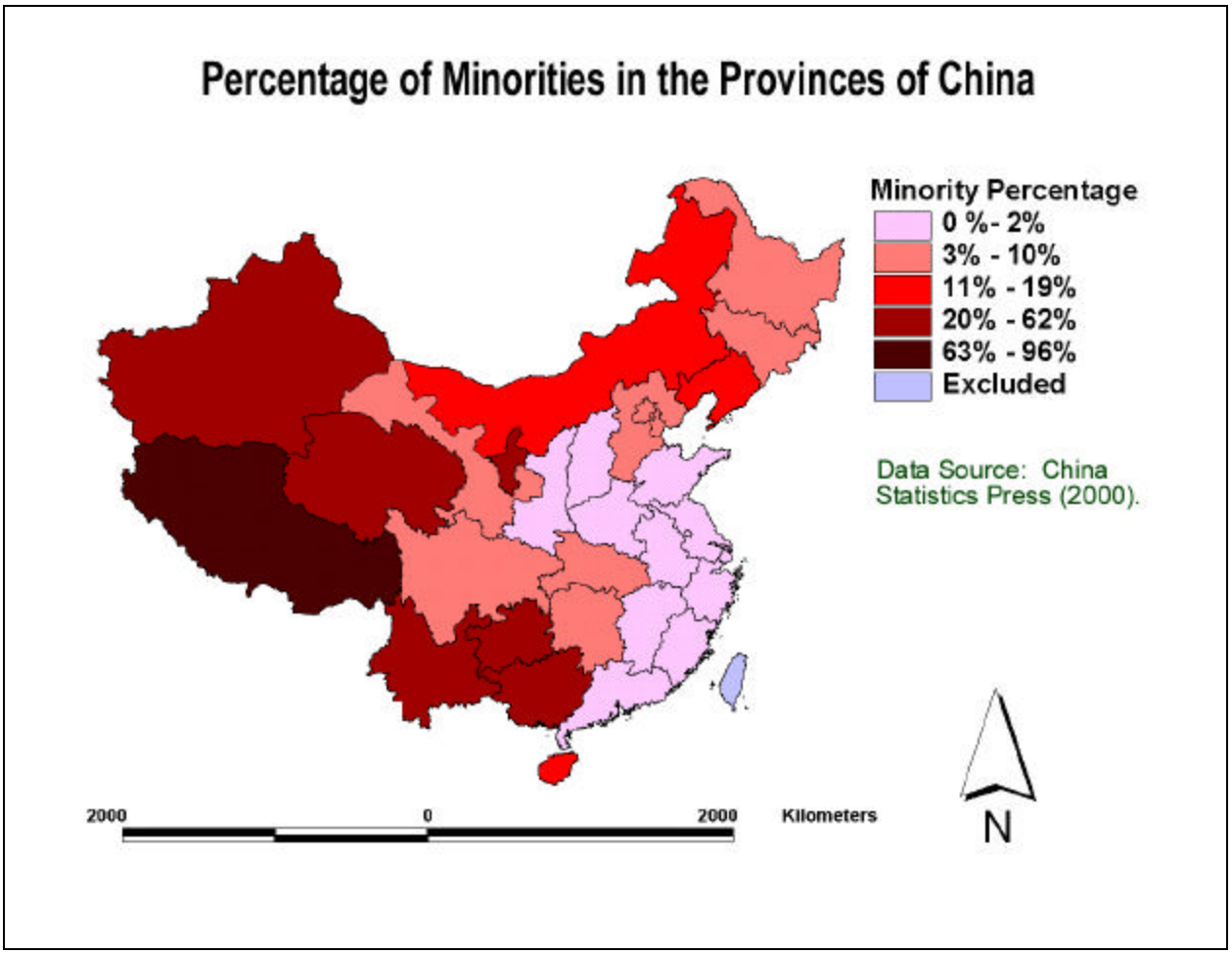


Figure 3.1. This map of modern China illustrates the geographic distribution of the ethnic minorities. Note that most of the region with the lowest percentages represent the historical regional core of the Han majority.

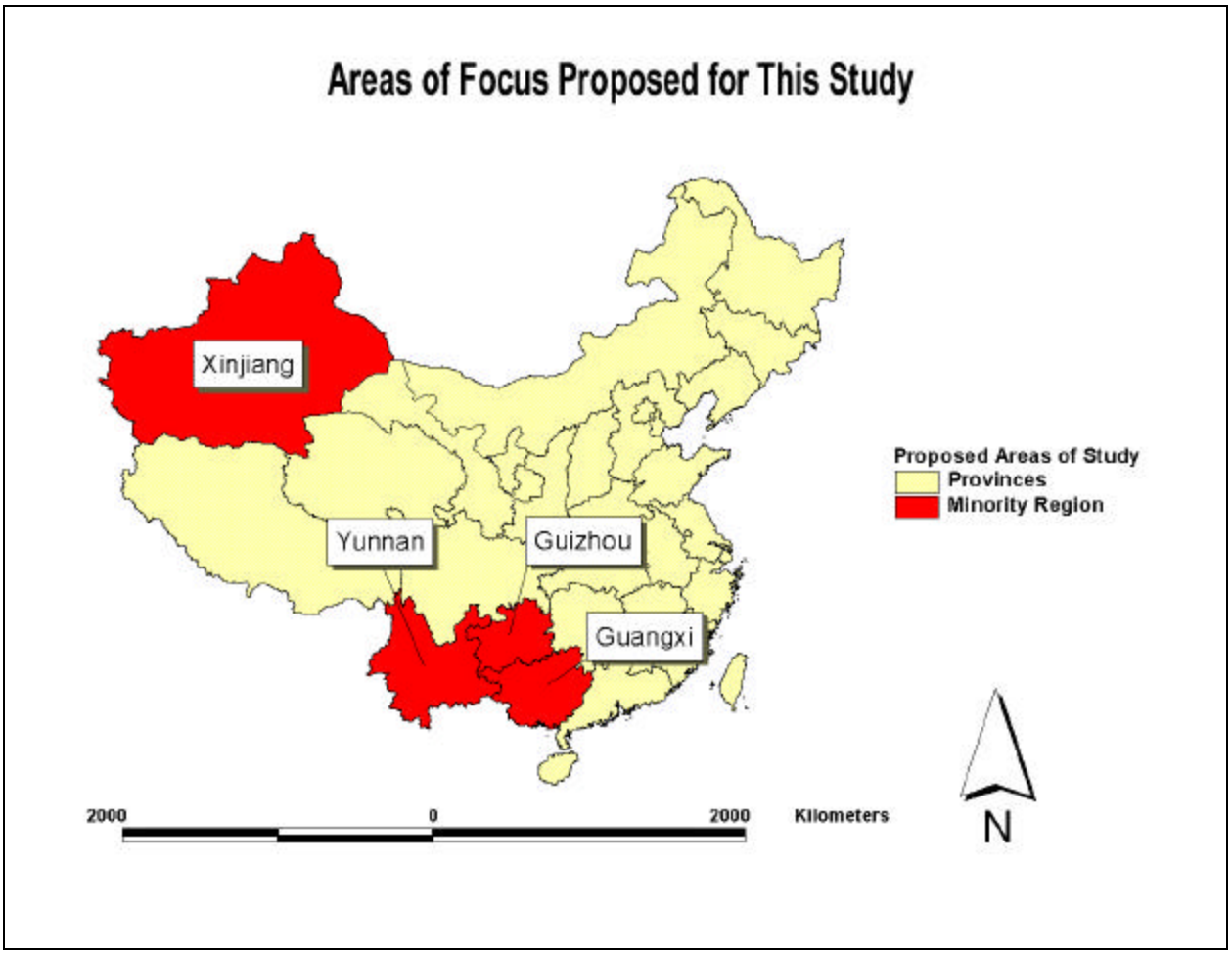


Figure 3.2. This map presents the two representative regions proposed for this study.

The Exclusion of Tibet from this Study

A discussion on the conditions of the minorities of China cannot exclude the current state of affairs in the Tibetan Autonomous Region of the PRC. The abundance of publicity concerning the occupation and suppression of the traditional Tibetan government and culture has likely lead to the distortion of facts on both sides of the issue. The government of the People's Republic of China has insisted that their occupation of Tibet in 1951 was a "peaceful liberation" from an oppressive theocracy and serfdom (China Internet Information Center, undated). Historical claims to Chinese sovereignty of Tibet reportedly date to the Yuan dynasty (1271-1368) (New Star Publishers, 2001) and the fourteenth Dalai Lama was supposed to have accepted a 17-Article Agreement acknowledging that "the Tibetan people shall return to the big family of the motherland—the People's Republic of China" (Gamrab, 1999, 4). This agreement was supposed to have not altered "the established political system in Tibet", creating an autonomous region within the PRC (*Ibid*, 5). The subsequent military occupation to ensure the "democratization" of Tibet was eventually opposed by "an armed rebellion" in March 1959, resulting in the dissolution of "the local government of Tibet" (*Ibid*, 15) and the exile of the 14th Dalai Lama. Tibetan exile groups including the Tibetan government-in-exile headed by His Holiness the Dalai Lama have referred to this Chinese occupation as "the military invasion of Tibet" and "The Chinese aggression" (The Office of Tibet, 1996). While the current regime insists that their efforts have brought about the protection of Tibetan population, culture, and relics

(Zhang, 1999), innumerable reports from various human rights organizations and Tibetan exile groups have refuted these claims.[4] The U.S. Department of State (1999) has continued to report on the abuse of human rights and political repression in Tibet while the European Parliament has soundly condemned current conditions in Tibet (European Parliament resolution on Tibet, 2000). It is likely that these opposing political perspectives have clouded objectivity and that the currently available data does not ultimately reflect the reality of life in this region. What is clear is that Tibet has changed considerably since the Chinese invasion of 1951 and that Tibetan society will continue to be transformed in the next few years. Because these difficulties are likely to yield questionable results and drag an otherwise lucid inquiry into an arena of considerable controversy, this writer has chosen not to focus on a detailed analysis of Tibet or to draw any inferences on Tibet in this quantitative study of ethnic minorities in the PRC.

Southwestern China: Guizhou, Guangxi, and Yunnan

Southwest China (Figure 3.3) can be divided into 2 major sections: Sichuan basin, closely associated with central China, and Yunnan-Guizhou Plateau which is most mountainous and least developed part of eastern monsoon China. Today, the provinces of southwestern China with the greatest number of minorities are Guizhou, Guangxi, and Yunnan. The unusually high number of minorities in these provinces is best seen in a map illustrating the distribution the standard deviations of province minority percentages (see Figure 3.4).

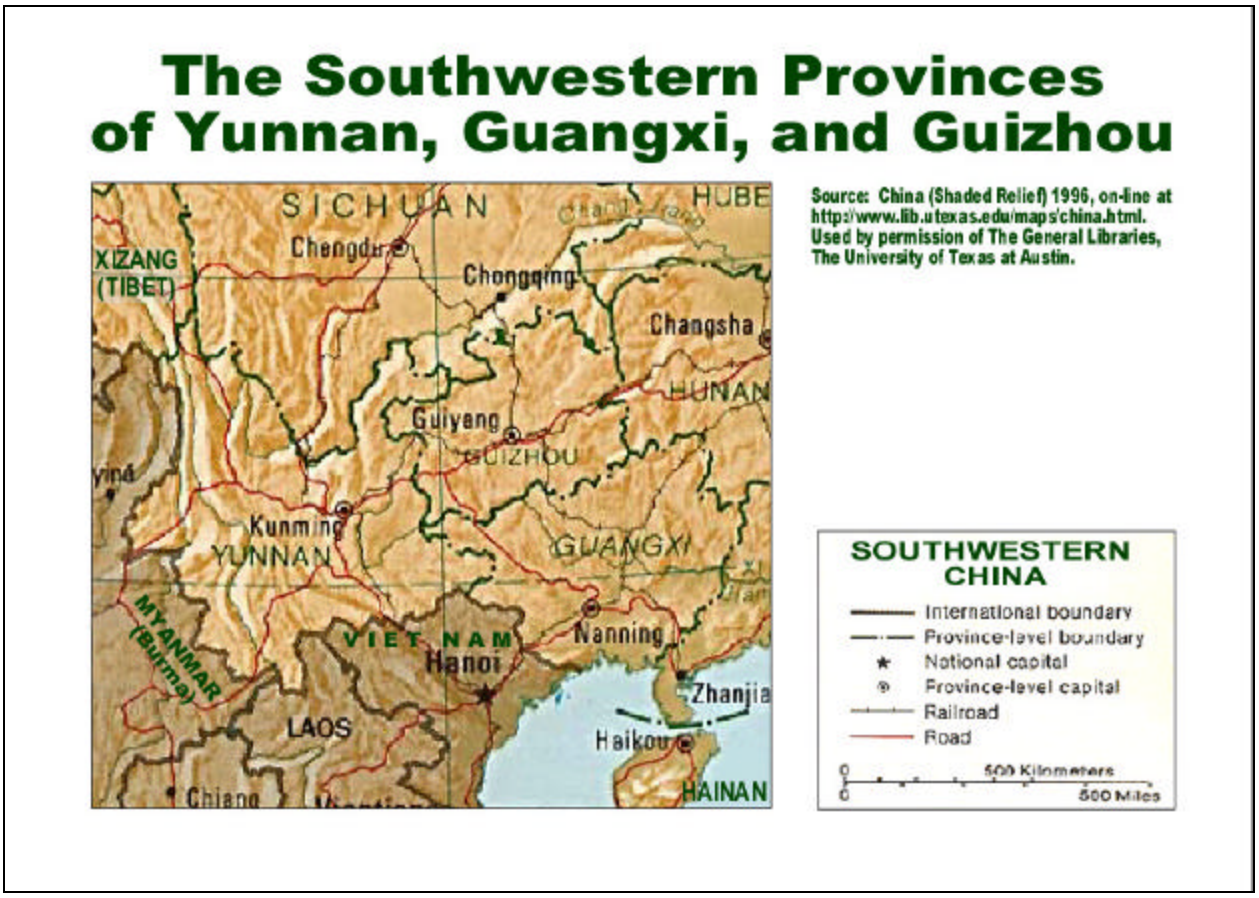


Figure 3.3. This map of the southwestern provinces of Guizhou, Guangxi and Yunnan demonstrates the isolation of the southwestern provinces of the PRC, both distally and topographically.

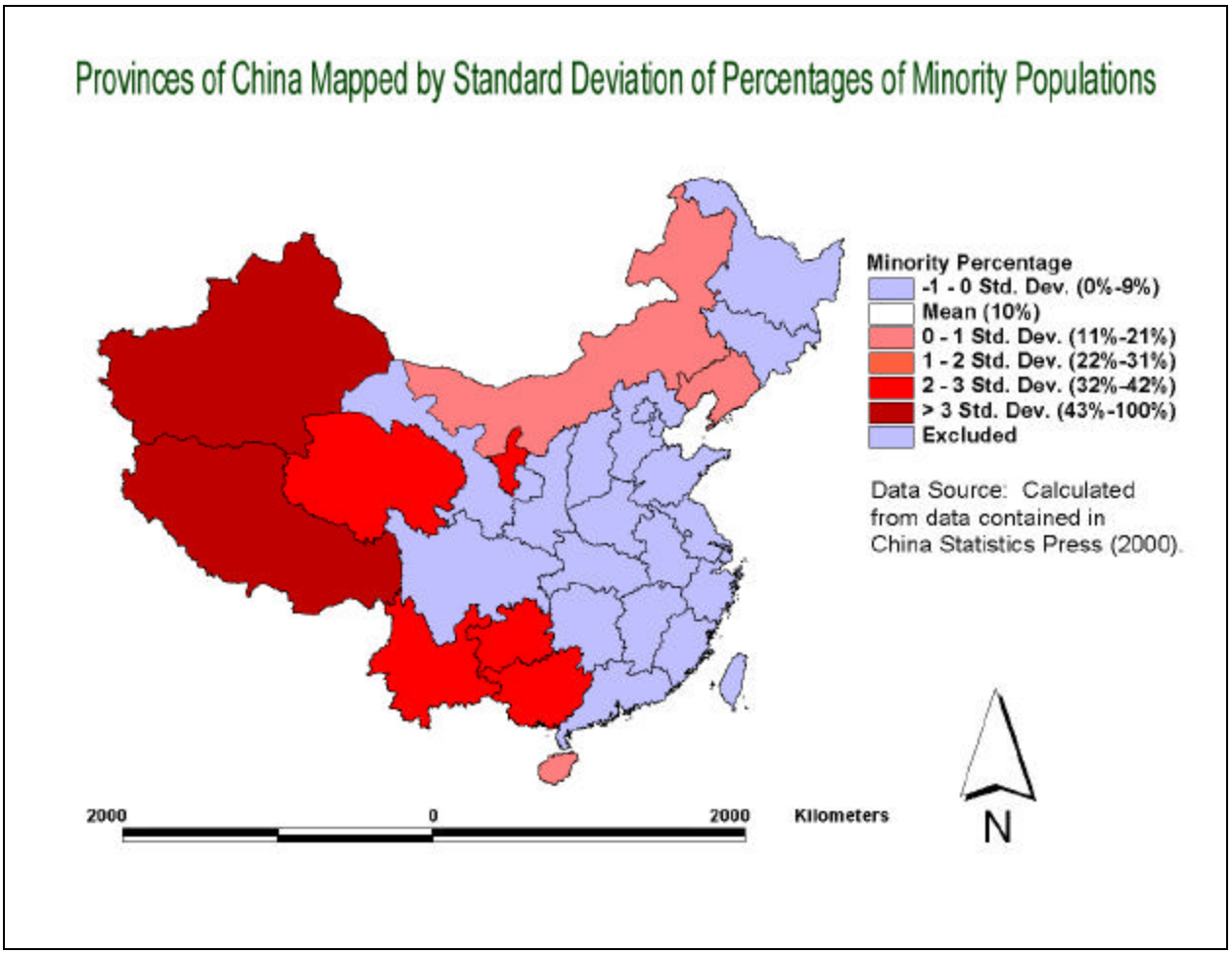


Figure 3.4. This map makes especially clear that the largest proportion of China's minorities live outside of the historical core of China. Each province above the mean percentage of minorities indicates that the percentages of minority populations are among the highest in China.

The Sichuan basin became part of China as early as the third century BCE. Sichuan inhabitants in modern times have been mostly immigrants from neighboring Jiangxi, Hubei, and other provinces. For a long time, the Yunnan-Guizhou Plateau has been a "museum" of numerous ethnic groups and feudal tribes and warlords. Until the 1950s and early 1960s, when the Third Line heavy industrial construction was started, the region had remained an undeveloped border area (Zhao, 1992, 222).

The Yunnan-Guizhou Plateau rises 1000-2000m above mean sea level marked by deep gorges, high waterfalls and towering mountains. Much of the northwest of Yunnan lies above 3,000m with mountains over 5,000m. The average monthly temperature is only 10ºC (Toops, 1983, 47). A total of 84% of Yunnan's land area is covered by mountains and is seismically active (Zhou, 1992, 384). The southwest region experiences a humid subtropical climate dominated by continental northern monsoons. The average temperature ranges from 2º-8ºC in January to approximately 25ºC in July (Zhao, 1992, 215), although altitude usually dictates the actual climate in any given area resulting in 3 differing climatic zones in Yunnan. Rainfall is generally over 1,000m per year creating a huge watershed runoff. Yunnan features over 25 soil types and boasts of approximately 130 exploitable mineral ores (Zhou, 1992, 384-392).

Yunnan had a population of 41,920,000 in 1999[5] with a population density of 90 persons per square kilometer. Approximately a third of the population is minority. Yunnan has the highest number of minority groups,

concentrated in 8 autonomous prefectures and 28 autonomous counties. Most of these minorities inhabit the less accessible mountainous areas of Yunnan. Yunnan is most famous for the magnificent karst landscape seen in much of the province. While this landscape is legendary for its beauty, it provides considerable barriers to agriculture, trade, and other economic activity (Toops, 1983, 50).

Early economic development resulted from the mining of copper. By the 13th century, Yunnan was China's largest producer of silver and copper. The region also produced salt, tea, and medicinal plants. Even through the modern area, there are many pockets of "self-supporting, natural economies" (Zhou, 1992, 393). Since 1949, development has rapidly grown with large increases in both agricultural and industrial products. Yunnan now produces rapeseed, sugarcane, cured tobacco, and tea.

As we shall see, the Yunnan region contrasts greatly from other primarily minority areas, such as Xinjiang. Yet, the concept tying these disparate regions together is the fact that they lie on the periphery of one of the world's great historic empires and are, by definition, transitional areas. The minority peoples of these areas have had to cope with isolation and often-severe conditions that have both shaped and differentiated them from the neighboring Han. Toops concludes his assessment of the physical difficulties of the region by associating the difficult transportation linkages with state of political integration (p. 51).

The Guangxi Zhuang Autonomous Region had a population of

47,130,000 at the end of 1999 (China Statistics Press, 2000b, 3), 38% of which are from ethnic minorities. Although many minorities are represented in Guangxi, 90% of all Zhuang live in Guangxi. The minorities are known to live within “compact communities” (Zhou, 1992, 316). Nearly two-thirds of the area contains mountains greater than 500m in height. Bathed in a subtropical monsoonal climate, half of the region contains limestone formations and extensive karst landscape. Mountains also encircle Guangxi, forming the Guangxi Basin. Guangxi had a primitive agricultural system and no developed industries until 1949. The years from 1950-1980 saw development of both agriculture and industry. After the reforms of 1979, the GOV of both agriculture and industry has continued to grow and tourism has surged.

Guizhou had a population of 37,100,000 at the end of 1999 (China Statistics Press, 2000b, 3). Guizhou is home to many ethnic minorities and most are widely distributed throughout the province. Guizhou is located on the eastern side of the Yunnan-Guizhou Plateau, between both the Sichuan and the Guangxi basins. Eighty-seven percent of the land is mountainous and highlands composed of limestone and basalt; two-thirds is karst. While located in a subtropical humid monsoon climate, most of Guizhou does not experience hot temperatures due to high altitudes (average mean temperature of 15-17°C). The region has several major rivers, but none of them are suited for navigation due to the flow and steepness of the landscape. However, there is great potential for hydroelectric power. Until recently, Guizhou been economically backwards and the first modern roads were built during World War 2. The

transfer of industry into the interior after the war made industrial development in Guizhou possible, increasing the industrial GOV approximately 4.8 times in the period 1949-1979. Guizhou has rich forest reserves while 45% of all agriculture occurs on terraces. Major crops are rice and maize while cash crops include tobacco and rapeseed (Zhou, 1992).

Western China: Xinjiang

Xinjiang is a land of great extremes and challenging settings. Existing on the periphery of the world's most populous country (Figure 3.5), one that is overwhelmingly dominated by a single ethnic group, the Xinjiang Uygur Autonomous Region is home to a minority population of 9.96 million that was 62.42% of its total population in 1990. Xinjiang contains 10.45% of the total minority population in the whole of The People's Republic of China (Economic and Development Department State Ethnic Affairs Commission, *et al*, 2000). Xinjiang is a province-level autonomous region consisting of five autonomous minority prefectures. A land of many differing ethnic cultures, Xinjiang possesses an environment and a history forming a crucible in which only the most adaptable have survived.

Xinjiang is now a focus of attention, not only in the PRC, but also throughout much of the developed world. Xinjiang, though on the periphery of China, has long been a way station for caravans on the Silk Road and now has great potential in the future as a source of petroleum. Development of Xinjiang and the far west was a priority for Beijing's Tenth Five Year Plan (Zhu, 2001),

Figure 3.5. The above is a physical map of Xinjiang and the surrounding region, depicting both the desert and the mountainous terrain that provides some of the unique challenges to developing this province.

not only to extract the potential mineral wealth of the region, but also to avert growing turbulence between minority groups and the Han majority.

To understand Xinjiang, the physical geography of Xinjiang must be examined. Xinjiang is a land of extremes, all of which impact the people and cultures found there. Xinjiang generally has an arid climate where the highest annual mean precipitation is 900-1000mm (35.4-39.3 in), found at the *Yi Lí* (Ili) River Valley and decreases to no more than 10mm (0.39 in) in the *Tu Lu Fan* (Turpan) basin (Xie, 1991, 13).

The region also experiences great variations in temperature, both annually and diurnally. Besides the high temperatures expected from receipt of solar radiation, Xinjiang is prone to long and severe winters. The highest temperature recorded in China, 47.6ºC (117.7ºF), occurred at Turpan (a depression) and a temperature of -51.5ºC (-60.7ºF) occurred at Fuyun (a mountain less than 500km north of Turpan). An extreme of 83ºC (181.4ºF) was recorded on a sand dune in the Gurbantünggüt Desert by a scientific expedition in 1956 (Zhao, 1992).

The region is also buffeted by frequent strong winds. The end of the spring and the beginning of the summer seasons has the strongest winds. The strongest winds gust 32.6-60.8 m/s (73-136mph),[6] while Xinjiang sustains winds of 17.4-20.6m/s (39-46mph)[7] for 100 days of every year (Xie, 1991, 17).

Xinjiang possesses a unique assortment of morphological features. The eastern portion consists of the Alashan Plateau at an elevation of 1000-1500m, yielding to the Junggar Basin in the northwest and the Tarim Basin in the

southwest, bifurcated by Tianshan Mountains. The Alashan Plateau is subject to shifting sand, desertification, and grassland degradation. The Junggar Basin in bounded by the Altay Mountains on the north and the Tarim Basin is encircled by the Pamir Mountains on the west, and the Kunlun Mountains, Altun Mountains, and Tibetan Plateau on the south. These basins enclose the two largest deserts in China: The Taklimakan and Gurbantünggüt Deserts. The Junggar Basin is more temperate than the Tarim Basin, and is subject to desertification, shifting sand, and salinization. The Tarim Basin is also subject to desertification, shifting sand, and salinization as well as deforestation. With the exception of the Ertix River in the Junggar Basin, the drainage of the western portion of Xinjiang is intermittent and flow, when occurring, terminates in salt lakes or marshes. Groundwater distribution is uneven with a large number of natural springs occurring in what is referred to as the "spring line" along the settlements of the Silk Road in the piedmont plains of the Junggar Basin. Generally, poor soils are widely distributed and are too alkaline for agriculture (Zhao, 1992, 276).

Mineral resources of Xinjiang are extensive. Petroleum is the most important with possibly the most far-reaching effects on the region. The major oil belt stretches east from central Asia to Gansu Province. Although the PRC started petroleum production in the region during the 1950s, production shifted to Daqing on northeast China Plain in the 1960s. New exploration may again boost production in Xinjiang in the future (Zhao, 1992, 281). 122 other useful minerals can be found, including coal, nickel, copper, iron, chromium,

gold, and salt. In fact, 81.3% of all minerals found in China can be found in Xinjiang—only Sichuan has a greater variety of minerals (Xie, 1991, 32). The Hotan area in the Tarim basin has long been known for jade (Zhao, 1992, 281).

Prior to the Western Han Dynasty (206 BCE-9 CE), few human artifacts are evident in Xinjiang until Neolithic settlement. Stone tools, pottery, bones of domesticated animals, and millet cake are found, indicating pastoralism and primitive agriculture. During the Warring States Period (403-221 BCE), the Junggar Basin was populated by nomadic Hun (Xiong-nu), Usan, and Yue-zi, while the oasis of the Tarim Basin was settled by Turkic (Uygur) peoples. Some of these oases have been farmed through irrigation for at least 3,000-4,000 years (Zhao, 1992, 281).

Pioneering settlement from the east extended into the lower reaches of the Tarim River, linking a series of oases. These settlements formed the basis for the Silk Road and the region, known to the Han as the "West Domain", was proclaimed a Chinese province in 60 BCE. In the modern period, the area was subject to large-scale pioneer settlement that both created and enlarged oases through the use of irrigation and canals. The Xinjiang Uygur Autonomous Region was established in 1956 and large-scale desert reclamation programs were initiated at the same time (Xie, 1991).

As a result of reclamation programs, farmlands had doubled in the Tarim Basin by 1990 and had increased ten times in only 20 years in the Junggar Basin. The region has long been known for its pastoralism, producing fine wool and other high-quality livestock (Zhao, 1992, 287).

Initially, modern industry in Xinjiang was represented by the small-scale oil production and refining at Karamai in the Junggar Basin. In 1949, only 2 wells produced 2-3 tons of petroleum per day. By 1988, production had increased to over 168 tons per day[8] (Xie, 1991, 162-163). Since 1978, oil products reprocessing have become important industries in Xinjiang. An industrial belt has been established at Ürümqi extending westward to Shihezi and Karamai, where cotton and sugar beets are also produced. Other industries include coal mining, chemical engineering, and light manufacturing (Zhao, 1992, 288).

Settlement in the region is generally sparse, with no settlement for hundreds of kilometers within the deserts. Along rivers and oasis belts, settlements are scattered, often consisting of a few earthen houses. Transportation in these areas is most often by automobile or camel. Urban settlement is concentrated on the few cities of Xinjiang: Ürümqi, Kashi (Kashgar), Shihezi, Karamai, and Hotan. Ürümqi, the capital and primary city of Xinjiang, has grown from a population of 100,000 in 1949 to 1.5 million in 1990.[9] Ürümqi is both the industrial and political center of Xinjiang. Kashi, located on the western border of the Tarim Basin, has long benefited from trade along the Silk Road. Today, Kashi has a population of 140,000 of which two-thirds are Uygur. Shihezi has development as a city with a focus both on industry as well as agriculture. Karamai has developed as a major center of petroleum production. Hotan is located on the southwestern border of the Taklimakan Desert and is one of the largest oases along the ancient Silk Route.

Hotan has been known since ancient times for its carpets and jades (Zhao, 1992, 290).

The predominance of minority population in Xinjiang is eclipsed only by Tibet (China Statistics Press, 1999, 434). The Uygur is the leading ethnic group of Xinjiang Uygur Autonomous Region and the third largest ethnic group in China. They are descendents of Turkic peoples and keep their own languages and Muslim customs. The Kazak, also a Turkic people, make up 6.9% of the population, followed by the Hui, a Muslim people concentrated in the Ningxi Autonomous Region. Other minorities found in Xinjiang include the Mongol, the leading minority on the Alashan Plateau, Xibe, Uzbeks, Kirgiz, and Tajiks. There are also 39 other minorities present in Xinjiang. An increasing number of Han are to be found in the region, involved in industry and administration, as well as providing technical expertise (Zhao, 1992).

The differing ethnic identities of Xinjiang have provided a potential source of conflict with Beijing. In recent years, incidents of torture and executions of separatists have increased as some minorities have considered separation from China, as noted by major human rights organizations (Amnesty International Publications 2001, 2001). However, since the 1980s, many thousands Muslims have been able to worship openly and some even visit Mecca (Mackerras, 1995, 116).

To deal with these difficulties, Beijing's Tenth Five Year Plan has called for extensive development of the far west, especially in Xinjiang (Zhu, 2001). These peripheral areas of the PRC provide territorial buffers as well as essential

natural resources. Time series data for specific provinces are lacking. Yet, aggregate data for minority areas indicate a continual rise in investment, infrastructure, and education in minority contexts.[10] This investment has led to a narrowing of economic disparities within Xinjiang but with a corresponding migration of ethnic Han into indigenous areas (Schmidt, 2005, 85-86). According to Schmidt, this investment has also led to widespread structural change to develop a service sector to support extractive industries (p. 101).

In examining the Xinjiang Uygur Autonomous Region, it is obvious that the region faces a number challenges. It is a land of extremes: harsh climates capable of extreme cold and intense heat; an intensely arid climate and contrasting topography; and untapped mineral wealth as well as an agriculture and industry burdened by problems of environment, infrastructure and distance. The People's Republic of China faces a number of issues if it wishes to continue to maintain sovereignty over the far west. Among these is continued economic development and the judicious exploitation of the region's resources. Xinjiang has long provided an outpost of Chinese civilization as well as a safe haven for weary traders. Xinjiang may continue to fulfill such a function for China if the peoples of this region are allowed to develop within their own cultural and historical contexts.

CHAPTER 4

ECONOMIC DEVELOPMENT IN CHINA

Theories of Development and China

With the coming of economic reforms of 1979, came the realization that new principles must be employed to counter the realities wrought after years of Marxist ideology, corruption, and ineptitude. That reforms were not just a random series of suppositions but a cohesive program representing the ideology of several differing theoretic perspectives is a tribute to the new regime headed by Deng Xiaoping. Deng said, "It does not matter whether the cat is white or black; if it catches mice it is a good cat" (Starr, 2001, 73).

In the preface to the third edition of The Stages of Economic Growth, W. W. Rostow cites the problems faced by less developed countries (LDCs) blocking preconditions for take-off:

> They are not traditional societies, because the world of contemporary technology is so powerful and intrusive that it has introduced elements of modernity in all nations. Nevertheless, perhaps 20% of the human race—a billion or so men, women, and children—lives in countries that have not yet attained self-sustained growth. This group includes, *inter alia*, most of Sub-Saharan Africa, Bangladesh, Burma, Haiti, Yemen, Afghanistan, Vietnam, and some of the Pacific Islands. This list suggests the variety of circumstances that may

> have forestalled entrance into take-off: climate, historical and cultural heritage, partial or total rejection of modernity as an explicit objective, resource limitations, war, endemic political instability, perverse public policies, or various combination of these frustrating constraints (p. xxii).

Furthermore, there is apparently no fixed time period for progress until the proper conditions are met (Rostow, 1990, xxii). That some societies choose not to modernize is admitted (Rostow, 1990, xxiv). In the case of the PRC, the application of Rostow's theory is muddled by absolute state control through a planned political economy. The failure of the Great Leap Forward and the years of the Cultural Revolution served to isolate the country from outside elements of modernization while blocking many of the conditions likely necessary for take-off.

Rostow summarized the stages in his second chapter by the following descriptions:

1. *The Traditional Society* in which production is limited by the levels of science, technology, and culture;
2. *The Preconditions for Take-Off* in which we find openness to science, new attitudes and ways of doing, as well as expansion of resources, infrastructure, and markets. Investment of national income could be greater than 5% to overcome lapses in infrastructure;
3. *The Take-Off* occurs when "old blocks and resistances to steady growth" are removed, growth becomes normal, compound interest part of the

institutional structure, and investment of national income attains the 5-10% level;

4. *The Drive to Maturity* as a period of sustained progress, extending technological advances over all areas of economic activity. As much as 10-20% of national income could be reinvested;
5. *The Age of High Mass-Consumption* as a period where "leading sectors shift towards durable consumer goods and services"; and
6. *Beyond Consumption* as a stage ambiguously described by Rostow as a society where less emphasis is placed on the generation of real income and greater emphasis is placed on individual fulfillment, such as producing more children, given by Rostow as a single example (Rostow, 1990, 4-12).

In examining these stages, it may be argued that certain of the coastal areas of China have entered *The Drive to Maturity* stage. Certain advanced areas with a burgeoning middle-class, such as Shanghai, may be entering *The Age of High Mass-Consumption* but substantial areas of the PRC are still struggling through the first or second stages. More questionable is the status of those areas previously industrialized, as in the Northeast.

Provinces such as Heilongjiang and Liaoning retain heavy industries that have either collapsed or have been propped up by continuing state subsidies. Certain preconditions necessary for take-off would seem to justify certain large-scale investments now taking place with the Three Gorges Dam, the Qinghai to Lhasa railway, or supporting infrastructure and extractive industry in Xinjiang.

Rostow confirms the belief that “there is no single pattern” for take-off, bolstering Beijing's hope that the current economic strategies will eventually be vindicated (Rostow, 1990, 46).

In trying to deal with the problem of entrenched stagnation in certain regions, the current leadership of the Communist Party may have struck a devil’s bargain in a gamble that all boats will eventually rise along with growing disparities of prosperity and inequality. That Deng’s “cat” is born from the womb of Western capitalist theory demonstrates the pragmatism of current leadership. Such willingness to waver from the Marxist paradigm to promote the program of reforms initiated in 1979 lends credence to Rostow’s proposition that the Chinese Communist elite were primarily interested in Lenin’s doctrines for controlling a vast disenfranchised population (Rostow, 1990, 163).

As yet another stage theory, the Harrod-Domar Growth Model incorporates the necessity for savings and new investment required for growth through the conceptualization of a capital-output ratio. Beijing has been careful to invest considerable capital into less developed regions it values as politically sensitive. However, savings and investments alone do not seem to be sufficient for economic growth (Todaro, 2000, 83). William Easterly has shown that financial aid calculated on the basis of the Harrod-Domar growth model is actually negatively correlated with economic growth! He concludes “there is no theoretical or empirical justification for the assumption that filling a ‘financing gap’ [is] determined by ‘investment requirements’” (Easterly, 1999, 437). We are left to wonder the means by which the current regime determines

investment in the various provinces of the PRC.

As capitalist economic and development theory has advanced, so also do we observe that Beijing has been careful to incorporate helpful conceptualizations, such as those proposed in the structural-change models. These models focus on the mechanisms for transforming less developed regions to modernized "industrially diverse manufacturing and service" economies (Todaro, 2000, 84).

One of the most well known of the structural-change models is the Lewis two-sector model. This model assumes that the margin product of labor equals zero and that all rural workers share equally in output. W. Arthur Lewis writes:

> Whether marginal productivity is zero or negligible is not, however, of fundamental importance to our analysis. The price of labour, in these economies, is a wage at the subsistence level.... The supply of labour is therefore "unlimited" so long as the supply of labour at this price exceeds the demand. In this situation, new industries can be created, or old industries expanded without limit at the existing wage; or, to put it more exactly, shortage of labour is not limit to the creation of new sources of employment (Lewis, 1954, 142).

The current economic expansion in the PRC seems to depend on surplus of agricultural labor; the government loosened the previously stringent household regulations after the economic reforms of 1979 allowing for increasing migration to the larger cities. At the same time, the agricultural advances of

the green revolution has increased agricultural output and produced increasing redundancies in labor. Lewis argues that labor remains cheap so long as migration is unrestricted and unions do not interfere with the wage scale (Lewis, 1954, 177). The great hope for China's current regime is that when development has a more equal distribution, wages will rise, once "the surplus is exhausted" (Lewis, 1954, 190).

Neoclassical growth theorist, Robert M. Solow, added a variable for technological growth to the Harrod-Domar model in the hope of predicting economic stabilization. The Solow equation exhibits diminishing returns for labor and capital separately while supplying constant returns to both factors jointly. Technical progress becomes a residual factor explaining long-term growth. An open economy, incorporating foreign investment and trade, experiences income convergence at higher levels (Todaro, 2000, 97). Such a finding could well have provided the justification for the establishment of the special economic zones (SEZs) following reforms. After laying out a rather intensive analysis, Solow concluded that a government could "choose whether it wants high employment with relatively heavy capital formation, low consumption, rapid growth; or the reverse, or some mixture" (Solow, 1956, 63). For the economic reforms of 1979, it would seem that Solow's first option was chosen to promote the greatest possible growth.

Endogenous growth theories discard neoclassical assumptions of diminishing returns to capital investments, permit increasing returns to scale in aggregate production, and focus on the role of externalities in determining

rates of return. Technology, while important, is not necessary for long-term growth (Todaro, 2000, 101). Such conditions seem ideal for economic growth in China. Endogenous growth theories reemphasize the importance of savings as well as an investment in human capital. An additional feature is understanding that even if savings are equal to wealthier countries, there is no guarantee that LDCs will keep up with more developed countries. The emphasis on human capital may explain why so many of the less developed provinces of China have increasing educational levels, as seen later in this thesis. Todaro writes that these models "suggest an active role for public policy in promoting economic development through direct and indirect investments in human capital formation and the encouragement of foreign private investment" (p. 102). Such theory certainly justifies Beijing's continued governance of the overall structure of economic reforms.

In an article entitled "Modern economic growth: findings and reflections", Simon Kuznets (1973) suggested that "institutional and ideological adjustments must be made to effect the proper use of innovations" to advance economic growth in those countries not blessed by "fortuitous gifts of nature". He proposed "six characteristics of modern economic growth" which may be summed as the following:

1. "High rates of growth of per capita product and of population" which Kuznets observes as 2% product per capita and 1% population per year;
2. A rise in the rates of total productivity, calculated as "a large multiple of the rate in the past";

3. “The rate of structural transformation of the economy is high”, meaning a shift from agriculture to industry, or from industrialization to the service sector;
4. Rapid ideological change and change in the structures of society; Kuznets includes urbanization in this definition which, in the case of China, is seen in the vast rural to urban migration now taking place;
5. “By means of the increased power of technology” are able to reach out to the rest of the world; and
6. “The spread of modern economic growth…is limited in that the economic performance in countries accounting for three-quarters of world population still falls far short of the minimum levels feasible with the potential of modern technology” (Kuznets, 1973, 248-249).

Whether or not the vast change observed in the PRC since the reforms of 1979 was intended to duplicate these observations, we have found that China today has reached or is reaching these benchmarks of economic growth. While particular political and ideological transformations have been limited by Beijing, certainly vast changes have been observed, at least, in more prosperous city dwellers. That China is now reaching out to the rest of the world is witnessed by the fact that China is increasingly seen as a world power and has even started demonstrating economic might in becoming an independent space-faring power. While China is becoming increasingly prosperous, Beijing has rightly concentrated on continuing development strategies to bring progress to the less developed regions of the PRC.

One of the basic assumptions in adapting macroeconomic theories, such the Harrod-Domar and the neo-classical schools, to regional analysis is the understanding that space economy is non-homogeneous. Agglomerations of economic activity forms nodal regions composed of heterogeneous units. These nodal regions are usually linked to other nodal regions through functional linkages such as trade, migration, and communication (Richardson, 1969, 67-69).

Various theories employed to explain this heterogeneity include Central Place Theory, Gravity models, and Growth Point or Growth-pole theory. For the purposes of this thesis, we shall concentrate on the Growth Pole Theory since this theory has obviously been adopted as the guiding principle for the economic reforms of 1979. For the PRC, Growth-pole theory links the concepts of nodal regions with physical and regional planning, allowing for the transition from a planned political economy to a more dynamic economy utilizing market forces.

Originally developed by François Perroux in 1955, Growth-pole theory assumes that market forces cause agglomeration of economic benefits, accruing social benefits. If infrastructure is built up at growth points, housing is located there and intraregional migration is encouraged, industry could be induced to concentrate without other state interventions. Then, as polarization increases, more economic activity will gravitate to the focal point and reinforce the dominant node within the boundaries of a particular region. Perroux theorized that drawing on the particular inputs of a region, industrial

concentration is accomplished through the development of certain key industries whose products are then sold to national markets. Income is maximized in the growth area by concentration of development at the growth point rather than thinly distributing resources throughout a region. Development then spreads through linkages with other dominant nodes (Richardson, 1969, 102-106).

Problems occur in the application of Growth-pole theory since Richardson himself concedes at least a 15-25 year horizon for results to occur (Richardson, 1975, 1). Favorable impacts, occurring through "spread effects", include the migration of the unemployed, remittances, demand of regional agricultural products and raw materials and, eventually, the diffusion of investment and innovation from the growth point to the periphery. "Backwash effects" are the unfavorable impacts, which include out-migration of skilled and educated workers, depopulation, capital shortages, and displacement of smaller businesses (Hughes & Holland, 1994, 365). According to Richardson, both spread effects and backwash are "subject to strong distance decay" (1975, 5). It is even likely that spread effects decay faster than backwash effects (Richardson, 1981, 18).

One practical application of Growth-pole theory is investment in intermediate regional centers which, in the view of Parr, serves "as a rather transparent means of consensus building" (Parr, 1999, 1204). The strategy involves building up growth poles that would intercept migration from rural areas. Parr argues that even if migrants eventually migrate to primary

metropolises, skills and savings earned benefit migrants and ease pressures on the primate centers. Such a strategy is likely being employed in the PRC as considerable resources are being invested in secondary center infrastructure with such projects as the Qinghai-Lhasa railway, the Three Gorges Dam, and continuing investments in Xinjiang. Parr points out that the use of a single investment strategy may suffer through differing problematic dynamics in various regions (1208).

According to Coates et al. (1977, 244), the creation of a growth pole is creation of inequality. The growing inequality seen in the present-day PRC has been observed and the supposed benefits of this strategy have yet to be experienced by a major portion of the population. That such growing inequality should be seen with alarm by Marxist theorists has made the reforms of 1979 that much more remarkable.

As shall be seen, current economic reforms in the PRC have gone behind a convoluted history traditionally seen as obeying the mandate of heaven. With the success of the revolution of 1949, Mao sought an end to the seemingly haphazard path of economic progress. He desired to build “a socialist state with modern industry, modern agriculture, and modern science and culture” (Foreign Languages Press, 1966, 28). That Mao never saw the fulfillment of these stated goals can be attributed to any number of reasons. Yet, once economic conditions for growth had been sufficiently met, nothing could keep this sleeping dragon from awakening.

Economic History

Shortly after the end of the Second World War, the economic system of China radically changed with the communist revolution in 1949 and the economic program instituted by Mao Zedong. Mao sought economic self-sufficiency and "to close the gap between rich and poor" (Prime, 1991, 9). Based on "central planning, collective agriculture, and land reform, with the goal of developing the nation's heavy industries" the Soviet-style system depended on Soviet advisors to modernize the economy (Hsieh, 2004, 441). Economic progress was often undermined through failed social and economic programs such as the "Great Leap Forward" (1958-1960), which resulted in "a famine of major proportions in much of rural China" (United Nations Development Programme, China, 1999, 16).

Following Mao's death, Deng Xiaoping embarked on a program of economic reforms in 1978 that initiated a transition to a market economy. Deng's immediate concern was in improvement of the standard of living, followed by political reforms. In the period between 1978 and 1995, the per capita GDP almost quadrupled—an accomplishment never paralleled in human history (Khan & Riskin, 2001, 3). To remedy the lack of productivity, Deng believed that individuals within society must be encouraged to do their best:

> More latitude was allowed for free markets, household sideline production, privately used plots, and diversification of agricultural production....a rapid process of decollectivization was well under way by the early 1980s throughout China. By the end of 1983,

almost all production teams had been converted to a household responsibility system (McKinley, 1996, 7-8).

Special economic zones (SEZ) were created, foreign investment was encouraged, as well as reform and decentralization of state-owned enterprises were integrated into a special economic mix dubbed as “the Chinese style of communism” (Hsieh, 2004, 442).

The introduced changes had significant impact on production and income. Real per capita income increased at a rate of 7.5% per year during the period of 1978 to 1988 compared 3.6% before 1979, resulting in a “real income per person in 1988” that was “about 5 times that in 1952 and was about twice as much as in 1978.” Industrial gross value of output (GVIO) expanded at 10.1% per year and agricultural gross value of output (GVAO) grew at 4.4% per year during the period between 1952 and 1978; following reforms, the GVIO grew at 15.7% per year while GVAO increased to 15.4% per year. The increases in GVAO were in large part due to the introduction of fertilizer (Webb, 1991, 55, 80).

At the founding of the People’s Republic in 1949, this distribution of wealth was spatially unequal. The inequalities were seen not only between regions (Knight, Li & Zhao, 2001), but also between rural and urban areas of China (Gustafasson & Shi, 2001). Mao started a process of equalization through land reform followed by a cooperatization where inequality was often seen between cooperatives and regions. Giant cooperatives consisting of 5,000 households were then advanced, culminating in 1958 with the People’s

Communes. A four-tiered communal structure was maintained until economic reforms began in 1978 (McKinley, 1996, 3-5).

Mao was concerned with increasing the development of inland provinces and sought growth through “third front” programs, which raised industrial and infrastructure investment in these areas by transferring funds from richer areas. Deng Xiaoping opened the coastal areas to foreign trade and investment in a policy of “coastal-led” development which came to be seen as Growth-pole theory. Together with the creation of SEZs, it has been believed that development would eventually reach the more distal regions of China (Prime, 1991, 10-11). Such belief is based on the trickled-down effect stipulated by the Growth-pole Theory. However, the efficacy of this strategy has yet to be seen.

As a result of economic reforms, inequality has increased substantially. Knight and Song (2001) concluded that in the seven years of their study (1988-1995), the Gini coefficient rose approximately one percent point per year. The United Nations Development Programme, China (1999, 56) noted an initial dip in the calculated Gini coefficients for provincial per capita income after reforms followed by a continued rise in inequality to the end of the study in 1995. This pattern was less pronounced when the Gini coefficients were calculated for per capita GDP.

According to Xin Liu (2000, 180-185), the effect of economic reforms on the minorities of China include social decline in an atmosphere of increasing stratification; the removal of the gentry by the Maoist revolution is now being reversed as a result of the social differentiation brought about by

modernization. Even such fundamental institutions as marriage have seen change as economic conditions have made availability of brides an increasingly difficult prospect, brought about the economic choices forced by the One Child Policy (Xin, 51-54).

Current Minority Development

A cursory examination of these two regions of minority concentration reveal relationships between minority cultures, regional geography, and historical relationships that have shaped both the majority Han and the minority peoples of China. To understand how each has faired in these relationships, it would be profitable to examine relevant social and economic measures.

Likely as a result of Beijing's growing concern toward the separatist movements, the tenth Five-Year Plan (2000-2004) has specifically named increasing investment and development of the far west. Some of the relevant goals of this Five-Year Plan includes increasing the incomes of agricultural workers, promoting agricultural reforms in rural areas, continuing to fight poverty with a priority "given in our anti-poverty endeavor to ethnic minority areas in central and western China", fostering development in the western region through fostering "the economic zone along the Tongguan-Lanzhou-Ürümqi line, the upper reaches of the Yangtze River, and the Nanning-Guiyang-Kunming line", and "improving the social security system at a faster pace" (Zhu, 2001). These promises of continuing development in both Xinjiang as well as the Yunnan-Guizhou-Guangxi region seemed pointed toward the

minority populations of China. Yet, despite the good intentions of some projects initiated by the government, levels of strife have continued to heighten between the indigenous communities and Beijing resulting from the consequent "degradation of the environment and diminution of rangeland resources" (Banks, 1999).

Minority Development in Guangxi, Guizhou, Yunnan, and Xinjiang

An investigation of the measures of economic development for regions of high minority populations reveals certain obvious differences from the majority Han. Comparing demographic development measures also show distinct differences between the core and peripheral areas of China. The percentage of illiteracy seems to be significantly higher for the southwest than in Xinjiang in 1990 (Figure 4.1). Illiteracy rates in 2004 (Figure 4.2) reveal an improvement in the literacy rate in Xinjiang province as well as a slight improvement in the southwestern provinces. There are no changes noted in Tibet while a great improvement is noted in the northeastern provinces.

A chart comparing the General Fertility Rates (Figure 4.3) between representative provinces and the nation reveals more contrasts. General Fertility Rate (GFR) may be defined as the number of live births in one year per number of fertile women (that is, aged 15 to 44 years of age at midyear; the resulting fraction is then multiplied by 1,000 to provide the commonly used measure). GFR uses available information on a population's age and sex structure to determine the portion of the population at risk for having a birth (Weeks, 1999, 184). This trend is continued in a map illustrating the

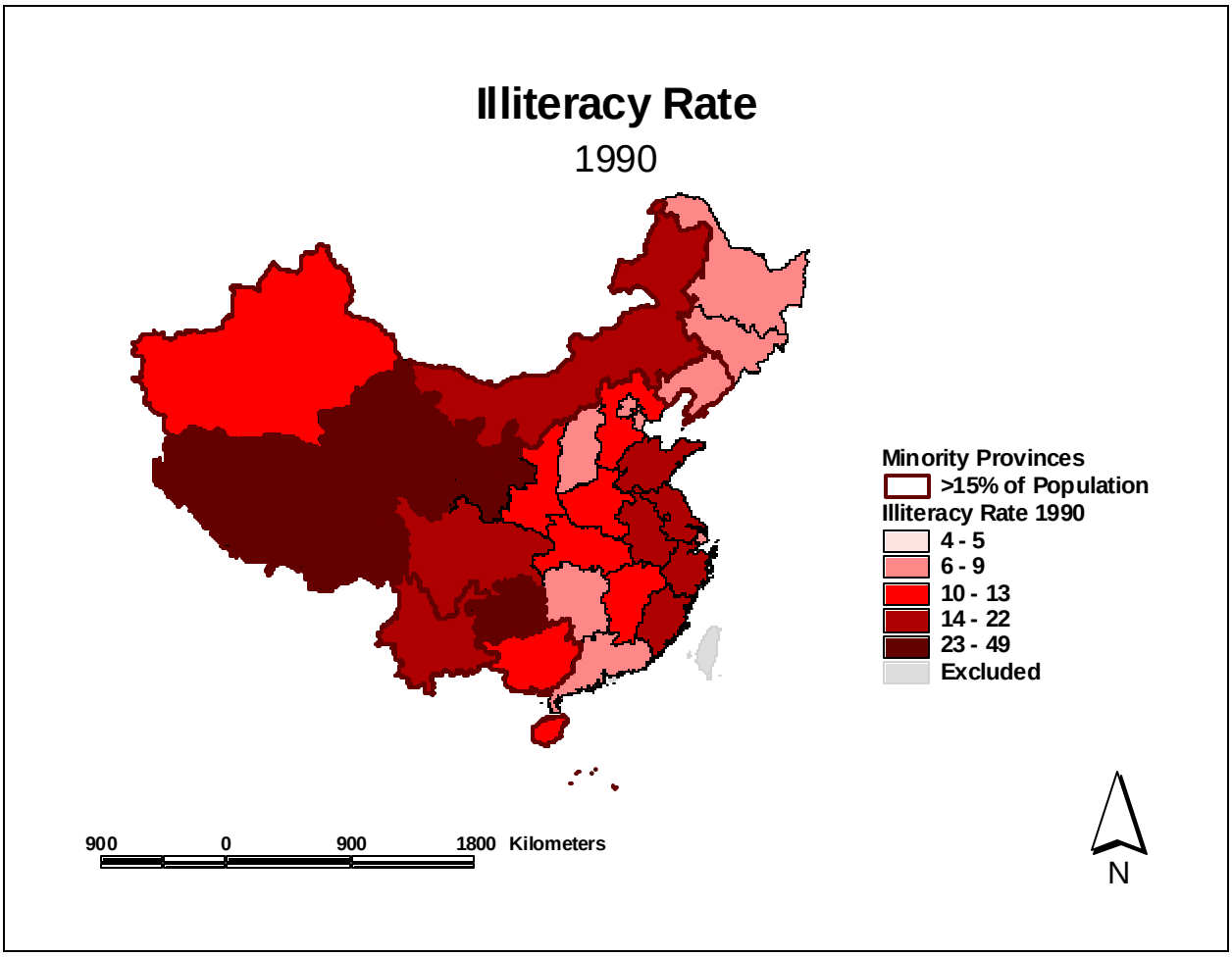


Figure 4.1. This map of the Illiteracy Rates of 1990 in the provinces of China demonstrates a distinct difference between Xinjiang and two of the southwestern minority provinces.

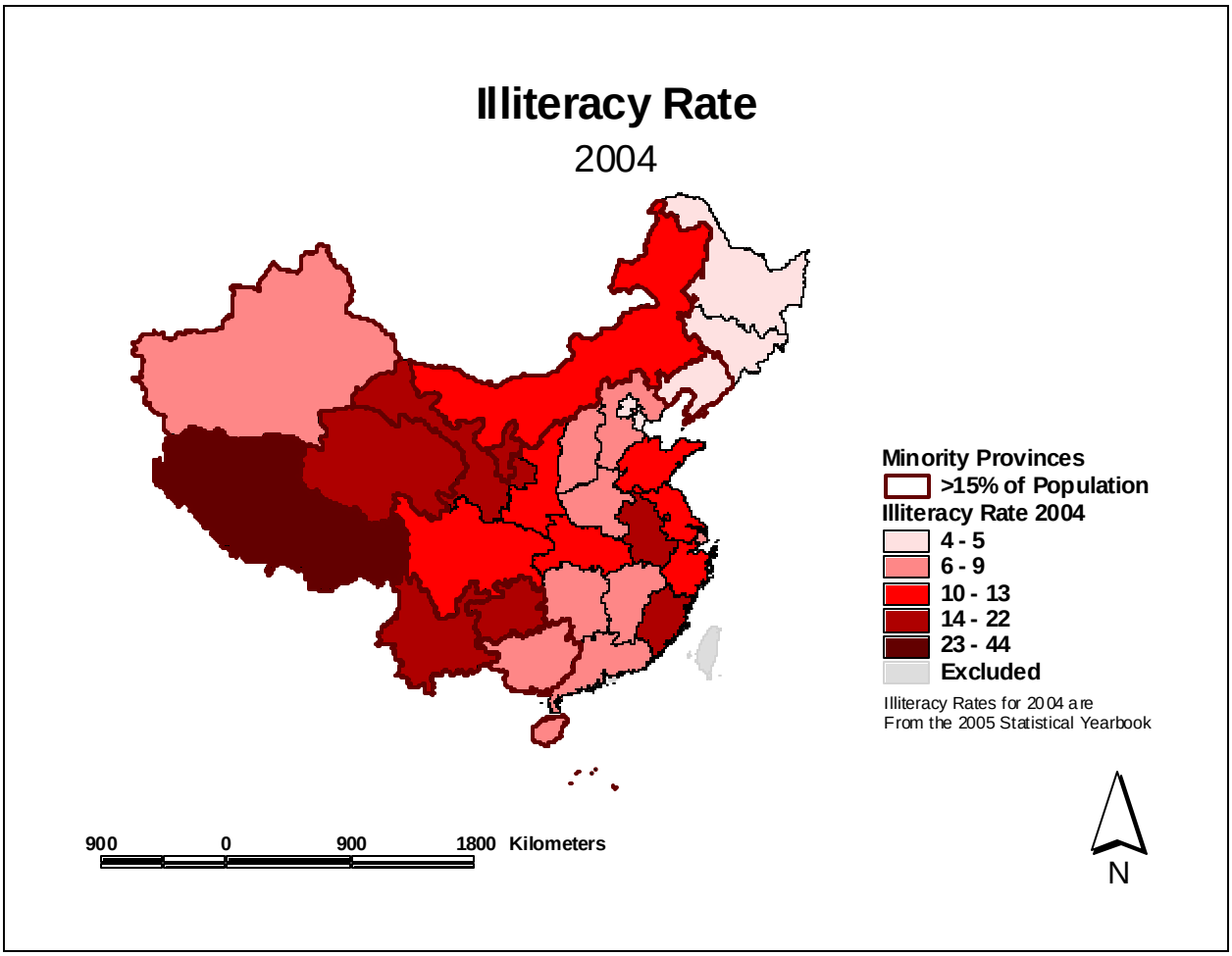


Figure 4.2. This map of the Illiteracy Rates 2004 in the provinces of China demonstrates a distinct difference between Xinjiang and two of the southwestern minority provinces.

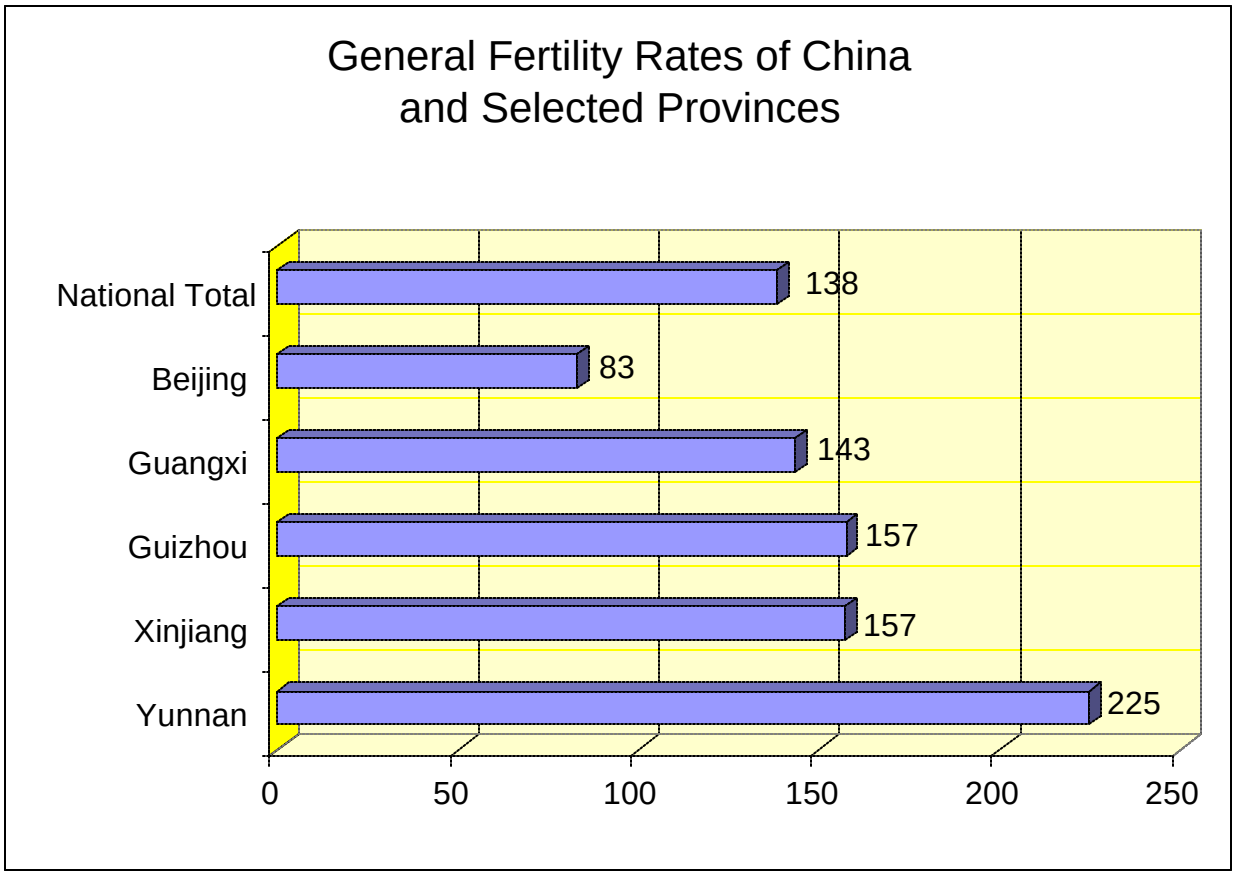


Figure 4.3. General Fertility Rates, from 1998, demonstrate notable differences between Yunnan and the other minority provinces. As a group, these minority provinces differ tremendously from Beijing, which has a very low GFR. On the whole, the GFR of the minority provinces is higher than that of the entire nation.

distribution of youth dependency (Figure 4.4). The child dependency ratio is perhaps a better picture of socio-economic development than the dependency ratio (Figure 4.5) since some regions, such as the more developed coastal provinces, have an extremely high elderly dependency ratio (Figure 4.6). Child dependency ratio excludes this opposing weight.

Clearly, there are distinct differences between areas of minority populations and the Han core. At the same time, we can find differences in development between the western province of Xinjiang and the southwestern provinces. Such comparisons raise far many more questions than they answer. It is also necessary to ascertain whether these apparent differences are truly significant and if so, is it possible to attribute these differences to environmental factors such as distance from the economic and cultural hearth, terrain, and transportation networks? Factors such as topography, railroads, passable rivers, historic patterns of economic activities, and infrastructure will be examined to suggest possible explanations for differences in development for each of the areas of interest.

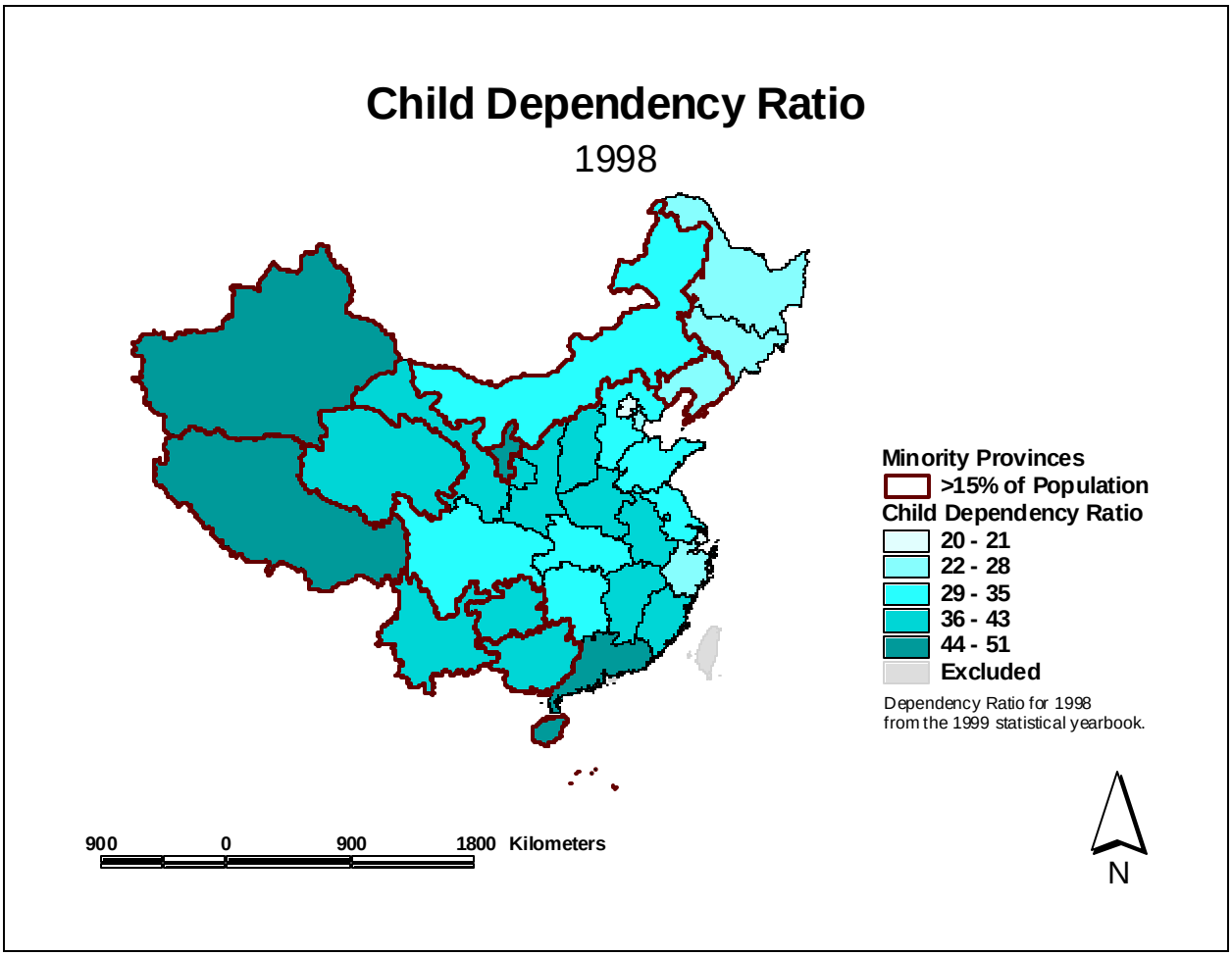


Figure 4.4. The Child Dependency Ratio is perhaps a better picture of socio-economic development than the general Dependency Ratio since some regions reflect differing economic conditions. Less developed regions often have a higher child dependency ratio while more developed regions often have a higher elder dependency ratio. The Child Dependency Ratio excludes such anomalies.

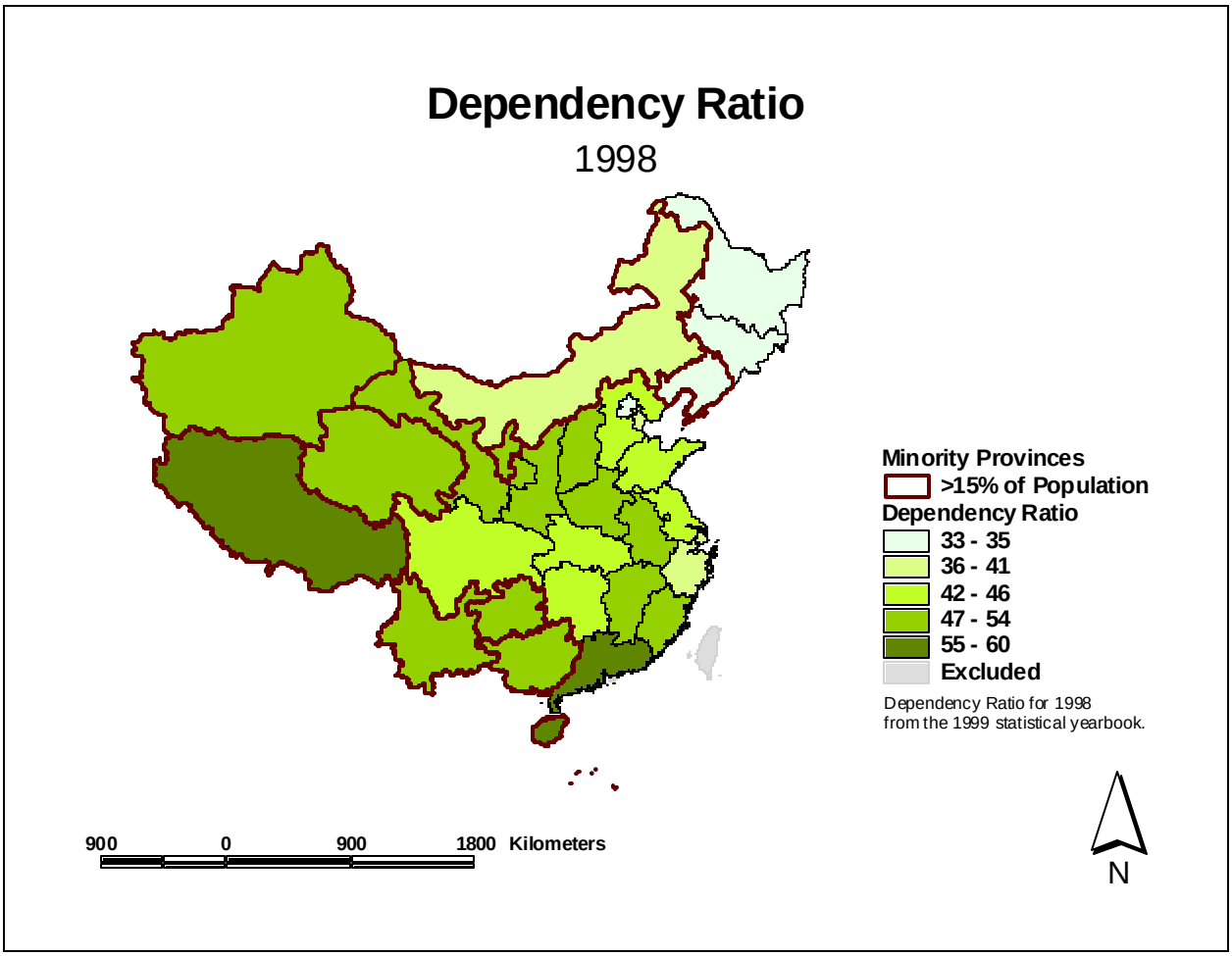


Figure 4.5. The general *Dependency Ratio* is a picture of socio-economic displaying the dependency burden of both children and the elderly on households. For the purposes of this study, the dependency ratio is defined as the proportion of the number of people aged 0-14 and 65 and over to the number of people aged 15-64. It may not accurately reflect economic conditions since the industrialized northeastern provinces have an extremely high elderly dependency ratio while many of the less developed peripheral provinces have a high youth dependency ratio. A weight on either end of the spectrum often reflects very different economic conditions. The decaying industrial northeast has the lowest dependency ratio in the PRC.

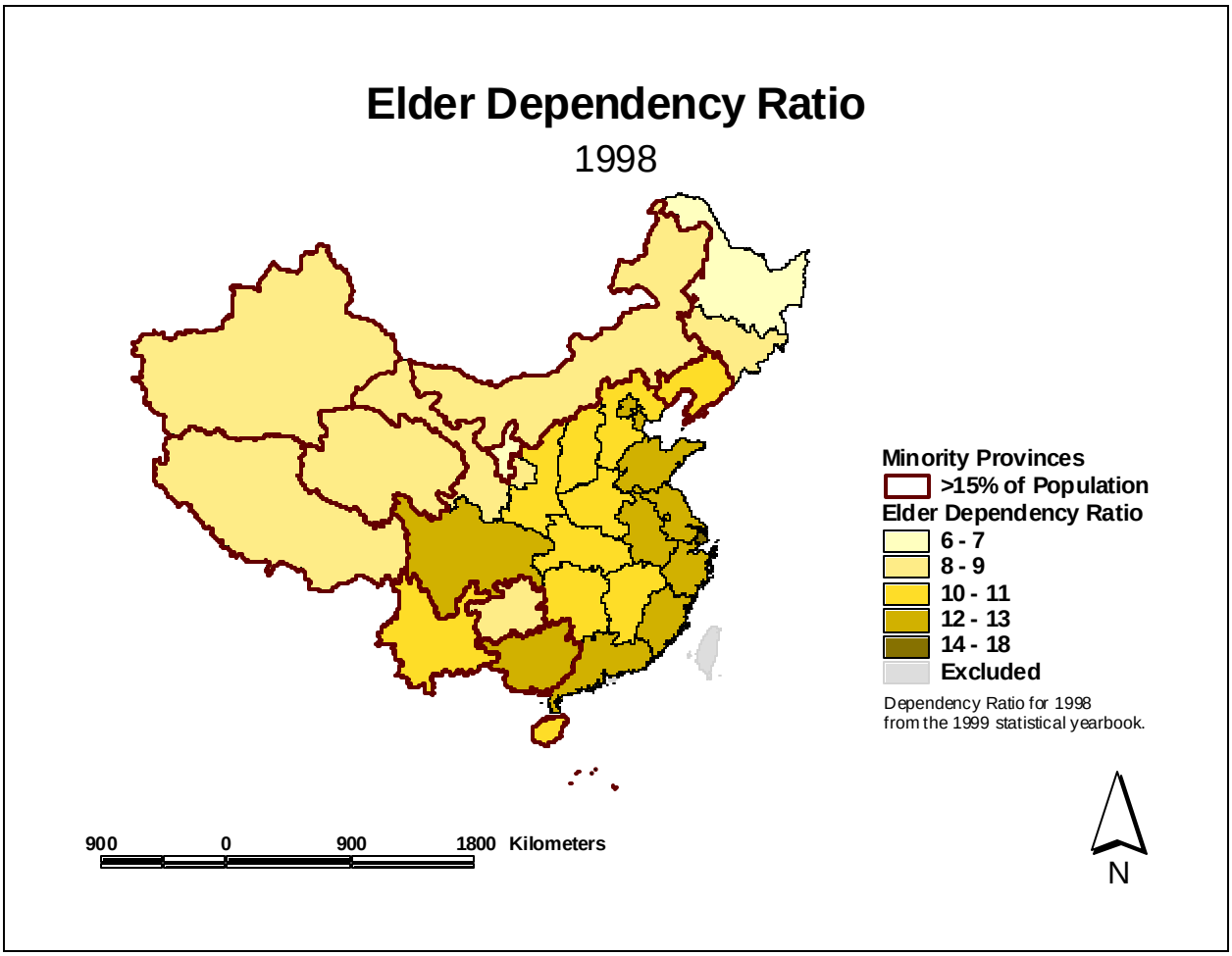


Figure 4.6. The Elder Dependency Ratio reflects higher level of industrialization in the eastern provinces of the PRC while the minority provinces, outlined in brown, typically have the lowest Elder Dependency Ratio.

CHAPTER 5

EXPLORATORY ANALYSIS

Data and Methods

When this study was first undertaken, the amount of published analysis of minority groups within the PRC was extremely limited. In the time it has taken to complete this thesis, available literature covering this topic has grown tremendously. The need for such literature is becoming increasingly important as the world grows both interconnected and dependent on understanding human needs and other cultures.

The data used in the preliminary analysis came primarily from China's Ethnic Statistical Yearbook (2000) and China Statistical Yearbook (2000). This analysis used data on the province level while hypothesis testing was accomplished comparing economic measures from the minority regions within each of the provinces to like measures from total populations of the various provinces.

Often, economic measures varied from year to year, forcing adjustments to standardize applicable data for analysis. Sometimes, certain measures were simply not suitable for analysis as admitted by the yearbooks themselves.[11] Many of the measures for economic development in these yearbooks do not lend themselves to easy comparison with more commonly used measures of development such as the HDI. Very few of the available minority economic

measures given provide enough of a picture for understanding the relative development of minorities within the PRC. Sometime curious categorical terms, such as “Social Labor Force”, remain undefined in the yearbooks.

Little in the way of sociological or demographic data is available for minorities as a category of the general population or for the Minority National Autonomous Areas in the China’s Ethnic Statistical Yearbook. Generally accepted sociological measures of development, such as literacy rates, fertility rates, child mortality rates, etc., can only be indirectly inferred from available general population data. Occasionally, demographic data useful for calculating useful measures, such as sex ratio, appear in the China’s Ethnic Statistical Yearbook as reflecting “total population” and *not* minority population or population of the Minority National Autonomous Areas.

Careful attention must be made in collating the available data for the minority population. Hierarchical categories are used in the various sources consulted. The first to be considered is the general population census and minorities existing as a portion of the general population. Minorities, regardless of residence, are classed as a percentage of the total population. Another important distinction in the available data is the population residing within official Minority National Autonomous Areas. They consist only of those minorities living within these areas and do not include those minorities living outside of these areas. Han populations are also found living within the Minority National Autonomous Areas and are often listed as a separate category; however, the data sources may aggregate both Han and minority

populations for important measures. Thus, in considering population data within a particular province for analysis, selection must be made between the general population, the minority population as a portion of the general population, the general population within the Minority National Autonomous Areas and the minority population living in the Minority National Autonomous Areas. Economic data is similarly divided, requiring diligence in data analyses.

Figures for total minority populations of the provinces were not available for 1999. This forced the use of the GOV per capita values provided for the Minority National Autonomous Areas rather than independently calculated values, as performed for the years 1952, 1980, and 1990.

Another example of the sometimes frustrating nature of the available data is seeming arbitrary category definitions rendering comparison across populations impossible. The industrial Gross Output Value of materials from Minority National Autonomous Areas were, to all indications, provided as they actually occurred in 1999. However, industrial Gross Output Value for the general population were limited to only those “above a designated size” without noting what that size may be. This left the total industrial Gross Output Value for some provinces smaller than the industrial Gross Output Values of the Minority National Autonomous Areas within those same provinces!

The methods of analysis were selected as a result of the limitations in the data; the primary issue being the relatively small number of provinces in the PRC. Many statistical methods are invalid or yield insignificant results with the small number of comparisons. This is further complicated by the fact that

the primary minority areas originally considered for this study are represented by only four provinces.

Preliminary analysis was completed using general population data from the China Statistical Yearbook (1999), before minority data became accessible to the author. The methods employed include Shapiro-Wilk W test for normal data, Chi-Squared Test for Goodness-of-fit ($?^2$), construction of Lorenz curves for equality of distribution, and Index of Dissimilarity to aid in the interpretation of the calculated Lorenz curves.

Shapiro-Wilk W test for normality was calculated and demonstrated that the variables considered ranged from normal distributions to non-normal distribution. Most of the variables considered were normal at a 95% confidence level, with the noted exceptions of dependency ratio (dep_rat), birthrate (birthrat), deathrate (deathrat), and the rate of natural growth (nat_gr). Thus, an analysis for significant differences required a non-parametric test. The Chi–squared ($?^2$) test for Goodness-of-fit was chosen. Many of the results calculated were invalid since minimum size restrictions require that the expected frequency in both categories be at least 5. However, the results of the $?^2$ serve as a guide for selection of variables and tests to be used for hypothesis testing.

Gastwirth (1971) and a number of later authors (refining the technique) demonstrated the use of the Lorenz Curve to graphically illustrate inequality of distribution between two measures. To further interpret the results, a Gini coefficient is calculated using the data used to calculate the Lorenz curve. The

Gini coefficient uses the simplified formula calculated by Malcolm Brown (1994) may be understood as the maximum value of differences in the accumulated percentages; the closer to one, the greater the inequality.

Both the Lorenz curves and Gini coefficients were constructed from the techniques found in Castillo-Salgad, et al. (2001). The data used were obtained from the relevant general and minority yearbooks. The tabulation and calculation of the cumulative percentages on each of the axes formed curves in which the various plotted points reflect the uneven rates of the various provinces. As a result, curves appear jagged. Those provinces without an autonomous minority area (yielding an accumulated gain on the x-axis) created an additional staircase effect and were deleted in drawing these Lorenz curves.

Because of the data requirements for the construction of Lorenz curves and limitations in the available data, few of the variables considered for study were utilizable for constructing Lorenz curves. However, of those constructed, a considerable range of equality for various measures can be observed. Figure 5.1 demonstrates a tremendous inequality between per capita exports from minority and non-minority regions in the PRC. The Gini coefficient = 0.90, being close to one, indicates near perfect inequality. The number of per capita college graduates minority and non-minority regions (Figure 5.2) draw a Lorenz curve that is more moderate but still exhibits considerable inequality. The Gini coefficient = 0.68, reports a moderate but large inequality. There is moderate inequality for per capita automobile ownership between minority and non-

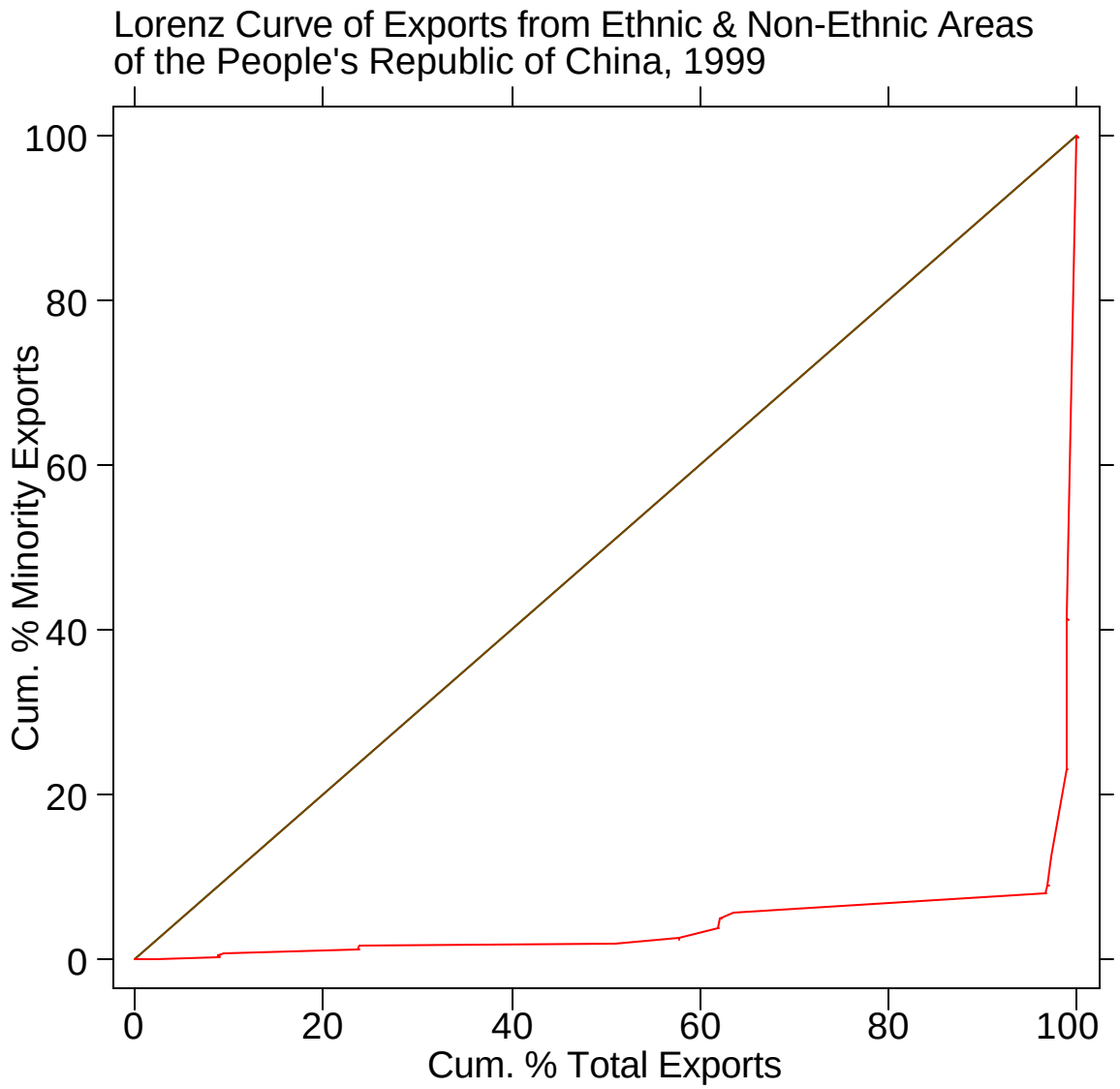


Figure 5.1. Lorenz curve demonstrating the relative inequality of exports per capita. The Gini coefficient = 0.90, indicating close to perfect inequality.

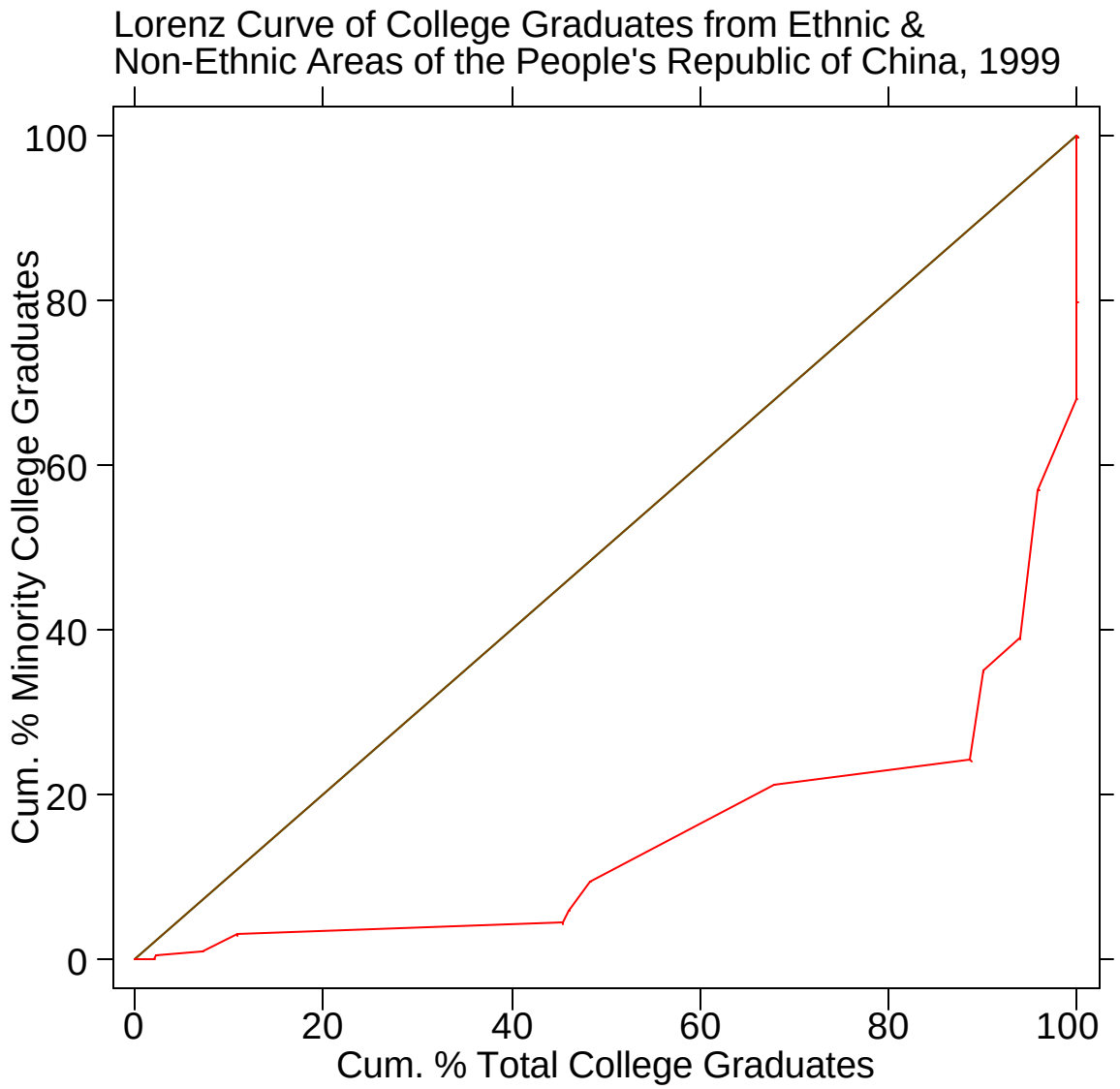


Figure 5.2. This Lorenz curve demonstrates the inequality between percentages of all college graduates and minority college graduates. The Gini coefficient = 0.68, reporting a moderate but increasingly greater inequality.

minority regions (Figure 5.3). The Gini coefficient = 0.56, also indicating a moderate level of inequality.

As a part of the preliminary analysis, Pearson's product-moment correlations were calculated between differing developmental variables. The results were interesting and sometimes unexpected (Table 5.1). Most notable correlations were between percentage of minorities as population of the national minority areas (emnaa) and the percentage of agricultural population in the national minority areas (agtpop) at 0.8019 as well as between the ethnic percentage of the total population of the region (etpop) and illiterate percentage of the total population of the region (illpop) at 0.6858. General trends (in bold type) demonstrate high positive correlation between illiteracy and birth ratio as well as a strong negative correlation between the number of college graduates and the dependency ratio. It must be noted that correlations do not imply causality.

Research Design

Substantial time has been invested here in considering the history, economic state, and relative development of minorities in the PRC. This has included a consideration in previous chapters of the extensive barriers to economic development, including geography, climate, distance and cultural disparities. Considering the current course of economic reforms in the PRC and the admitted inequities of economic growth, what benefits are reforms bringing to the minorities of China?

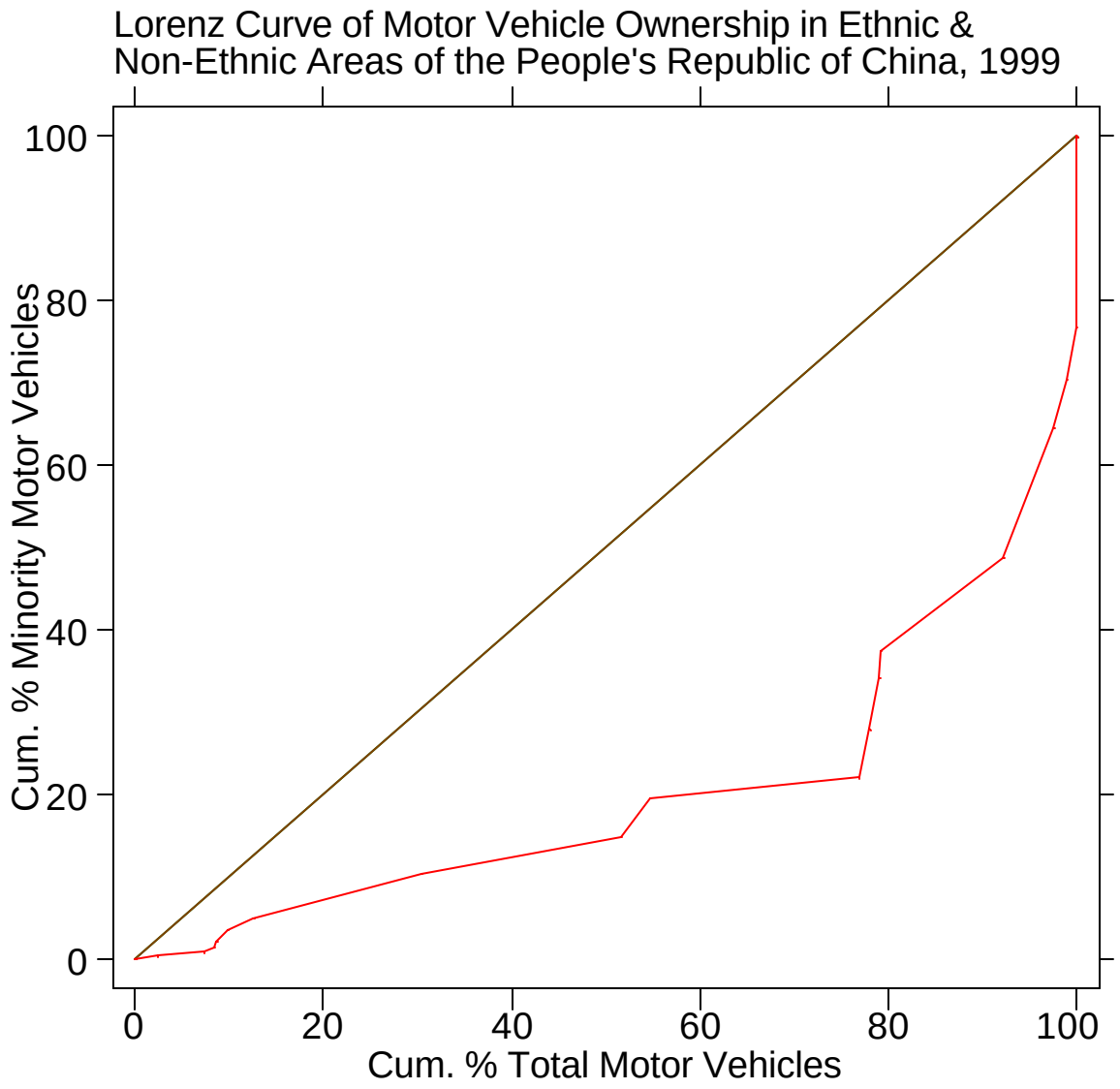


Figure 5.3. Lorenz curve demonstrating inequality of motor vehicle ownership between the populations of National Minority Autonomous Areas and the non-ethnic areas of China. The Gini coefficient = 0.56, indicating a moderate level of inequality.

Table 5.1. Pearson's Product-Moment Correlations for Various Measures of Development for Minority Populations in the PRC

	av_lv_ch	dep_rat	illpop	il_f_p	cctpc	ccmpc	ccfpc
av_lv_ch	1.0000						
dep_rat	0.8820	1.0000					
illpop	0.4514	0.4629	1.0000				
il_f_p	0.4492	0.4622	0.9922	1.0000			
cctpc	-0.7404	**-0.6013**	-0.4136	-0.4283	1.0000		
ccmpc	-0.7434	-0.6016	-0.4258	-0.4351	0.9971	1.0000	
ccfpc	-0.7305	-0.5970	-0.3976	-0.4187	0.9952	0.9848	1.0000
nmctpc	0.1516	0.0169	0.0652	0.0345	-0.0333	-0.0497	-0.0119
etpop	0.3742	0.4445	**0.6858**	0.6233	-0.1974	-0.2326	-0.1539
emnaa	0.3106	0.3128	0.4695	0.4249	-0.3134	-0.3341	-0.2860
agtpop	0.1991	0.0759	0.2963	0.2862	**-0.3425**	-0.3436	-0.3385
birthrat	0.8171	0.7639	**0.6887**	**0.6640**	-0.5846	-0.6067	-0.5523
deathrat	0.1525	0.2090	0.3979	0.4038	-0.3418	-0.3631	-0.3125
nat_gr	0.8343	0.7688	0.6584	0.6314	-0.5581	-0.5778	-0.5291

	nmctpc	etpop	emnaa	agtpop	birthrat	deathrat	nat_gr
nmctpc	1.0000						
etpop	0.3949	1.0000					
emnaa	0.2206	0.6783	1.0000				
agtpop	0.2270	0.3327	**0.8019**	1.0000			
birthrat	0.1994	0.7060	0.5569	0.3465	1.0000		
deathrat	-0.0756	0.4143	0.3883	0.1685	0.3632	1.0000	
nat_gr	0.2224	0.6738	0.5186	0.3350	0.9876	0.2124	1.0000

The variables are defined as agtpop = percent agricultural population in the Minority National Autonomous Areas (1999), av_lv_ch = birth rate of children living past first year (1999), birthrat = birth rate (1999), ccfpc = female college graduates from total pop. per capita (1999), ccmpc = male college graduates from total pop. per capita (1999), cctpc = total college graduates from total pop. per capita (1999), etpop = ethnic percentage of total pop. of region (1999), il_f_p = percentage of female illiteracy in total population (1999), illpop = percentage of illiteracy in total population (1999), nat_gr = natural growth Rate (1999), and nmctpc = total college graduates from National Minority Autonomous Areas per capita (1999).

The major hypothesis for this project shall be the following:

H_1: The continuing program of economic reforms begun in 1979 have significantly contributed to the development of minorities in The People's Republic of China.

Alternatively, the null hypothesis is:

H_0: The economic reforms begun in 1979 have not significantly contributed to the development of minorities in the PRC.

Assuming that the economic reforms of 1979 *have* significantly contributed to the development of minorities, then I would propose the following sub-hypotheses:

- Educational levels of minorities have improved and, as a result, have contributed to their economic development
- Investments in regions of high minority concentrations, where practical, have contributed to the economic development of these regions
- Improvements in the infrastructure of regions of high minority concentrations have contributed to their economic development; these improvements would necessarily include regional access such as roadways, buildings, electricity, and water for manufacturing
- Because different minority areas will have differing distribution of intervening factors such as communication, physical geography, transportation, and previous development, we can expect to find that the overall levels of development due to reform will vary significantly in regions of high minority concentrations
- As a result, we shall find that measures for quality of life, such as life expectancy, literacy, healthcare shall increase for developing minorities while other measures, such as the dependency ratio will gradually decrease (assuming that the minorities follow the demographic

transition, we could find that dependency ratio will increase before decreasing)

The data to be used in the preliminary examination of these issues will come from four representative regions of high minority concentrations: Guangxi, Guizhou, Yunnan, and Xinjiang. To test these hypotheses, the best means of analysis will be the chi-squared ($?^2$).

The $?^2$ test can be used to determine if developmental measures between the selected four minority areas vary significantly from each other. The $?^2$ test may also test whether they vary significantly across differing time periods (1952, 1980, 1990 and 1999). The hypothesis test using $?^2$ would be:

H_0: the particular measure of development does not vary significantly from the measure of development from the other group being tested

H_1: the particular measure of development tested does vary significantly from the measure of development from the other group being tested

A discussion of the results of hypothesis testing follows in the next section of this chapter.

Hypothesis Testing

A number of difficulties presented themselves in testing our major hypothesis; primarily, testable economic measures that could be tested across various periods and the selected regions. The only economic measure that was available and suited for analysis was Gross Output Value (GOV), which consists of the “total products by the whole society” for the years 1952, 1980, and 1990. These figures were divided by the total number of minorities in each

of the four minority provinces of Guangxi, Guizhou, Xinjiang and Yunnan. The figures for 1999 are not directly comparable to the first three categories in that the available GOV and population data are from the Minority National Autonomous Areas only. They are included in the analysis as reference since comparable data is not available.

It was determined that the best method to determine a significant difference between the values would be a chi-square ($?^2$) test. Since a chi-squared ($?^2$) test for independence with so few data elements yielded an insignificant result, a matrix was constructed to employ the Chi-squared Test for Differences in Probabilities, r x c (Conover, 1999, 199-202). Integers are employed in constructing the table with each column representing a nominal category. The test statistic is calculated as follows:

$$T = \sum_{i=1}^{r}\sum_{j=1}^{c}\frac{(O_{ij} - E_{ij})^2}{E_{ij}}, \quad \text{where} \quad E_{ij} = \frac{n_i C_j}{N}$$

and n_{ij} represents the number of observations in the ith sample,
C_j is the total number of observations from the jth category,
N equals the total number of observations from all samples,
O_{ij} is the observed number in the cell (i, j), and
E_{ij} is the expected number.

If the test statistic T is greater than the calculated probability, the null hypothesis is rejected. In practical application, the $?^2$ is an adequate approximation if the E_{ij} is not too small (Conover, 201).

Table 5.2 presents the matrix of GOV per capita for the selected regions and years. With a probability calculated as less than 0.001 (? > 0.95), the test statistic well exceeds the calculated probability for each of the provinces.

Thus, we reject the null hypothesis (H_0) that the GOV per capita before the reforms of 1979 does not vary significantly from those after reform. This means that we fail to reject our hypothesis (H_1) that there is a significant difference between the GOV per capita before and after the economic reforms of 1979 in the provinces of Guangxi, Guizhou, Yunnan and Xinjiang.

Using the same method to test if each of the four provinces across the period 1952-1999 differs significantly from the others, we reject the null hypothesis that they do not differ significantly. Thus, we fail to reject our hypothesis that there is a significant difference between each of the selected provinces for GOV per capita in the period 1952-1999. Table 5.3 provides the test statistics for the per capita GOV 1952-1999 for the four selected provinces.

In rejecting the null hypothesis, an analysis of a few of the measures to support the sub-hypotheses was conducted. For a few of these measures, a few seeming absurdities in the data became apparent. For example, the total number of doctors within the Minority National Autonomous Areas in 1999 was 230,138 compared to 261,888 hospital beds. The ratio is calculated to be 1.138 beds for every doctor. Yet for the minority areas of Chongqing, there are 0.540 beds for every doctor (or 1.852 doctors for every hospital bed). This compares to 1.432 hospital beds to every doctor for the general population of the PRC in 1999.[12] The minority areas of Zhejiang, Hubei, Guizhou and Tibet are similarly slanted though not to the extreme found in Chongqing.

In considering this preliminary analysis, we can likely conclude that there is a significant difference in the development of the minority provinces

Province	row	col 1 GOVpc1952	2 GOVpc1980	3 GOVpc1990	4 GOVpc1999	Total
Guangxi	1	243	1308	4279	5330	11160
Guizhou	2	206	205	435	2677	3523
Xinjiang	3	310	1245	4910	6791	13256
Yunnan	4	241	288	565	3682	4776
Total		1000	3046	10189	18480	32715

Pearson chi2(9) = 2490.0292 Pr = 0.000

Table 5.2. The r x c Contingency Table calculates the probability that the GOV per capita data in each of the columns are significantly different from each other. Since the test statistic T is greater than the calculated probability, we reject our null hypothesis and fail to reject our hypothesis that there is a significant difference between the GOV per capita before and after the economic reforms of 1979.

year	row	column 1 Guangxi	2 Guizhou	3 Xinjiang	4 Yunnan	Total
1952	1	243	206	310	241	1000
1980	2	1308	205	1245	288	3046
1990	3	4379	435	4910	565	10289
1999	4	5330	2677	6791	3682	18480
Total		11260	3523	13256	4776	32815

Pearson chi2(9) = 2527.9926 Pr = 0.000

Table 5.3. The r x c Contingency Table calculates the probability that the province data in each of the columns are significantly different from each other. Since the test statistic T is greater than the calculated probability, we fail to reject our hypothesis that there is a significant difference between each of the selected provinces for GOV per capita from 1952-1999.

from that of the majority provinces in the PRC. This conclusion tells us little of the nature of this difference and those factors involved in creating this difference. In the next chapter, we shall extend our investigation further by examining those factors likely involved through the arithmetic transformation of available data.

CHAPTER 6

ANALYSIS OF INEQUALITY

Introduction

A number of problems in the data defied simple approaches to direct comparisons across time and populations. These problems included the availability of data for desired minority areas and populations, incomparability of changing measures and changing definitions of measures. When data for minorities were available, the small numbers of data values often denied significance for most measures of analysis. Although it is felt that the Chi-squared Test for Differences in Probabilities in the previous chapter probably supports the hypothesis that there is a significant difference between the development of minorities and the majority Han populations in the tested measures of economic development, it is likely that little can be inferred from this analysis, due to this paucity of data and analyses. Another approach was necessary and reasonably useful data needed to be found. Ultimately, the original objective to test only the four selected minority provinces was found to be too limited. It was decided to expand the analysis to include other minority provinces to facilitate comparison of primarily Han provinces to those with significant minority populations. After a cursory examination of the minority populations of all provinces, it was decided that a natural break between what might be labeled either majority and minority provinces fell at approximately

15% minority population. This decision was confirmed when a review of the available statistical yearbooks of China revealed that all of the provinces above the 15% minority population standard contained officially recognized autonomous areas and all those below 15% did not.

Furthermore, the methods used in the preliminary analysis provided a number of difficulties and the decision was made to use other means. Lo (1990) noted that the difficulties of the Lorenz curve and Gini efficients include the excessive weight of outlying values in the calculations. This is troublesome in that many of the minority provinces there are extreme differences when compared to the majority provinces in available economic figures. Todaro (2000, 160) further critiques the Lorenz approach as being of questionable value in the case of "dualistic development modern-sector enlargement typology"; such a condition certainly exists in the PRC today as the country is rapidly industrializing and economic disparities are rapidly increasing.

Data and Methods

As a result of these problems, new measures and techniques were tried to utilize the available data in order to answer the posed research questions. Lo (1990) as well as Fan & Sun (2005) found the coefficient of variation (V_w) a useful measure of dispersion in their studies of inequality. Williamson (1965) defined the coefficient of variation as:

> a weighted coefficient of variation which measures the dispersion of the regional income per capita levels relative to the national average while each regional deviation is weighted by its share in

> the national population; the higher the V_w, the greater the size of geographic income differentials (p. 11).

The coefficient of variation is calculated as follows:

$$V_w = \sqrt{\frac{\sum_i (y_i - \bar{y})^2 \frac{fi}{n}}{\bar{y}}}$$

where

fi = population of i^{th} region
n = national population
y_i = economic measure of the i^{th} region (*i.e.*, Gross Domestic Product per capita), and
$\bar{y}$ = national economic measure.

In addition to the coefficient of variation, a new factor was calculated by altering the formula for the coefficient of variation to create the inequality index (IE). The inequality index allows a comparison of individual provinces in which zero represents equality. It is calculated as:

$$IE = \frac{(y_i - \bar{y})\frac{fi}{n}}{\bar{y}} * 100$$

with the variables defined the same as the coefficient of variation formula above.

Similar to the coefficient of variation, the inequality index provides a relative scale based on the mean but provides a measure of inequality for each element in the set. The value for any particular element indicates whether it is above or below the mean by whether the value is either positive or negative. For our purposes, provinces with a positive inequality index are faring better than the mean and those provinces with a negative inequality index are faring

more poorly than the mean of all the provinces. This provides ease in comparing one province to another, particularly when mapping areal distribution of any given phenomenon. It is particularly useful when the classes remain the same across time, allowing ready recognition of trends as demonstrated in Figures 6.4 through 6.10 below.

The coefficient of absolute deviation (M_w) is easily calculated from the same data as the coefficient of variation, allowing comparisons where the polarity (+/-) of deviation from the group mean is not desired. It is calculated as:

$$M_w = \frac{\sum_i |y_i - \bar{y}| \frac{fi}{n}}{\bar{y}} * 100$$

with variables defined as above in the coefficient of variation formula. The mean is equal to one and no value is below zero.

To measure development across time, a survey of the definitions for available measures was conducted. The goal was to find measures that did not radically change in definition and lent itself to transformation, if necessary, to units not subject to devaluation due to inflation of currency.

An example of this was the utilization of yearly Gross Domestic Product (GDP) and Gross National Product (GNP) data. Some yearbooks listed GDP and GNP. Other listed only GNP and not GDP. The definition for GDP was found to be the total domestic product including foreign investment. GNP was found to be total domestic product excluding foreign investment (Todaro, 2000, 43; Central Statistics Office, 2006). In those yearbooks that included both

measures, the difference between both measures were judged to be negligible since foreign investment in a country the size of the PRC was often less than 1% of the GDP. GDP/GNP was then divided by population to generate GDP per capita figures used in all of the calculations.

Since GDP per capita could not be compared across time due to inflation, the coefficient of variation (V_w) was calculated for each time point. Since the coefficient of variation could only be calculated for the PRC as a whole, the inequality index was calculated to provide a measure for each of the individual provinces. A scale with a positive as well as a negative range proved useful in perceiving those provinces doing well or poorly; when mapped, the index reveal geographical patterns. An additional measure, the coefficient of absolute deviation (M_w), was calculated where appropriate.

Additional calculations for each province yielded fractions of the national GDP per capita and average annual growth rate (AAGR) of fractions of the national GDP per capita charted the relative position of minority provinces within the total economy of the PRC.

Results of the Inequality Analysis

Once the GDP/GNP per capita values were transformed and their coefficients of variation and inequality indices were calculated, the results were graphed and then mapped. Figure 6.1 graphs the interprovincial inequality in GDP per capita for the years 1990 to 2004. As can be seen, inequality grew drastically during the whole period, starting from $V_w = 18.288$ in 1990 increasing to $V_w = 41.08$ in 1998 and finally ending with $V_w = 57.94$ in 2004.

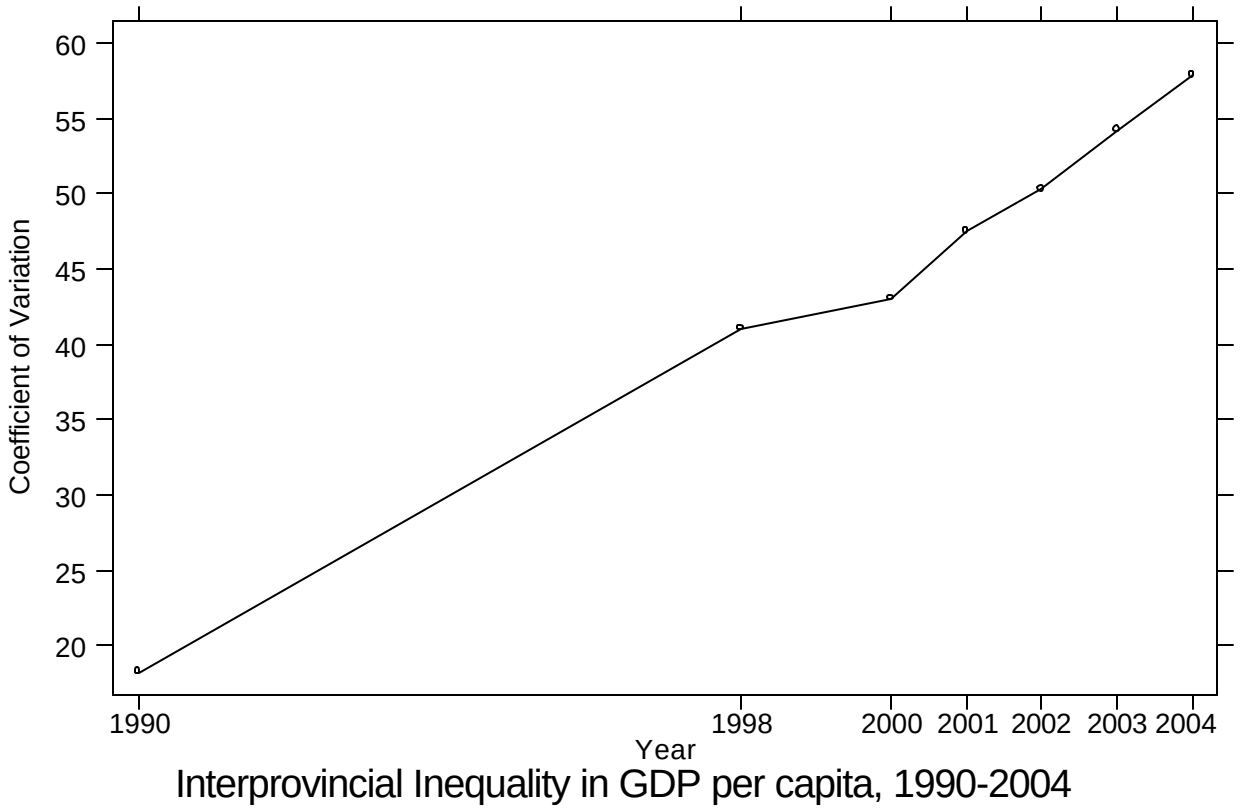


Figure 6.1. The Interprovincial Inequality in GDP per capita demonstrates the increasing inequality in all of the PRC between the years 1990 and 2004.

Figure 6.2 depicts a similar rate of growth in the coefficient of variation among the minority provinces themselves, starting with a minority V_w = 6.983 in 1990, increasing to a minority V_w = 16.078 in 1998 and ending with a minority V_w = 24.42 in 2004. The numerical values of this graph must be placed within the context of the lesser-developed economies of the minority provinces as a whole. It is possible that the major outlier, Liaoning, extends the range of inequality among the minority provinces (see Figure 6.3, Fraction of GDP per capita 1990-2004). Although technically a minority province, Liaoning is a coastal province and has received substantial state investment for a number of years. The primary minority of this region, the Man, was the last ruling dynasty of imperial China and is essentially assimilated in modern society today.

The inequality indices for each of the provinces of China were then calculated for the years 1990-2004 and appear in Figures 6.4 to 6.10 below. The classes for all the maps in this series were standard so that the movement of individual provinces can track across time. Generally, the coastal provinces are faring better than the rest of the nation, the only exception being Jilin, in the northeast between Liaoning and Heilongjiang. As each year passes, the southern coastal provinces prosper more unequally as they shift from the lower positive inequality to the higher class of inequality. In 1998, we see that a couple of the minority provinces, Xinjiang and Tibet, do not fare as poorly as other western provinces. This is likely due to massive investment into the infrastructure of both provinces. Xinjiang has also been the target of the “Go

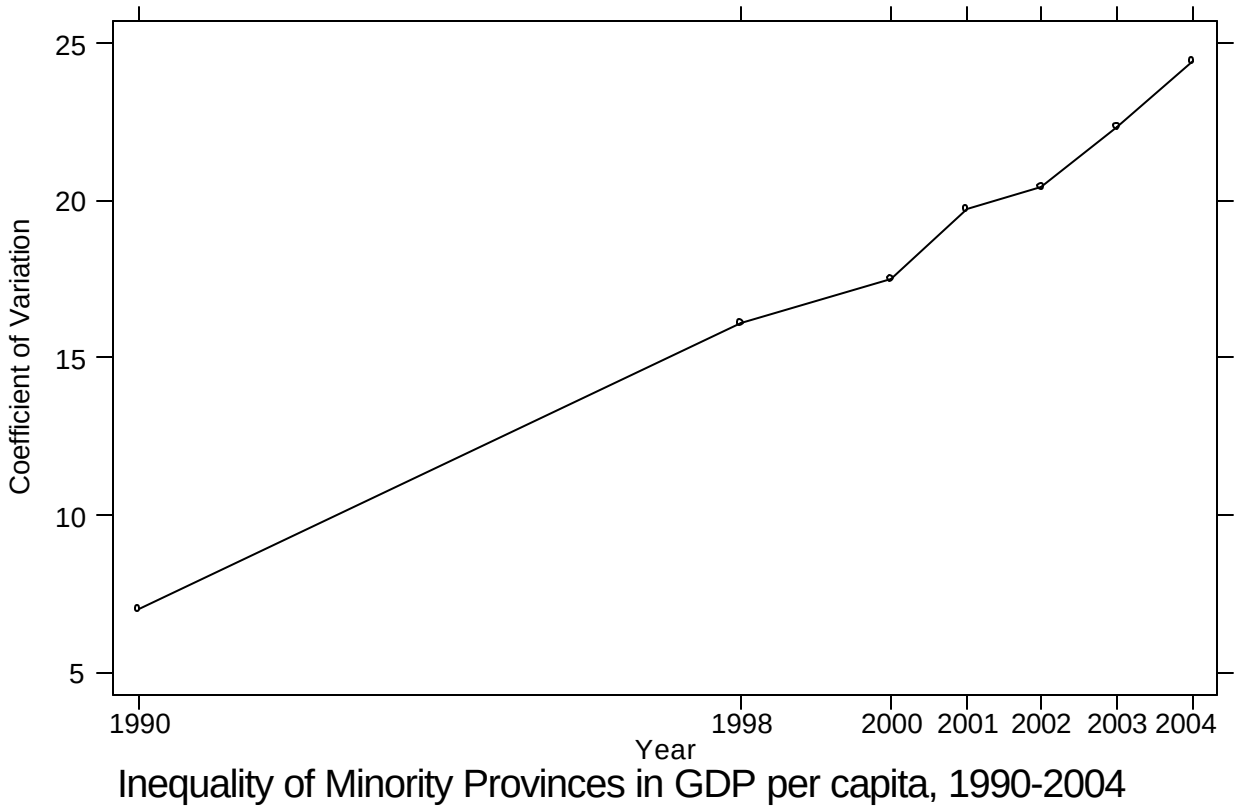


Figure 6.2. The graph demonstrates that the coefficient of variation for the minority provinces of the PRC in the years 1990-2004 were not as severe as that for all provinces but increased at the same rate. The lower numerical values must be placed within the context of the disproportionate position that the minority provinces already occupy.

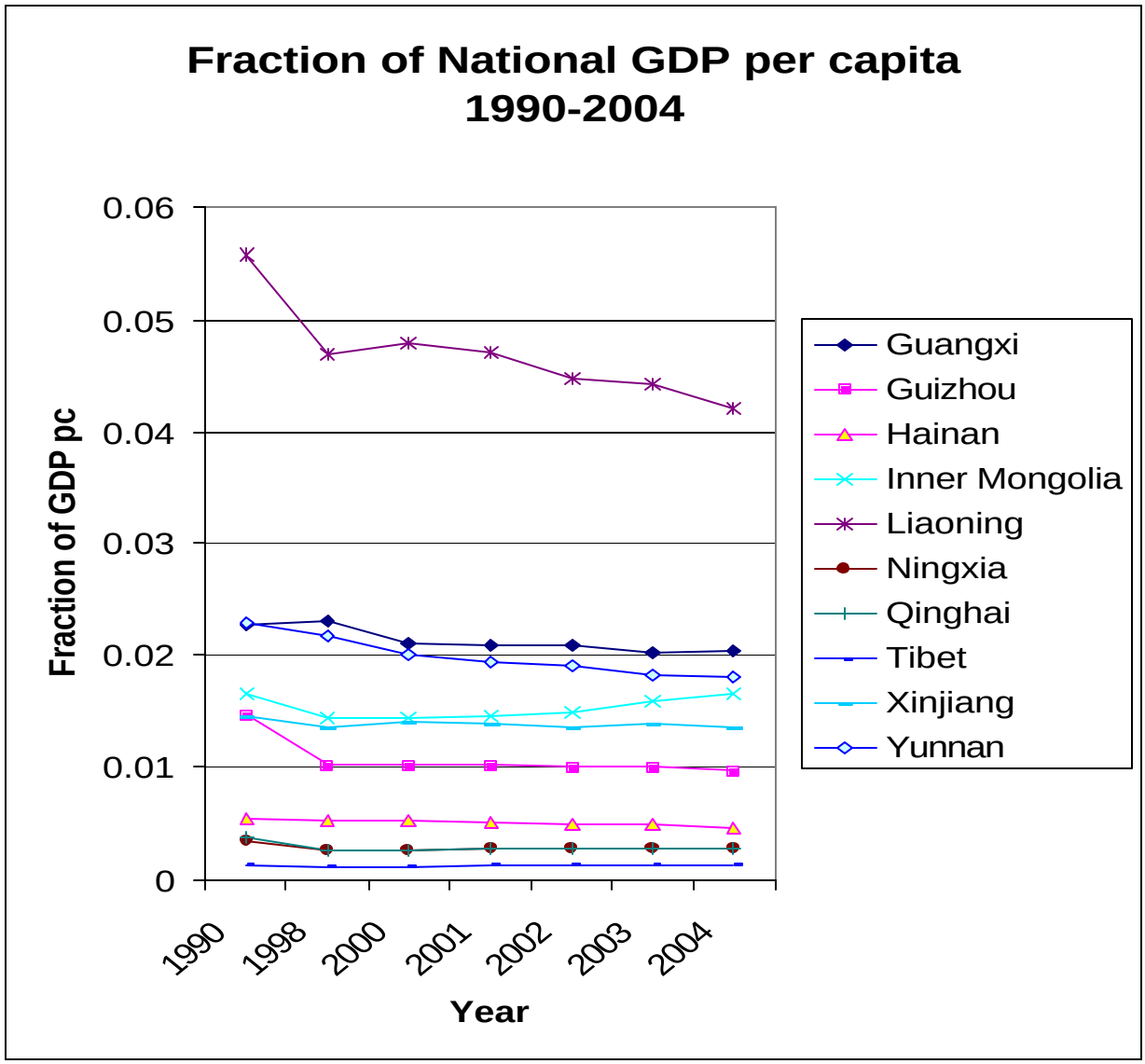


Figure 6.3. This graph depicts the proportional fraction of the national GDP per capita each minority province produced in the years 1990-2004. Most notable as a positive outlier is Liaoning. Although Liaoning is technically a minority province, it is a coastal province that has received substantial government investment for a number years.

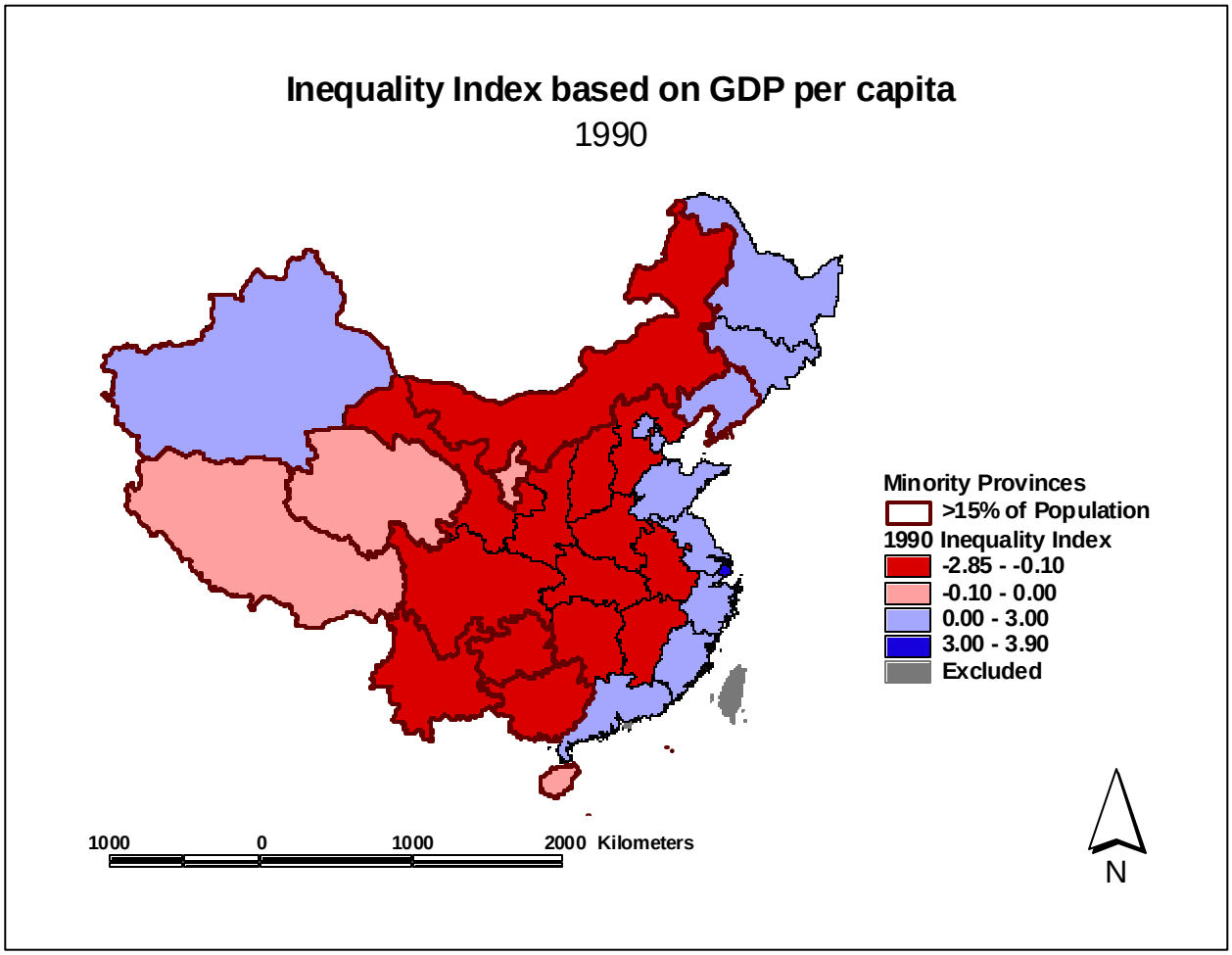


Figure 6.4. Inequality indices based on the GDP per capita for the provinces of the PRC in 1990. The minority provinces are outlined.

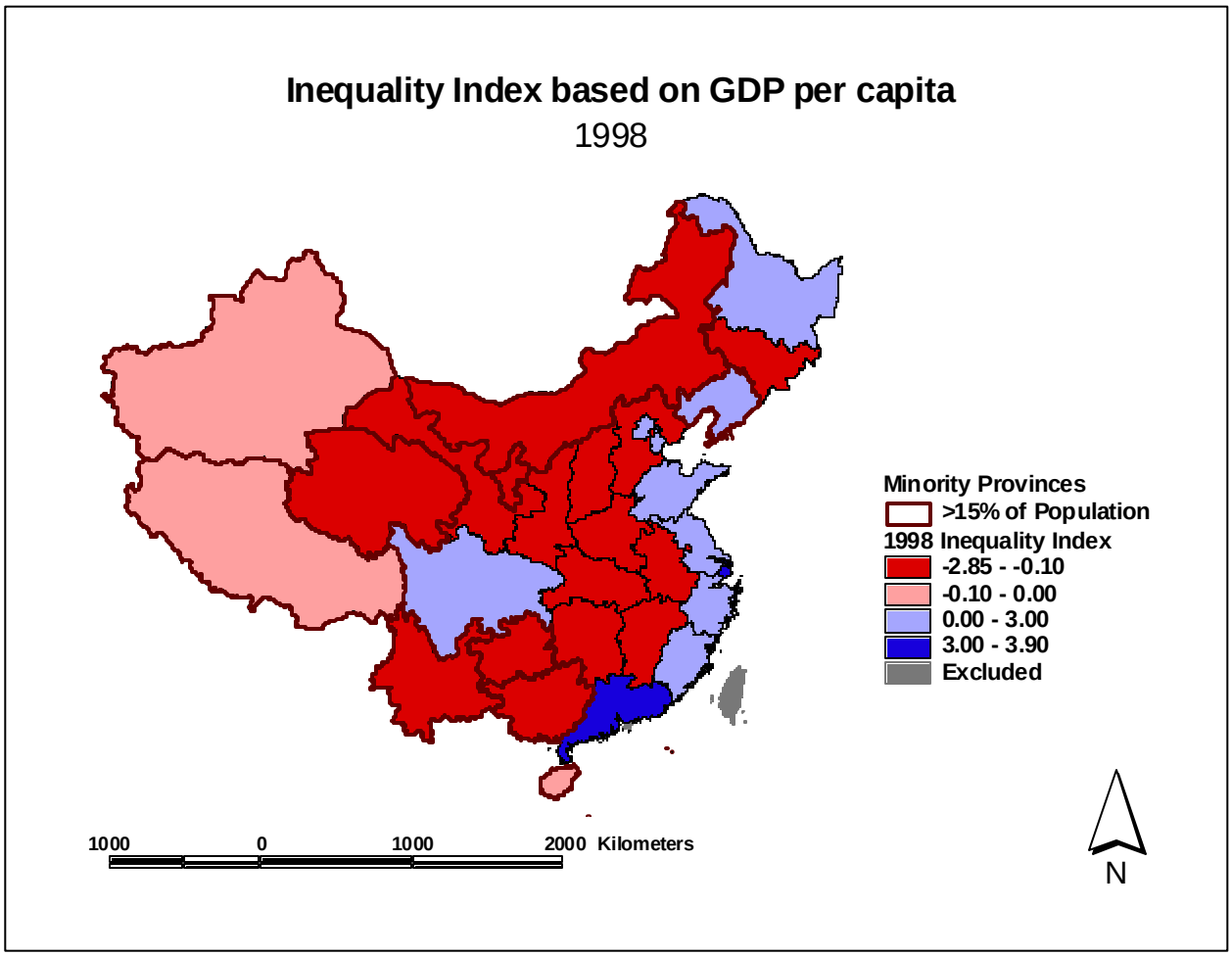


Figure 6.5. Inequality indices based on the GDP per capita for the provinces of the PRC in 1998.

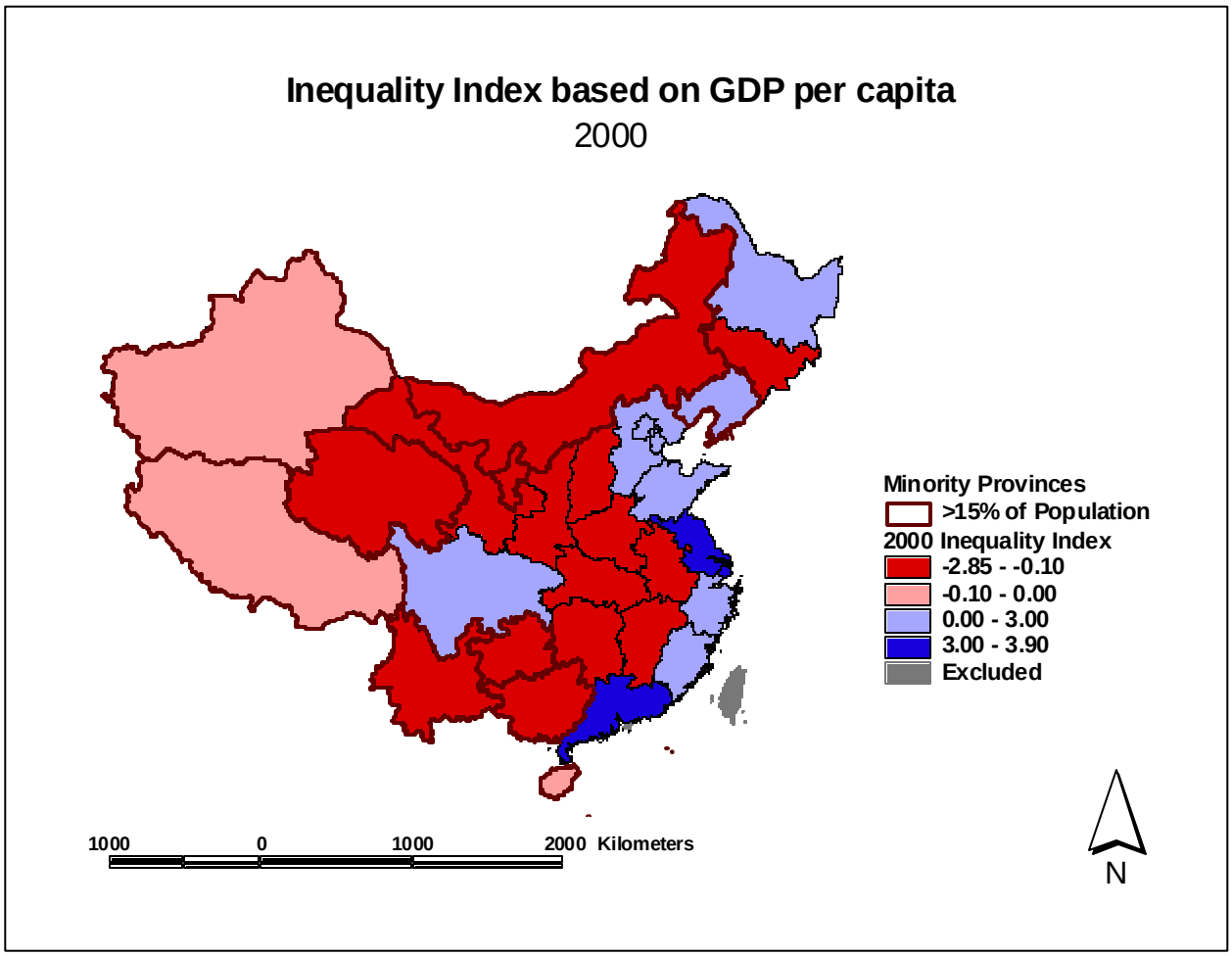


Figure 6.6. Inequality indices based on the GDP per capita for the provinces of the PRC in 2000.

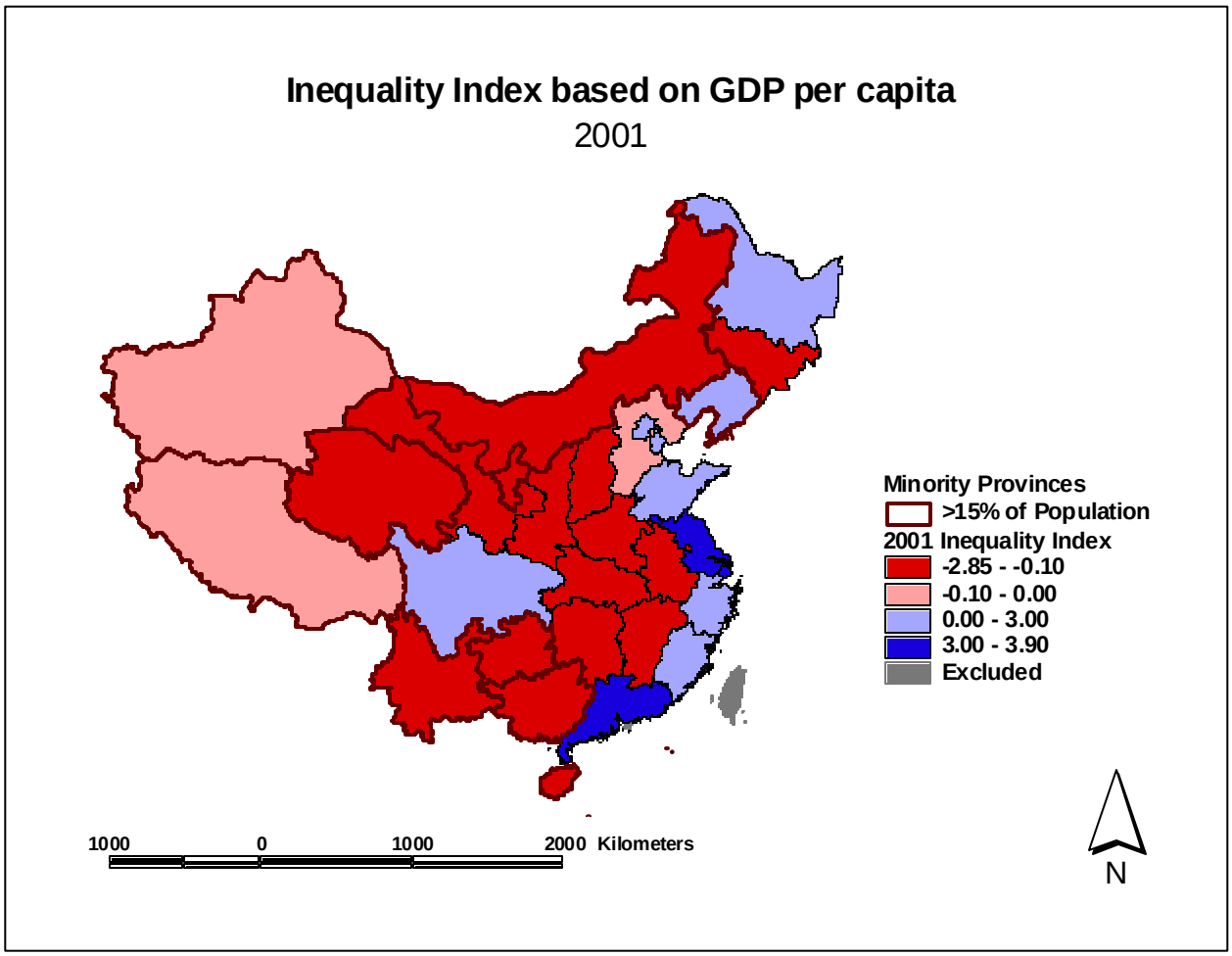


Figure 6.7. Inequality indices based on the GDP per capita for the provinces of the PRC in 2001.

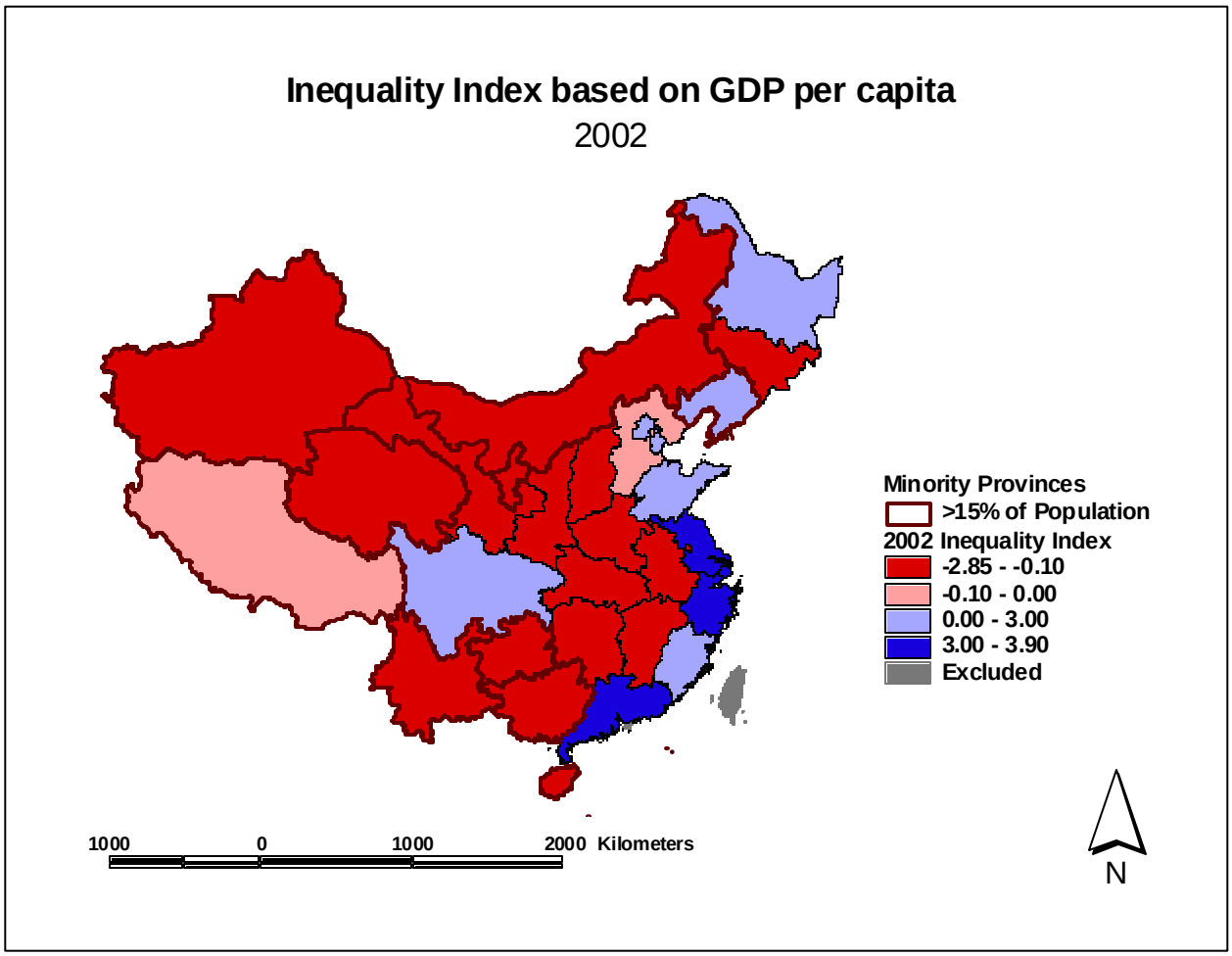


Figure 6.8. Inequality indices based on the GDP per capita for the provinces of the PRC in 2002.

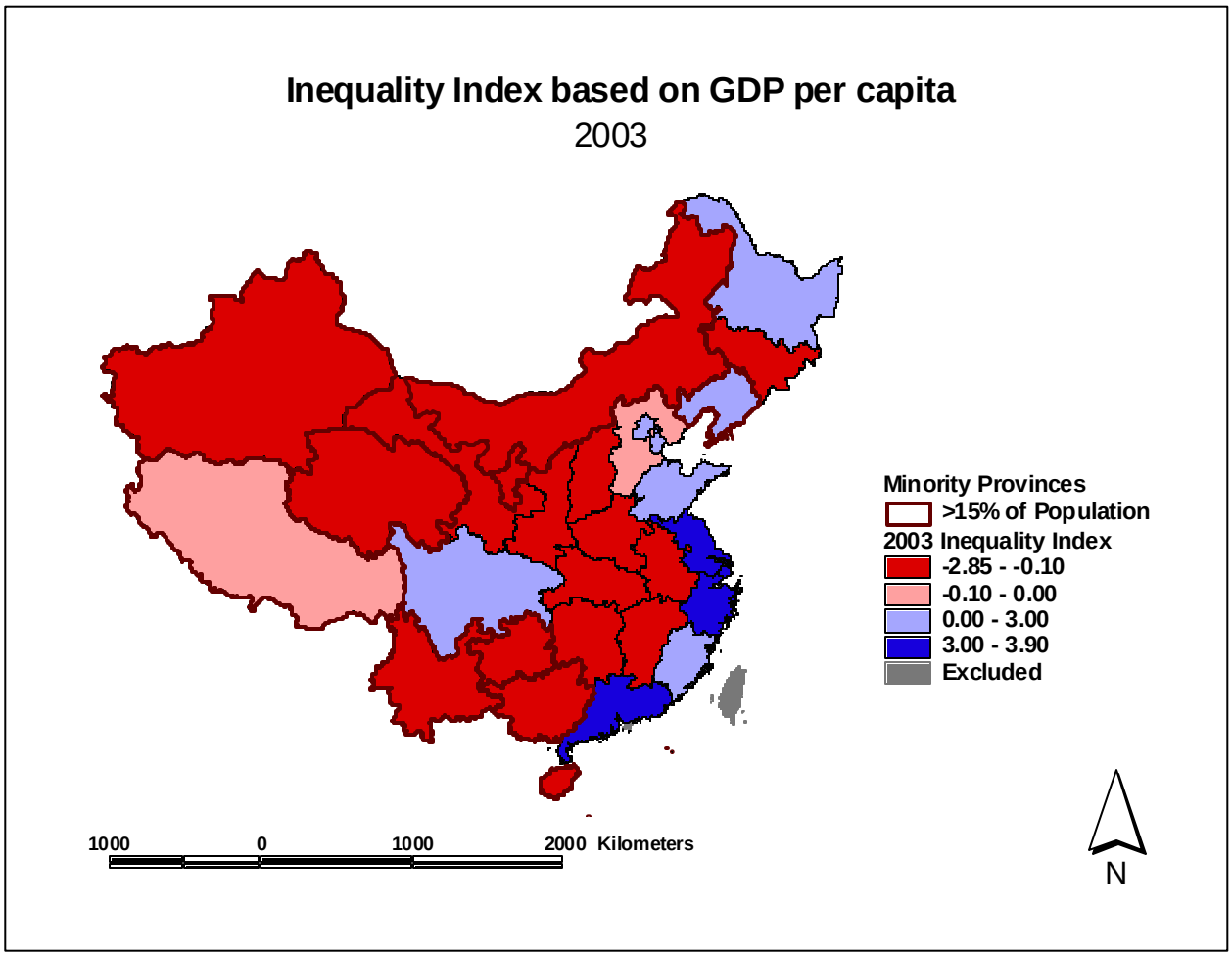


Figure 6.9. Inequality indices based on the GDP per capita for the provinces of the PRC in 2003.

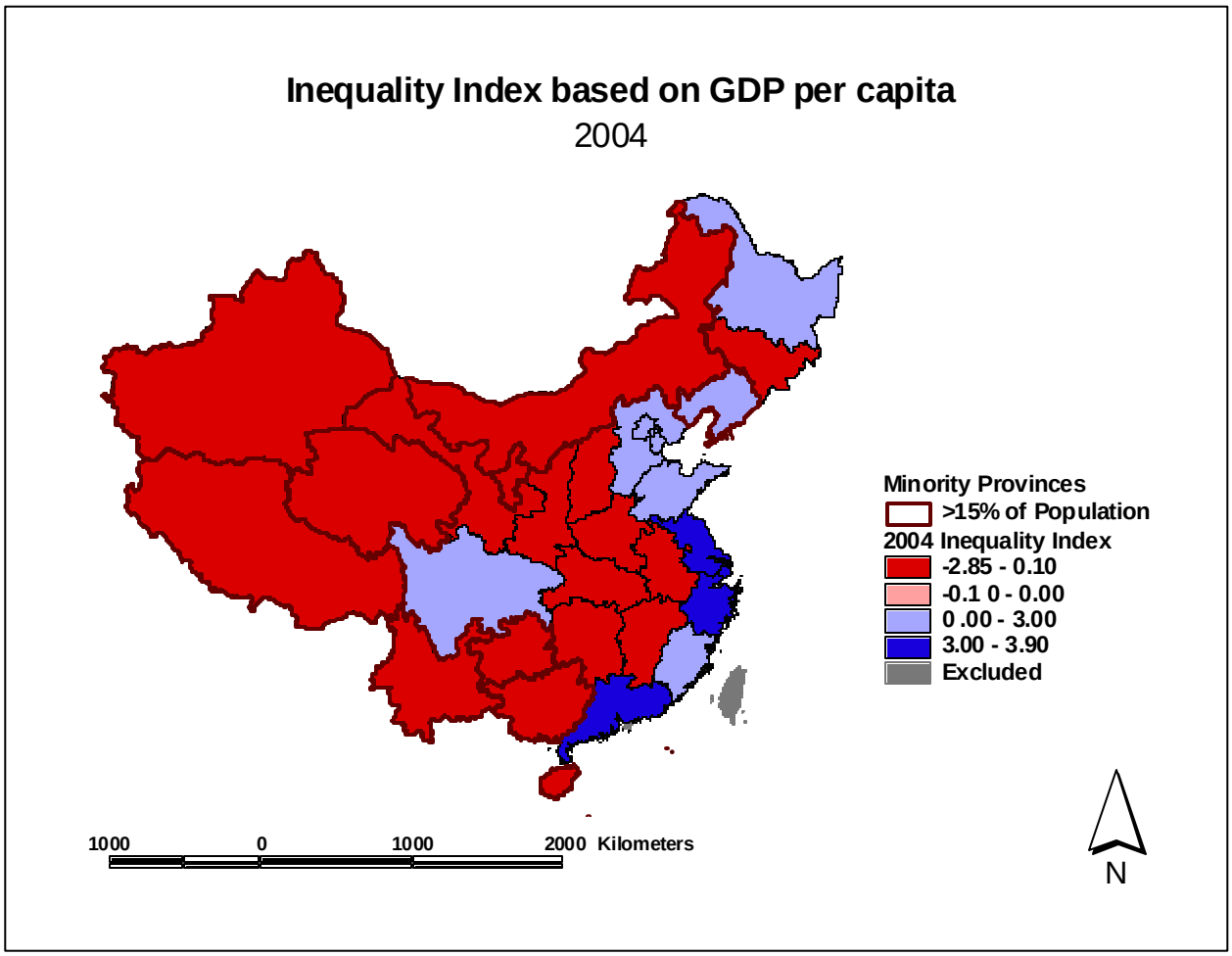


Figure 6.10. Inequality indices based on the GDP per capita for the provinces of the PRC in 2004.

West" strategy in recent economic planning. However, as time passes, even these provinces slip into the class of the greatest negative inequality.

As the changes in GDP per capita were examined across time, it was believed that more might be learned by observing their growth rates. The Average Annual Growth Rates (AAGR) in GDP per capita were calculated for both minority and all provinces of the PRC and then plotted in Figure 6.11 below. The AAGR was calculated using the following formula:

$$AAGR = \left(\frac{y_0}{y_n} \right)^{\left(\frac{1}{n}\right)} - 1$$

where

y_0 = beginning amount
y_n = ending amount, and
n = number of years.

The resulting rate is then multiplied by 100 to create percentages. As can be noted, while the minority AAGRs started far below those of all provinces in 1990, they rose above the majority provinces in 2000, peaking above the majority provinces in 2001 and then gradually sank below the level of growth for the majority provinces. Note also that the only positive growth rates for either group occurred only in the years 2000-2002, as delineated by the line of zero growth. All points in the curves above this line indicate positive growth while all points below the line indicate negative growth rates.

Table 6.1 provides an assemblage of the fractions of national GDP per capita, their ranks among all provinces of the PRC, and AAGRs in the period from 1990 to 2004. The mean fraction of GDP per capita for all the provinces

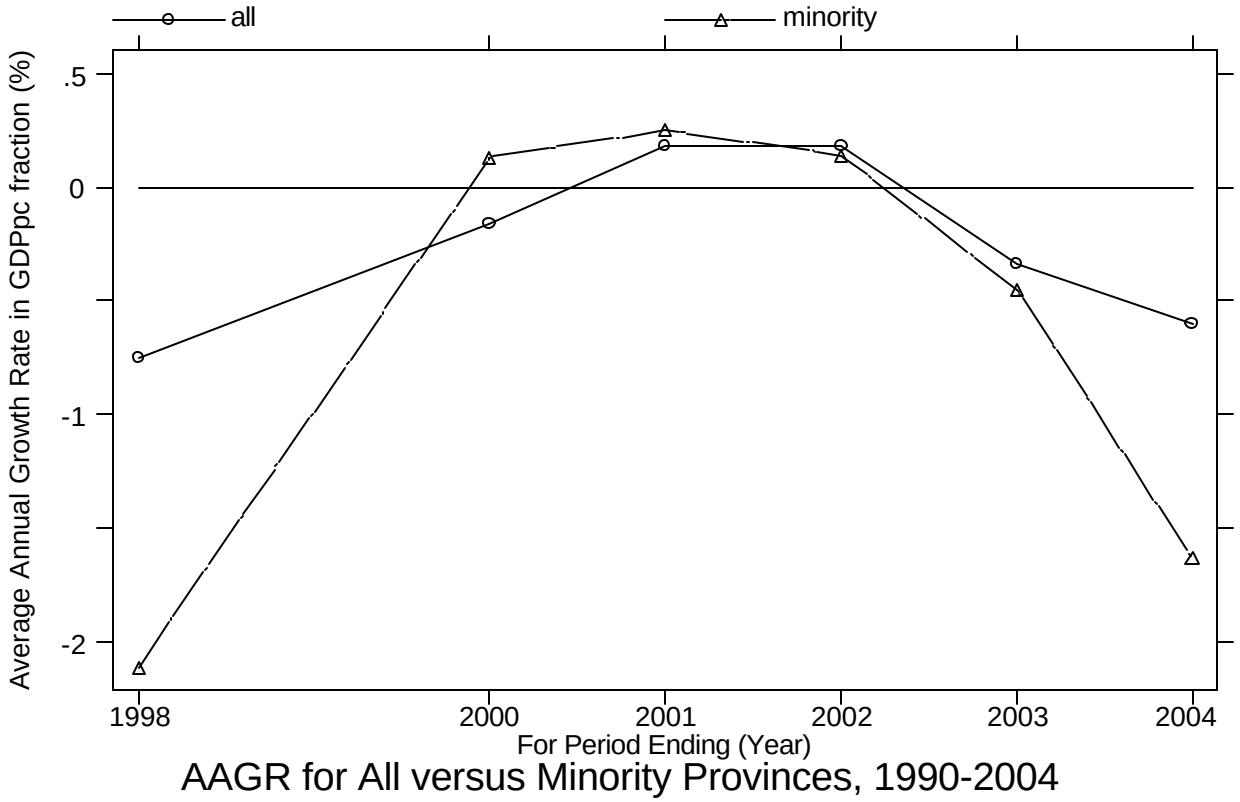


Figure 6.11. The Average Annual Growth Rates (AAGR) of GDP per capita were calculated for both minority and all the provinces of the PRC and then plotted. Note that the only positive growth rates for either group occurred only in the years 2000-2002, as delineated by the line of zero growth. All points in the curves above this line indicates positive growth while all points below the line indicate negative growth rates.

Table 6.1. Level and growth of GDP per capita, 1990-2004

Minority	GDP per capita (as a fraction of the national GDP per capita)							Rank (among all provinces)							Deviation from Mean (mean = 1)						Average Annual Growth Rate (%)					
Provinces	1990	1998	2000	2001	2002	2003	2004	1990	1998	2000	2001	2002	2003	2004	1990	1998	2000	2001	2002	2003	1990-1998	1998-2000	2000-2001	2001-2002	2002-2003	2003-2004
Guangxi	0.023	0.023	0.021	0.021	0.021	0.020	0.020	29	26	26	28	28	28	27	0.54	0.56	0.56	0.52	0.51	0.50	0.13	-4.22	-0.91	-0.02	-3.42	0.79
Guizhou	0.015	0.010	0.010	0.010	0.010	0.010	0.010	30	30	30	30	30	30	30	0.45	0.32	0.34	0.32	0.31	0.31	-4.53	0.25	-0.58	-0.76	-0.78	-2.53
Hainan	0.006	0.005	0.005	0.005	0.005	0.005	0.005	15	16	15	15	16	16	17	0.83	0.80	0.81	0.76	0.75	0.73	-0.46	0.30	-4.13	-0.57	-2.64	-4.79
Inner Mongolia	0.017	0.014	0.014	0.014	0.015	0.016	0.017	18	17	18	18	17	14	12	0.77	0.70	0.72	0.72	0.74	0.80	-1.75	0.03	0.46	3.23	6.16	4.72
Liaoning	0.056	0.047	0.048	0.047	0.045	0.044	0.042	4	8	8	8	8	8	9	1.42	1.29	1.35	1.33	1.28	1.26	-2.16	1.21	-1.85	-4.95	-1.17	-4.93
Ningxia	0.004	0.003	0.003	0.003	0.003	0.003	0.003	19	25	24	22	24	24	23	0.76	0.58	0.58	0.59	0.58	0.59	-3.10	-0.29	2.30	0.26	1.46	-0.81
Qinghai	0.004	0.003	0.003	0.003	0.003	0.003	0.003	13	23	20	20	18	19	20	0.86	0.60	0.62	0.64	0.65	0.65	-4.48	0.97	3.95	2.98	-0.82	-0.90
Tibet	0.001	0.001	0.001	0.001	0.001	0.001	0.001	22	28	28	23	22	22	25	0.64	0.50	0.55	0.58	0.61	0.60	-3.09	4.74	7.53	5.71	-0.90	-4.80
Xinjiang	0.015	0.013	0.014	0.014	0.014	0.014	0.013	9	13	13	12	13	12	13	0.96	0.88	0.87	0.88	0.85	0.86	-0.97	2.00	-0.87	-2.25	1.85	-2.71
Yunnan	0.023	0.022	0.020	0.019	0.019	0.018	0.018	26	24	27	27	27	27	28	0.62	0.60	0.56	0.53	0.52	0.50	-0.70	-3.66	-3.38	-2.24	-4.25	-0.33
Total Minority	0.162	0.141	0.140	0.138	0.135	0.134	0.132																			
Mean	0.016	0.014	0.014	0.014	0.014	0.013	0.013														-2.11	0.13	0.25	0.14	-0.45	-1.63
CV	6.983	16.078	17.490	19.715	20.441	22.357	24.417																			
All Provinces																										
Mean	0.034	0.034	0.034	0.034	0.034	0.034	0.034														-0.75	-0.16	0.18	0.18	-0.34	-0.60
CV	18.288	41.081	43.064	47.594	50.354	54.250	57.943																			

Sources: NBS (1991, 1999, 2001-2004)

of the PRC is 0.034 (or 34%); at the same time, the coefficient of variation increases dramatically, from 18.288 in 1990 to 57.943 in 2004. A similar rise of inequality is seen among the minority provinces themselves, perhaps reflecting the vast differences seen, ranging from 0.001 fraction of GDP per capita in Tibet to 0.042 fraction of GDP per capita in Liaoning in 2004. A general downward trend in rank is noted among all minority provinces with a couple of notable exceptions. Among these is Inner Mongolia, moving from a low of 18 in 1990 to a high of 12 in 2004; this is reflected in Inner Mongolia's absolute deviations from the mean and phenomenal increases in AAGR of GDP per capita; moving from an AAGR of –1.75% in the period 1990-1998 to 4.72% in the period 2003-2004, well above the mean minority AAGR of –1.63%. It may be that China's economic policies are starting to influence the first of the westward provinces.

Other provinces have not seen overall progress. Guizhou has remained ranked 30th throughout the time period and has seen AAGR increase somewhat from –4.53% in the period 1990-1998 to –2.53% in the period 2003-2004; the absolute deviation from the mean decreased from 0.45 to 0.31 in the same period, providing a hope that this province may eventually approach the provincial mean for GDP per capita. Similar trends can be seen in Ningxia and Yunnan.

In looking at the coincidence of minority provinces and negative inequality, we may be tempted to ask what is the relationship between inequality and minority percentage. Figure 6.12 presents a scatterplot of

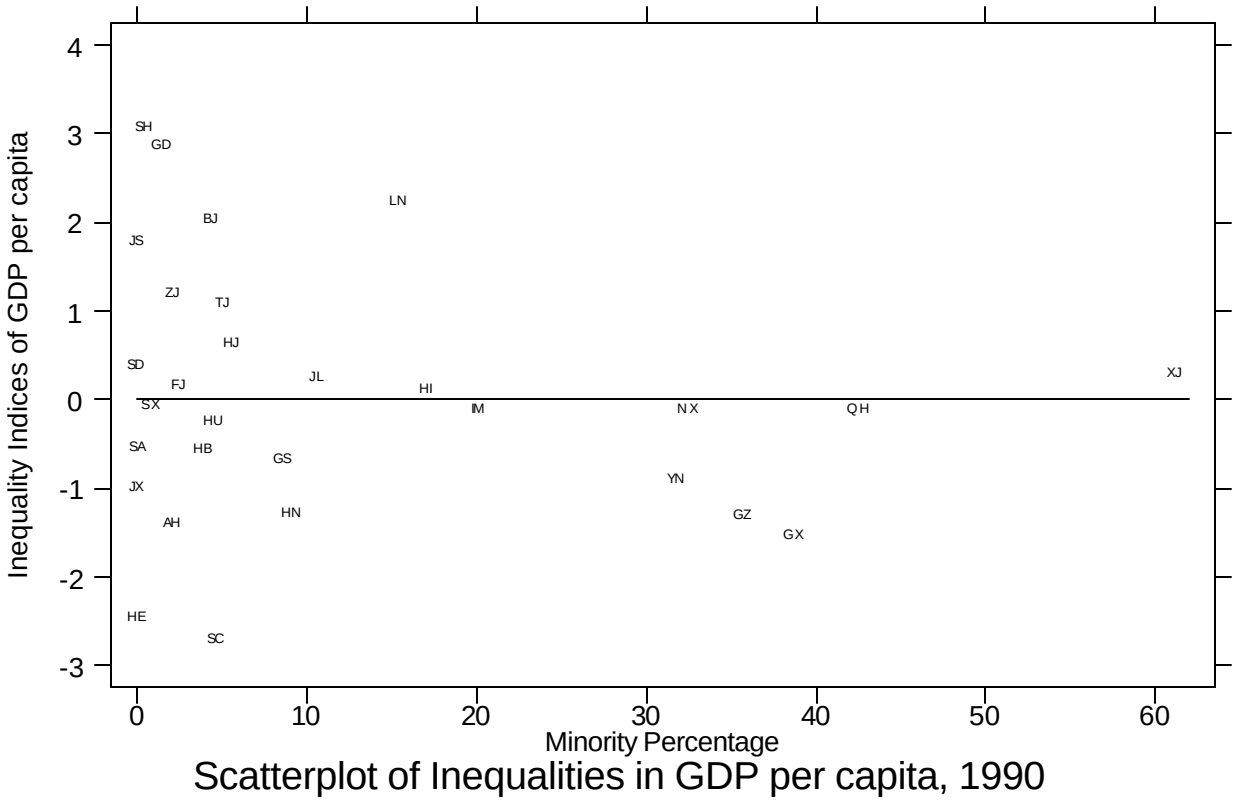


Figure 6.12. This scatterplot graphs the Inequality Indices (IE) of GDP per capita of all provinces on their minority percentages in 1990. Since Tibet was such an extreme outlier, it was dropped from this plot. Two letter codes were used to represent all the provinces of the PRC. The letter codes used are as follows: Anhui, AH; Beijing, BJ; Fujian, FJ; Gansu, GS; Guangdong, GD; Guangxi, GX; Guizhou, GZ; Hainan, HI; Hebei, HB; Heilongjiang, HJ; Henan, HE; Hubei, HU; Hunan, HN; Inner Mongolia, IM; Jiangsu, JS; Jiangxi, JX; Jilin, JL; Liaoning, LN; Ningxia, NX; Qinghai, QH; Shaanxi, SA; Shandong, SD; Shanghai, SH; Shanxi, SX; Sichuan, SC; Tianjin, TJ; Tibet, TB; Xinjiang, XJ; Yunnan, YN; and Zhejiang, ZJ.

inequality indices of GDP per capita graphed on minority percentage in 1990. A similar scatterplot was produced for 2004 (Figure 6.13). Since Tibet was such an extreme outlier, it was dropped from both graphs. This is to render these graphs more legible and is justified by the unique circumstances related earlier in this thesis. Where the province minority percentage is less than 10% in the period between the years 1990 to 2004, there is a general increase in inequality, both in the positive and negative areas of these plots. Eastern provinces such as Jiangsu and Guangdong have prospered greatly in this period. Certain minority provinces, such as Guangxi and Guizhou, have fared slightly poorer in comparison to other provinces in the PRC. Seeing the possibility of a pattern suggested in these plots, the decision was made to calculate pair-wise correlations on a number of factors to investigate the relationships involved.

As stated earlier, the number of measures were limited; however, a number of factors which may be in some way correlated to the development of provinces and represented the various factors involved in development were selected. Factors considered were investment in fixed assets (TIFxAs) as a measure of economic infrastructure, the percentage of state owned enterprises (StOpc) to represent the large portion of the enterprises still operated by the state, and junior secondary education (JrScSh) to represent human capital. As the data were collated and examined, a couple of other factors were noticed. The statistical yearbooks always class the provinces in particular geographic groups and it seemed that many of these groupings shared similar

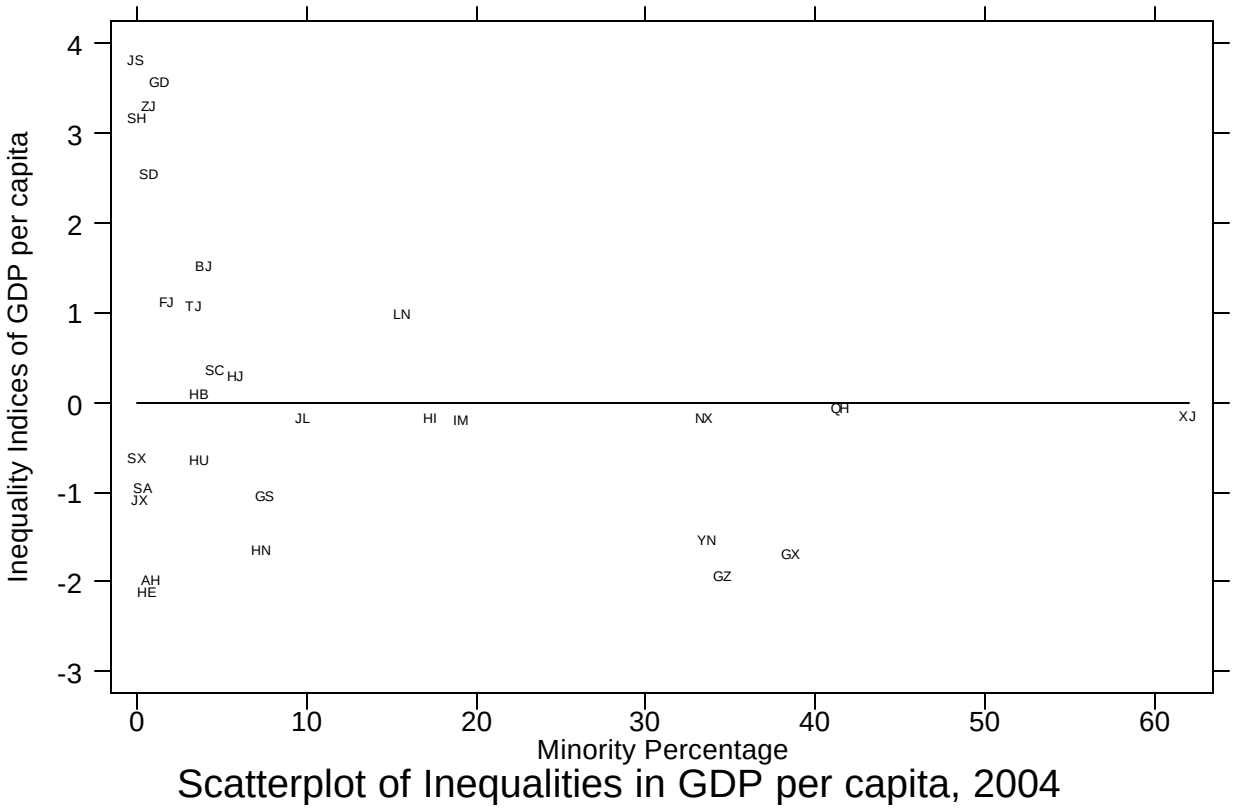


Figure 6.13. This scatterplot graphs the Inequality Indices (IE) of GDP per capita of all provinces on their minority percentages in 2004. Since Tibet was an outlier, it was dropped from this plot. We can observe that when the minority percentage grows larger than 10%, the inequality index tends to trend down in the period between the years 1990 to 2004. The two letter codes used are as in the previous figure. The data for Chongqing was combined with Sichuan to allow comparison with 1990 data.

characteristics. Each of the provinces was coded according to yearbook classes (yrbkorder) and this code served as a variable in subsequent operations. These codes are represented in the map in Figure 6.14. As can be seen from the map, the codes convey a measure of distance from the coastal northeast. The codes number from 1 to 33 where smaller numbers indicate proximity to the coast and larger number specify the interior. They are, thus, a relevant locational factor.

Since population density (popden) seemed to also correlate with other developmental factors, it was included as another factor (see Figures 6.15-6.17) for analysis. Population density seems to correlate with other factors of development in the various provinces. At the beginning of economic reforms, the map of population density for 1982 (Figure 6.15) shows that the highest population density occurred in the mid-coastal provinces as well as in the province-level cities of Beijing, Tianjin and Shanghai. These areas showed the highest levels of economic development in the PRC during this period. The map of population density of 1990 (Figure 6.16) maintains the same classes as the previous map; thus, we can say that in 1990, population density seems to have spread from the core mid-coastal provinces noted in Figure 6.15 as well as increase in Guangdong, the province (surrounding both Hong Kong and Macau). Guangdong saw the installation of the first of the Special Economic Zones (SEZs) in Shenzhen and an accompanying rapid increase in industrialization. Figure 6.18 provides a plot demonstrating the differences between the majority and minority mean population densities in the years

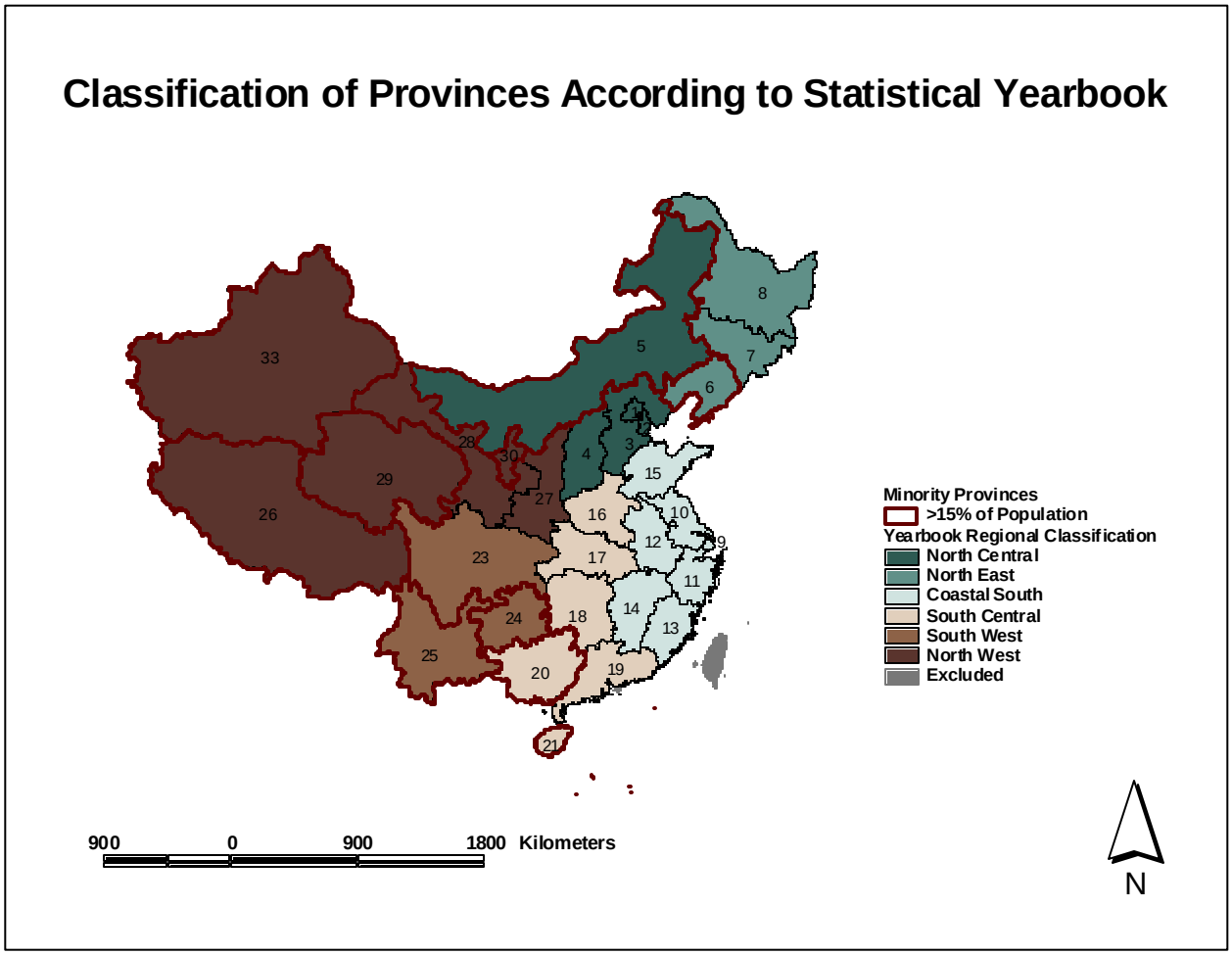


Figure 6.14. The position of the various provinces within the statistical yearbooks provided a convenient geographic classification as well as a likely factor for analysis of economic development.

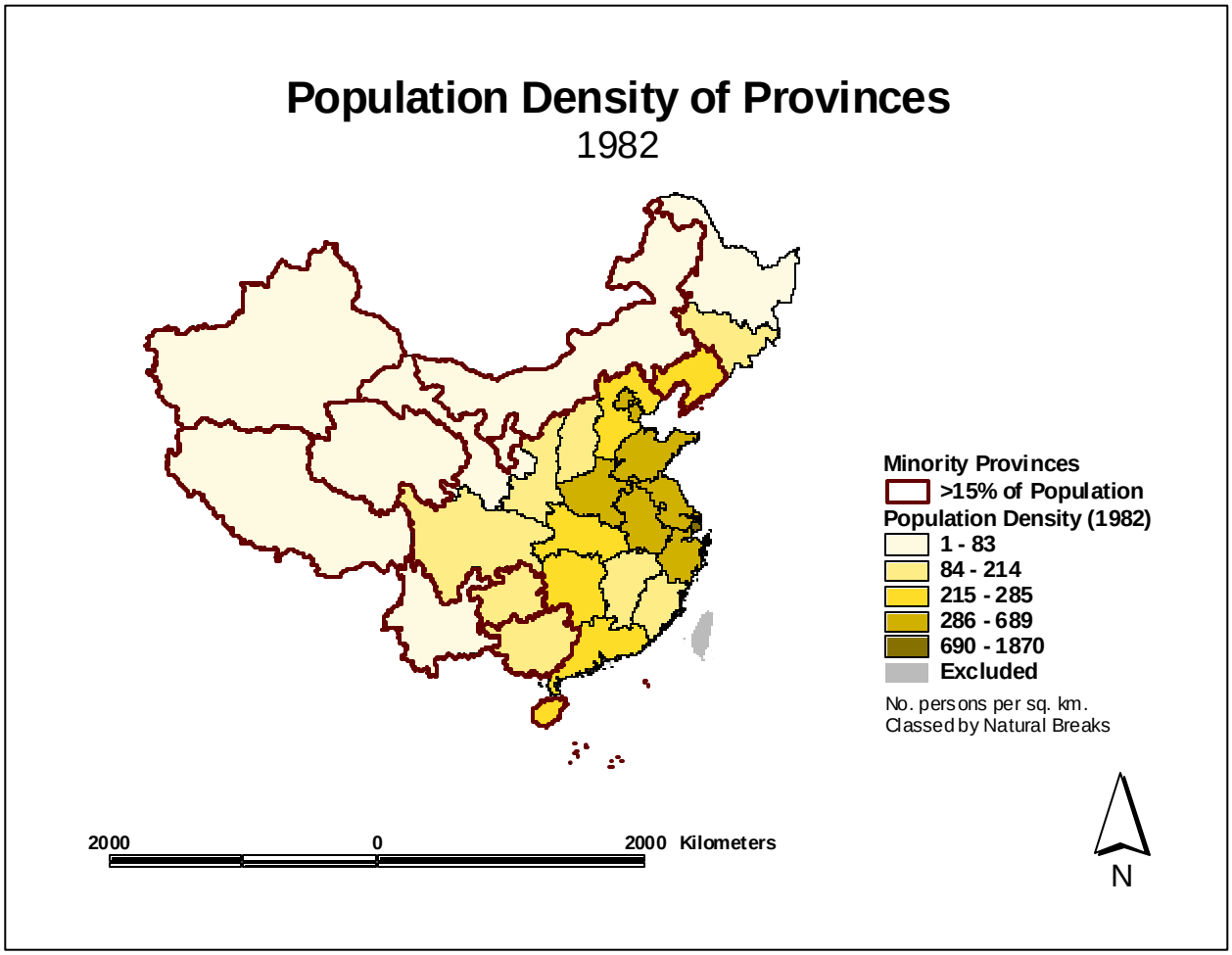


Figure 6.15. Population density seems to correlate with other factors of development in the various provinces. At the beginning of economic reforms, this map of population density for 1982 shows that the highest population density occurred in the mid-coastal provinces as well as in the province-level cities of Beijing, Tianjin and Shanghai. These areas showed the highest levels of economic development in the PRC at this time.

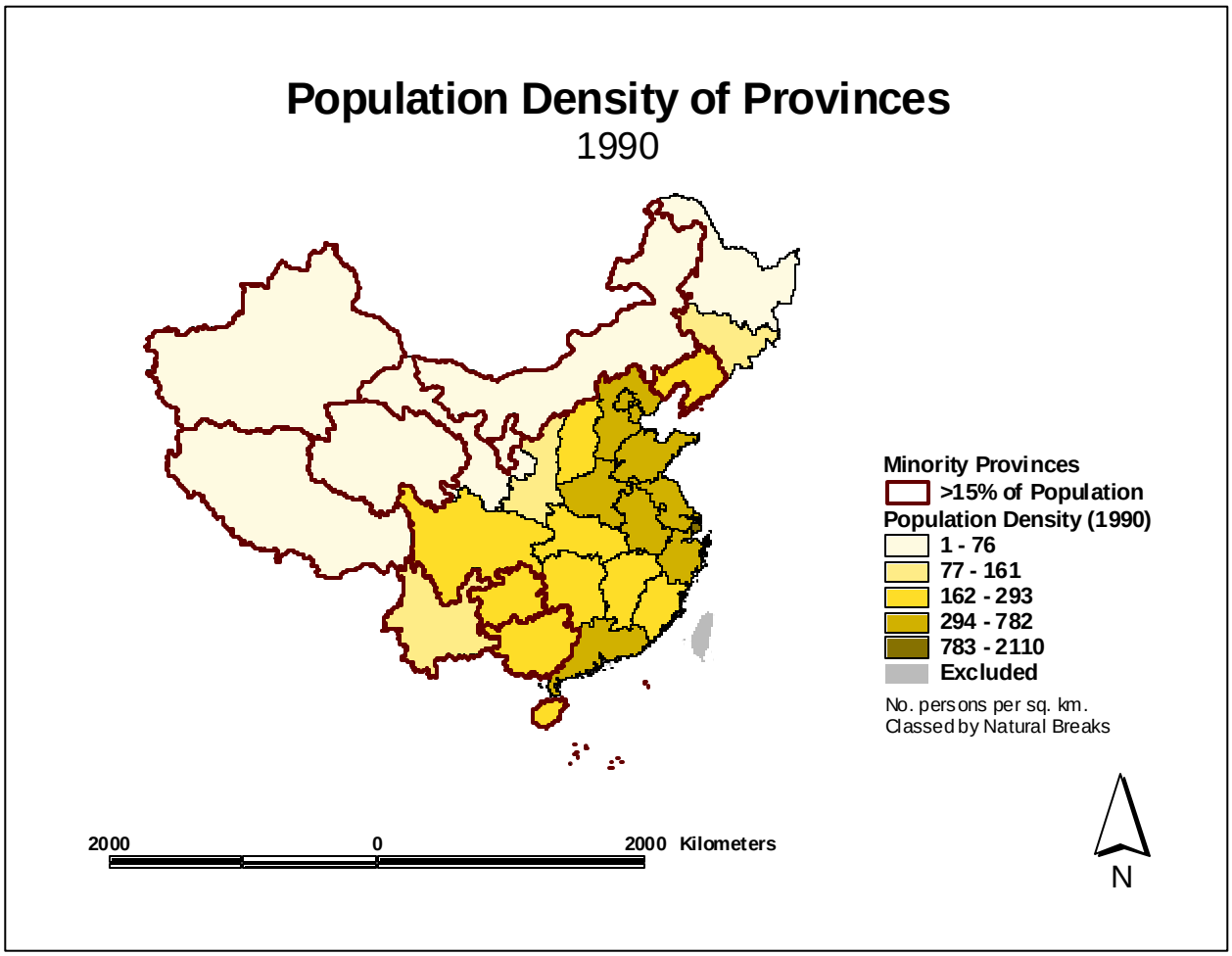


Figure 6.16. This map of Population Density of 1990 maintains the same classes as the previous map. In 1990, population density seems to have spread from the core mid-coastal provinces noted in Figure 6.15 as well as increase in Guangdong, a province (surrounding both Hong Kong and Macau) noted for the installation of the first Special Economic Zones (SEZs) and an accompanying rapid increase in industrialization.

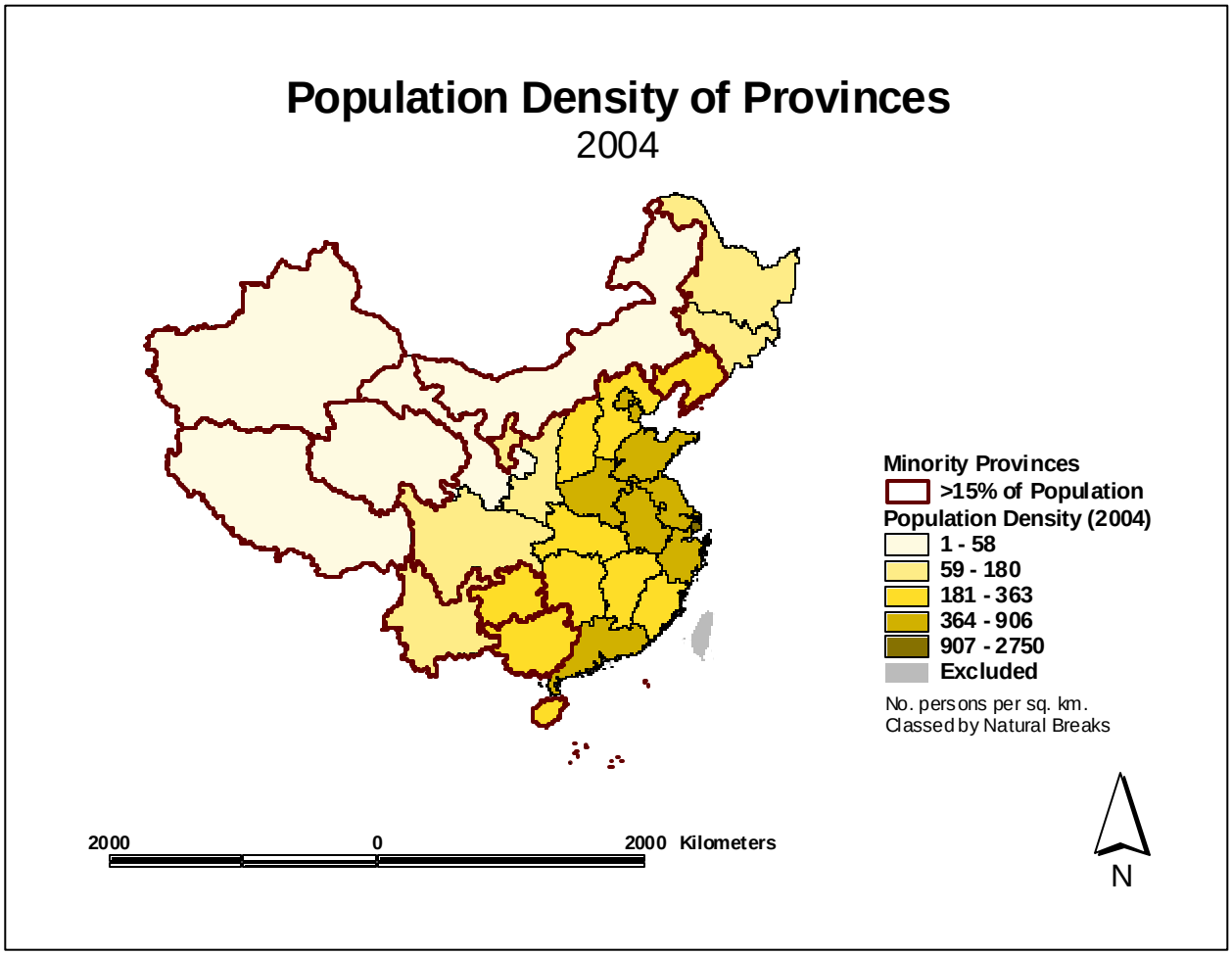


Figure 6.17. This map of Population Density of 2004 maintains the same classes as the previous two maps. In 2004, population density seems to have changed little.

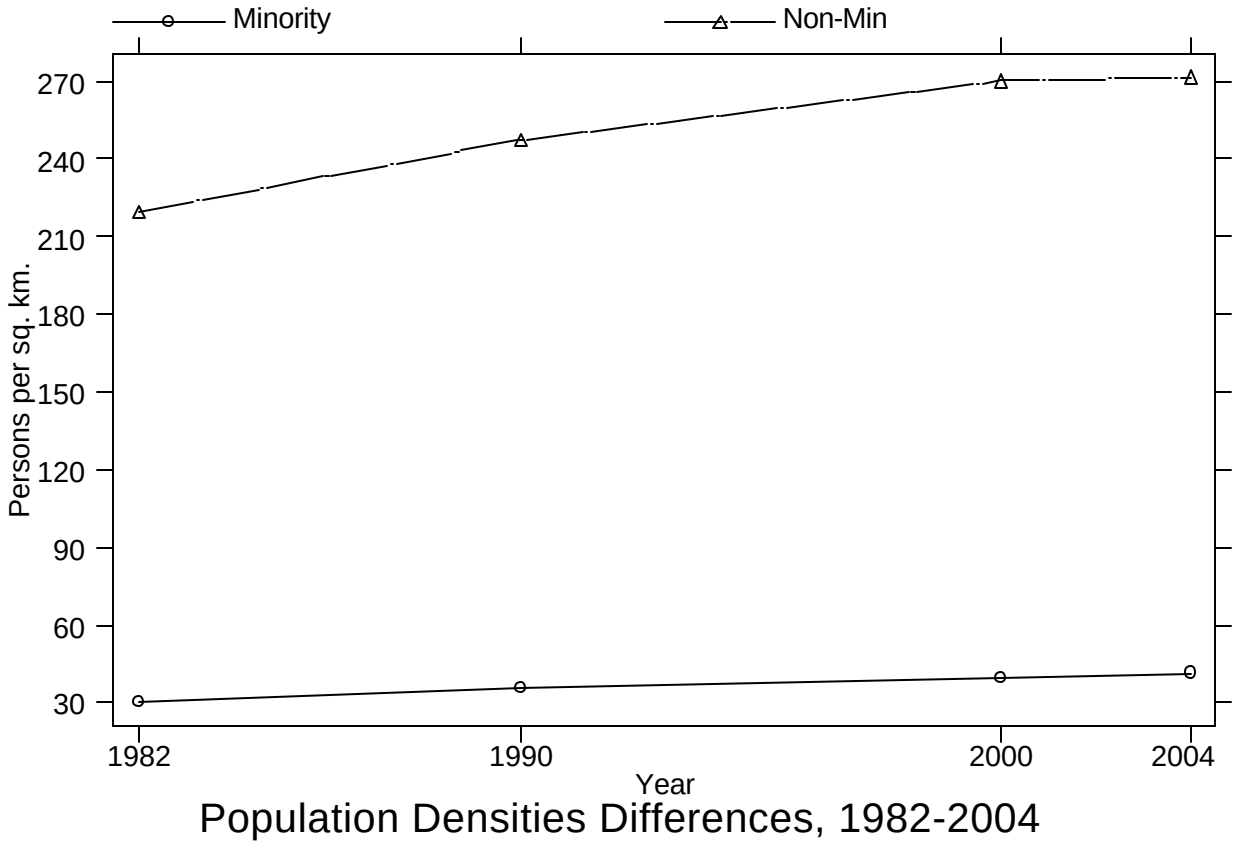


Figure 6.18. This plot demonstrates the differences between the majority (Non-Min) and minority means of population density in the years 1982-2004. This plot shows how such a difference would indicate consideration in a model of development in the PRC. It is interesting to note the increasing density in the majority provinces despite a more rigid enforcement of the one child policy in non-minority regions.

Table 6.2. Pearson's Product-Moment Correlations for factors of development in the provinces of the PRC in 1990

	jrscsh90	tifxas90	stopc90	ie_gdp90	yrbk_ord	min_pct	popden90
jrscsh90	1.0000						
tifxas90	0.5088*	1.0000					
	0.0041						
stopc90	0.0745	-0.4556*	1.0000				
	0.6956	0.0114					
ie_gdp90	0.4558*	0.4918*	0.1223	1.0000			
	0.0114	0.0058	0.5198				
yrbk_ord	-0.6767*	-0.3749*	0.1468	-0.3748*	1.0000		
	0.0000	0.0412	0.4390	0.0413			
min_pct	-0.6768*	-0.5278*	0.2939	-0.1379	0.5635*	1.0000	
	0.0000	0.0027	0.1149	0.4673	0.0012		
popden90	0.4974*	0.4400*	-0.0557	0.5076*	-0.4095*	-0.3979*	1.0000
	0.0052	0.0150	0.7698	0.0042	0.0246	0.0294	

Please note that those correlations with a probability greater than 95% (? = 0.05) are indicated by an asterisk here and in table 4. The alpha value (?) is located below each of the correlation values.

Table 6.3. Pearson's Product-Moment Correlations for factors of development in the provinces of the PRC in 2004

	jrscsh04	tifxas04	stopc04	ie_gdp04	yrbk_ord	min_pct	popden04
jrscsh04	1.0000						
tifxas04	0.2785	1.0000					
	0.1362						
stopc04	-0.5707*	-0.6194*	1.0000				
	0.0010	0.0003					
ie_gdp04	0.1323	0.5925*	-0.4020*	1.0000			
	0.4860	0.0006	0.0276				
yrbk_ord	-0.5828*	-0.3360	0.4998*	-0.3697*	1.0000		
	0.0007	0.0694	0.0049	0.0444			
min_pct	-0.6172*	-0.4935*	0.7044*	-0.1813	0.5635*	1.0000	
	0.0003	0.0056	0.0000	0.3376	0.0012		
popden04	0.0604	0.3488	-0.4213*	0.4808*	-0.3922*	-0.3677*	1.0000
	0.7513	0.0589	0.0204	0.0072	0.0321	0.0456	

1982-2004. Such a large difference would indicate consideration in a model of development in the PRC. Although the point is still debated, there is a consensus among some economists that some concentration of population is critical for economic development to take off (Weeks, 1999, 449 ff.).

Pair-wise correlations were calculated, their levels of significance were noted, and tabulated for the years 1990 and 2004 respectively in Tables 6.2 and 6.3. Both yearbook classes and population were significantly correlated with most of the other factors of development in both years. The most interesting correlation seems to be that of the percentage of state owned enterprises (stopc) and total investment in fixed assets (tifxas). A negative correlation actually increased from moderate to strong and the significance of the correlation increased substantially. The correlation of the inequality index of GDP per capita with total investment in fixed assets was moderately strong and increased in both magnitude and significance from 1990 to 2004.

The factors considered here were then used to construct graphs called starplots. Starplots demonstrate the relative importance of each of the factors by using each as a dimension in the plot. Thus, patterns and trends can be quickly identified by comparing the shapes of each plot. They can also be useful in identifying possible models affecting any given dependent variable. Two sets of starplots were generated from the factors given above for the 1990 and 2004. Each set consists of one plot for each province and these plots were sorted by the statistical yearbook class. Sorting by yearbook class seems to be

a good predictor of the final plot shape. Figures 6.19 and 6.20 display the starplots generated for 1990 and 2004 respectively.

What is immediately obvious in Figure 6.19 is the distinct differences in shape between the more developed provinces or province-level cities (e.g., Beijing, Shanghai, Guangdong) and those of less developed provinces (e.g., Inner Mongolia, Xinjiang). The primary difference within each category is the yearbook order dimension; in other respects, the plots of more developed provinces resemble the plots of other developed provinces and the plots of less developed provinces resemble those of other less developed provinces. The prime reason for this observation is the first and (so far) only law of Geography: "Everything is related to everything else, but near things are more related than distant things" (Tobler, 1970, 236). As we shall see in the next chapter, location is shown to play a significant role in the level of the economic development of national minorities in China. Those starplots that seem most similar are usually located near each other. Plots that seem to indicate transitory states or regions influenced by factors other than those considered include Hebei, Liaoning, and Shandong.

When the starplots of 2004 (Figure 6.20) are examined, we find the shapes of the plots for the more developed provinces have changed considerably in the fourteen years since 1990 while the plots of the less developed provinces have changed little. State owned enterprises have virtually disappeared while the proportion of educational attainment has increased within the more developed provinces, giving the plots of more developed

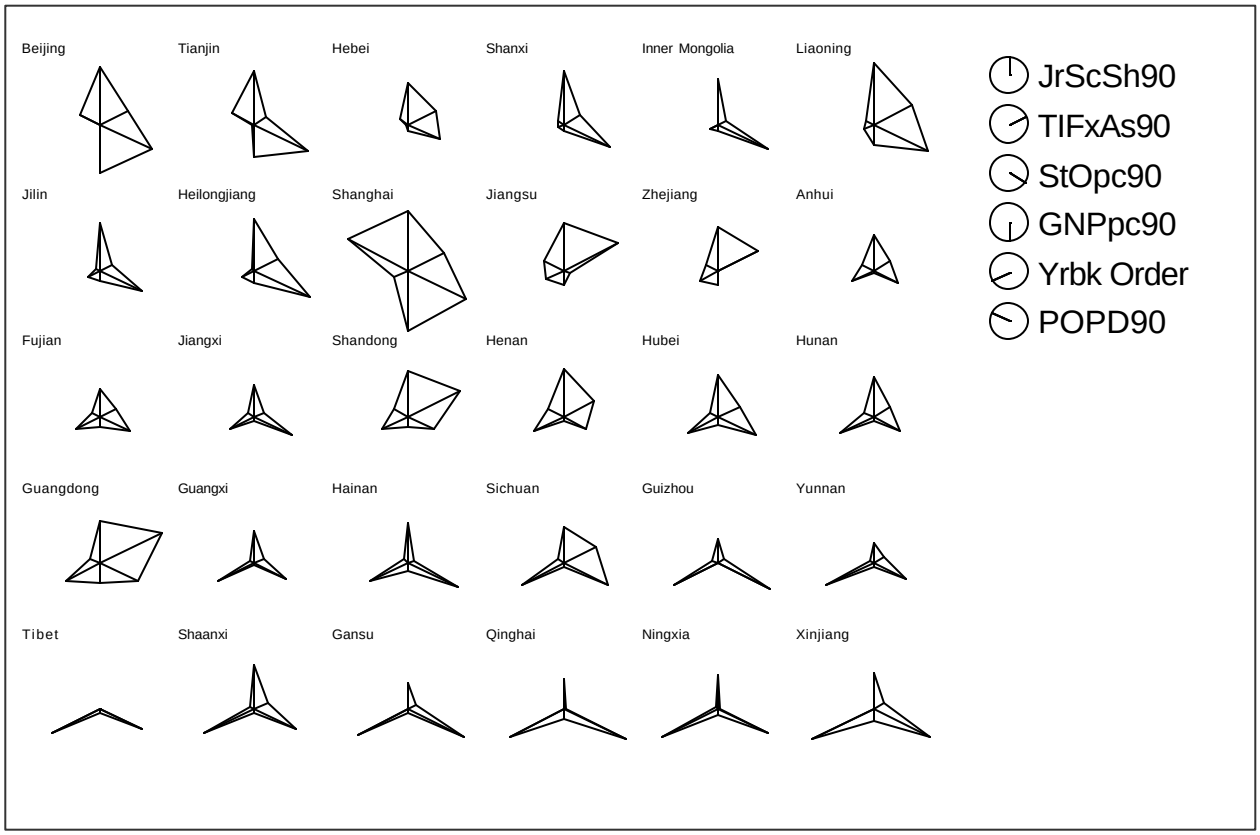


Figure 6.19. Starplots of the provinces of the PRC for 1990, sorted by yearbook order, with the following dimensions junior secondary school (JrScSh), total investment if fixed assets (TIFxAs), state owned per capita (StOpc), GDP per capita (GNPpc), yearbook class (Yrbk Order), and population density (POPD).

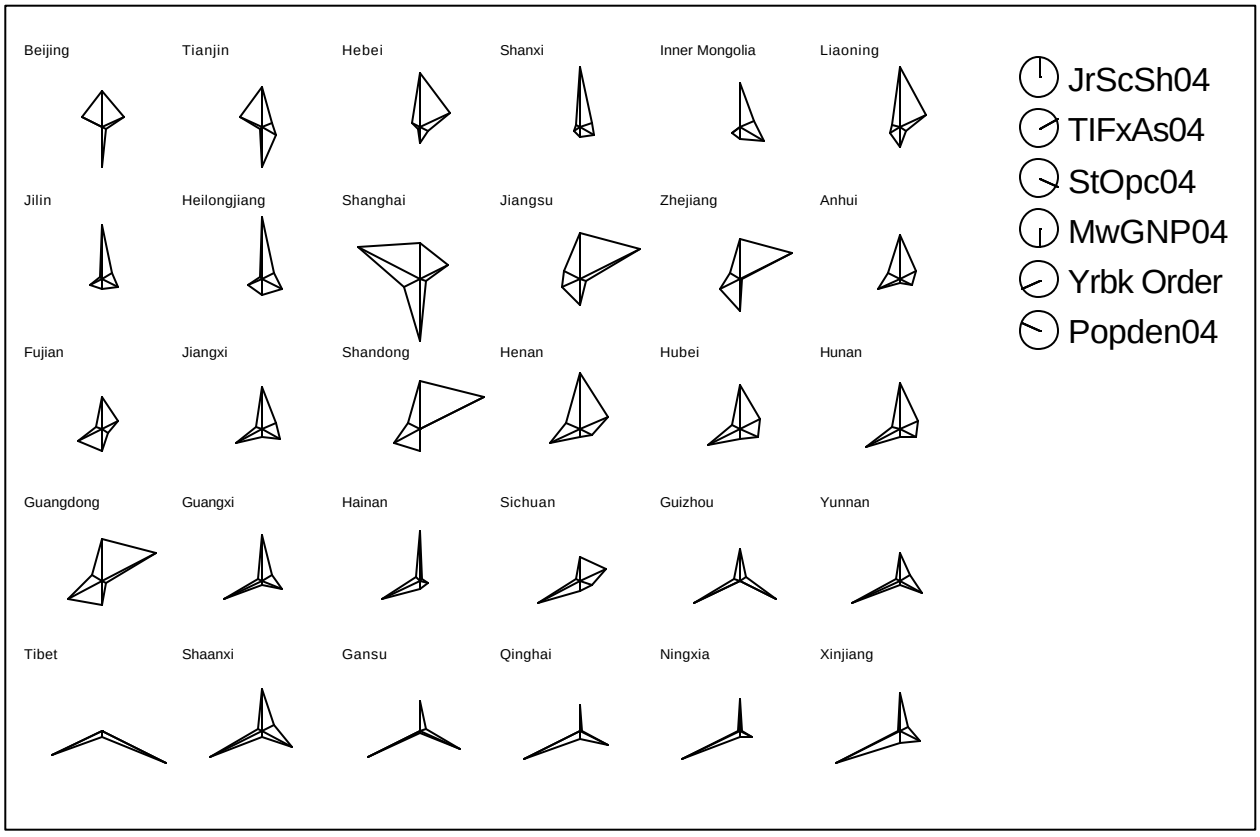


Figure 6.20. Starplots of the provinces of the PRC for 2004, sorted by yearbook order, with the following dimensions junior secondary school (JrScSh), total investment if fixed assets (TIFxAs), state owned per capita (StOpc), GDP per capita (GNPpc), yearbook class (Yrbk Order), and population density (POPD).

provinces a diamond-head spike shape. A couple of provinces, Liaoning and Inner Mongolia, are clearly in transition.

Table 6.4 presents a compilation of these factors for the minority provinces. Most notable are the exceptions found for Liaoning. While the GDP per capita for Liaoning is extraordinary, the excessive proportion of state owned enterprises may indicate significant troubles since the percentage of state owned enterprises is negatively correlated with GDP per capita (see Table 6.3). Two other provinces, Guizhou and Qinghai, still have a majority of state owned enterprises in 2004 and rank 30th and 23rd respectively among all provinces in GDP per capita (see Table 6.3). Tibet has the highest percentage of state owned enterprises but, as noted earlier, Tibet is a special case for a number of reasons mentioned earlier.

All of the minority provinces have made great improvements in the percentage of junior secondary education of their workforces. There seems to be a general trend toward investment in fixed assets among the minority provinces but these figures seem inconsistent. Since these are percentages of the national investment, such inconsistency may also reflect the investment outside of minority areas taking a greater share of the whole.

The analyses so far point to a possible model to explain the results of these various factors on GDP per capita. This possibility is examined in the next chapter.

Table 6.4 Geographic, Economic and Human Capital Indicators, 1990-2004

Minority Province	Yrbook Code	Geographic Location	Pop. Density (per. km. sq.)		Investment in Fixed Assets (% of National Investments)			State Owned Enterprises (% of Province Total)			Jr. Secondary Education (% of Population)		
			1990	2000	1990	2000	2004	1990	2000	2004	1990	2000	2004
Guangxi	20	South Cen	180	207	1.54	1.77	1.75	60.03	53.96	43.33	19.14	32.34	37.25
Guizhou	24	Southwest	188	224	1.02	1.21	1.23	79.28	62.40	58.27	14.65	20.48	28.68
Hainan	21	South Cen	196	241	0.88	0.60	0.45	78.02	41.81	31.67	22.53	32.50	39.27
Inner Mongolia	5	North Cen	18	20	1.46	1.29	2.54	78.45	62.09	48.72	25.47	34.80	37.26
Liaoning	6	Northeast	272	289	5.85	3.85	4.23	82.75	51.23	31.23	32.32	40.08	46.48
Ningxia	30	Northwest	71	89	0.46	0.48	0.53	78.21	62.14	36.65	20.27	27.83	29.05
Qinghai	29	Northwest	6	8	0.48	0.46	0.41	89.17	63.56	51.51	17.76	21.66	26.29
Tibet	26	Northwest	2	2	0.22	0.19	0.23	69.86	95.89	84.41	3.85	6.14	11.11
Xinjiang	33	Southwest	10	12	1.98	1.85	1.63	84.77	53.97	45.26	20.66	27.53	32.53
Yunnan	25	Southwest	95	112	1.85	2.08	1.83	61.06	63.93	46.99	13.80	21.23	26.21

Sources: NBS (1991, 1999, 2005)

CHAPTER 7

SYNTHESIS

Introduction

Designing a model dependent on time variables can present a number of problems. Cross sectional data sorted by time are usually referred to as panel data. Panel data are problematic since autocorrelative effects through time are likely; specifically, that an unaccounted variable will correlate with the error term (Brüderl, 2005, 5). The way around this problem is through a process called time demeaning where the unaccounted effects are part of the error through use of a dummy variable (Park, 2005, 12). The three primary regression models used in modeling panel data are fixed effect, between effects, and random effects. The fixed effects model assumes that omitted variables differ between cases but are constant over time (Princeton University Library, 2006). Our previous analyses have shown that most variables affecting GDP per capita vary between cases as well as over time. A random effects design was chosen since a number of random factors, such as weather, changing economic factors, changing trade linkages, and migration are just a few of the factors which may have unanticipated effects upon the dependent variable in any of the provinces of the PRC.

The data used for regression modeling are provided below in Appendix A. Stata Statistics/Data Analysis software (Stata Corporation, 2001) was chosen

for modeling since Stata has a number of tools useful for handling and processing panel data (Princeton University Library, 2006). The data must first be configured into a form usable for analysis by the software by putting data from all periods into the same column and along with the corresponding year in another. After choosing among fixed, between and random effects models, the data must be sorted and the panel and date variables must be identified. The Stata "xtreg" command can estimate fixed-effects, between-effects, and random-effects models as well as population-averaged models with the following formula, as given in the Stata documentation:

$$y_{i,t} = a + Bx_{i,t} + u_i + e_{i,t}$$

where

xb are the fitted values,
stdp is the standard error of the fitted values and
ue is $u_i + e_{i,t}] = y - xb$, the combined residual.

Once executed, the regression model command returns the results of the regression. Following a random effects model, a Hausman test is performed to determine whether "the coefficients estimated by the efficient random effects estimator are the same as the ones estimated by the consistent fixed effects estimator" (Princeton University Library, 2006). These procedures were followed for the first model below.

The First Model

The first model estimated included variables grouped by yearbook class code (yrbkorder). The variables used in the model include the absolute deviation of Gross Domestic Product per capita (mwgnppc) as the dependent

variable, junior secondary school education (jrsecshl) as measure of human capital, percentage of investments in fixed assets (pcfxas) as a representation of economic infrastructure, percentage of state owned enterprises as a representation of the inefficiency of the older socialist enterprises (stownpc), population density (popdens) as an indication of either the critical mass

Table 7.1. Model of generalized least-squares estimates of random effects

```
R-sq:  within  = 0.2674                         Obs per group: min =         3
       between = 0.7348                                        avg =       3.0
       overall = 0.7214                                        max =         3

Random effects u_i ~ Gaussian                   Wald chi2(5)       =     94.27
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000

------------------------------------------------------------------------------
     mwgnppc |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    jrsecshl |   4.93e-06   2.87e-06     1.72   0.086    -7.04e-07    .0000106
      pcfxas |   .0639455   .0195543     3.27   0.001     .0256198    .1022712
     stownpc |    .001961   .0012046     1.63   0.104       -.0004     .004322
     popdens |   .0010952   .0001692     6.47   0.000     .0007636    .0014269
       group |  -.0476009   .0383134    -1.24   0.214    -.1226938     .027492
       _cons |   .3684511   .2340388     1.57   0.115    -.0902565    .8271587
-------------+----------------------------------------------------------------
     sigma_u |  .31543591
     sigma_e |  .10896741
         rho |   .8933869   (fraction of variance due to u_i)
------------------------------------------------------------------------------


Hausman specification test:

                ---- Coefficients ----
             |      Fixed       Random
     mwgnppc |    Effects      Effects       Difference
-------------+----------------------------------------
    jrsecshl |   4.26e-06     4.93e-06        -6.71e-07
      pcfxas |   .1065355     .0639455           .04259
     stownpc |    .001352      .001961        -.0006089
-------------+----------------------------------------

    Test:  H_o:  difference in coefficients not systematic

                 chi2(  3) = (b-B)'[S^(-1)](b-B), S = (S_fe - S_re)
                           =     5.91
                 Prob>chi2 =     0.1161
```

necessary for economic takeoff or the excessive demands upon resources due to overpopulation, and regional location (group), a variable representing the aggregation of the yearbook classes into the regional groups appearing in the statistical yearbooks.

This model has an overall R^2 value of 0.72, indicating that these independent variables account for 72% of the variation in the absolute deviation of Gross Domestic Product per capita in all of the provinces of the PRC. In the overall model, the percentage of state owned enterprises was unexpectedly a positive coefficient; the high presence of state owned enterprises in certain provinces, such as Liaoning, is largely viewed as a major block to economic expansion (Kwan, 2004). The model may be expressed:

MwGNPpc = .00000493(JrSecShl) + .0639455(PcFxAs) + .001961(StOwnpc) + .0010952(Popdens) - .0476009(group) + .3684511(error).

The likelihood that these various independent variables have their said effects upon the dependent variable is determined by their respective P values in the above Table 7.1 (Jaisingh, 2000, 249). Interpretation of the calculated coefficients show that there is some probability that junior secondary school education (jrsecshl) has the calculated effect on the absolute deviation of Gross Domestic Product per capita (mwgnppc) at a 91% level of confidence, while the percentage of investments in fixed assets (pcfxas) has a strong probability at greater than a 99% level of confidence, the percentage of state owned enterprises (stownpc) has a small probability at a 89% level of confidence,

population density (popdens) has a very strong probability at greater than a 99% level of confidence, and location (group) has little probability at a 79% level of confidence.

Due to the particular regression estimators used in the random effects model, the model must be tested for validity. The test used is the Hausman specification test, which examines the appropriateness of the random-effects estimator; if significant, the result "can be interpreted as evidence that the random effects and the regressors are correlated" (Stata Corporation, 2001). In this model, the Hausman specification test reveals that there is sufficient evidence against the null hypothesis at only an 88% level of confidence. While there is some probability for the validity of this model, by the normally accepted standards (? = .05 or 95% level of confidence), we must consider a model other than random effects for modeling economic development in the Peoples' Republic of China.

A Second Model

After due consideration of the original model, a new regression model was created adding a minority percentage factor (minpct). This was felt justified since the location and percentage of state owned enterprises accounted for considerably less influence upon the GDPpc than originally thought in the first model. A between effect regression model was chosen to consider the unaccounted effects that change over time but are likely constant between cases (Princeton University Library, 2000). The results of the second regression model appear below in Table 7.2.

The second model has an overall R^2 value of 0.78, indicating that these independent variables account for 78% of the variation in the absolute deviation of Gross Domestic Product per capita in all of the provinces of the PRC. The locational variable "group" was replaced by each province's yearbook classification code (yrbkorder) since, in the first model, the probability for the dummy variable "group" was weak. As noted above, the yearbook variable is a surrogate distance, defined as the location of each province from the northeastern coast.

In the first model, probability against the *z* score was calculated for each of the independent variables to provide a measure of likelihood for each. In this model, the P value is calculated against the *t* score. The *t* distribution allows the three possible hypothesis tests: a right-tailed test, a left-tailed test,

Table 7.2. A model of generalized least-squares estimates of between effects

```
Between regression (regression on group means)  Number of obs      =        90
Group variable (i) : code_90                    Number of groups   =        30

R-sq:  within  = 0.0321                         Obs per group: min =         3
       between = 0.8157                                        avg =       3.0
       overall = 0.7880                                        max =         3

                                                F(6,23)            =     16.97
sd(u_i + avg(e_i.))=  .2998333                  Prob > F           =    0.0000

------------------------------------------------------------------------------
       mwgnp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      jrscsh |  -2.31e-06   .0000128    -0.18   0.858    -.0000287    .0000241
      pcfxas |   .0444802   .0355494     1.25   0.223    -.0290593    .1180196
       stopc |   .0041287    .008697     0.47   0.639    -.0138624    .0221198
     popdens |   .0010309   .0001389     7.42   0.000     .0007436    .0013183
    yrbk_ord |  -.0223014   .0088357    -2.52   0.019    -.0405795   -.0040233
      minpct |   .0062736   .0035447     1.77   0.090    -.0010592    .0136063
       _cons |   .6002187   .7902998     0.76   0.455    -1.034641    2.235078
------------------------------------------------------------------------------
```

and a two-tailed test. Negative *t* scores, as noted in the above results, are indicative of left-tailed hypothesis tests (Jaisingh, 266-269). Hence, the two variables with negative *t* scores, educational level (jrscsh) and location (yrbk_ord), are valid coefficients in this model.

The factors with the strongest probabilities are population density (popdens) at greater than a 99% level of confidence, yearbook classification code or location (yrbk_ord) at 98% level of confidence, and minority percentage (minpct) at 91% level of confidence. The other factors in this second model have very weak probabilities. The error term is also very weak, with the widest range in the 95% confidence interval of all other variables. This indicates considerable uncertainty over the influence and effect of error on this model. This model may be expressed as:

MwGNPpc = -.00000231(JrSecShl) + .0444802(PcFxAs) + .0041287(StOwnpc) + .0010309(Popdens) – .0223014(yrbkorder) + .0062736(minpct) + .6002187(error).

Models provide us a theoretical construction on which we can assess the likelihood of various factors upon a given outcome. They can assist us in examining the dynamic processes in a population and provide clues to the possible causes of change in particular cases. Returning to the original four minority provinces originally selected for this study, we shall attempt to draw conclusions regarding the economic development of minorities by an examination of each in the next chapter.

CHAPTER 8

FOCUS ON THE MINORITY PROVINCES

Introduction

Our previous examination of the possible models considering for the factors of the development in the provinces of the PRC reveals the most important influences. These models become increasingly important when examining the extremes observed in the minority provinces, serving both as test of the vitality of these models as well as roadmap for identifying those factors possibly more significant in the minority regions. This dynamic is demonstrated in the difference in the shapes of the starplots between the more developed provinces and the less developed provinces (see Figures 6.19 and 6.20).

An examination of data on the minority provinces reveals Liaoning is a significant positive outlier relative to the other minority provinces of the PRC. The proportional fraction of the national GDP per capita (Figure 6.3) provides an obvious depiction of this phenomenon. This is further highlighted in a plot (figure 8.1) of the absolute deviation of the Gross Output Values of Industry and Agriculture (GVIAO). Liaoning, being a coastal province, has been a beneficiary of the earlier policy of developing the coastal East before other regions and an emphasis was placed on building heavy industry. This resulted in considerable investment in what is now a substantial portion of inefficient

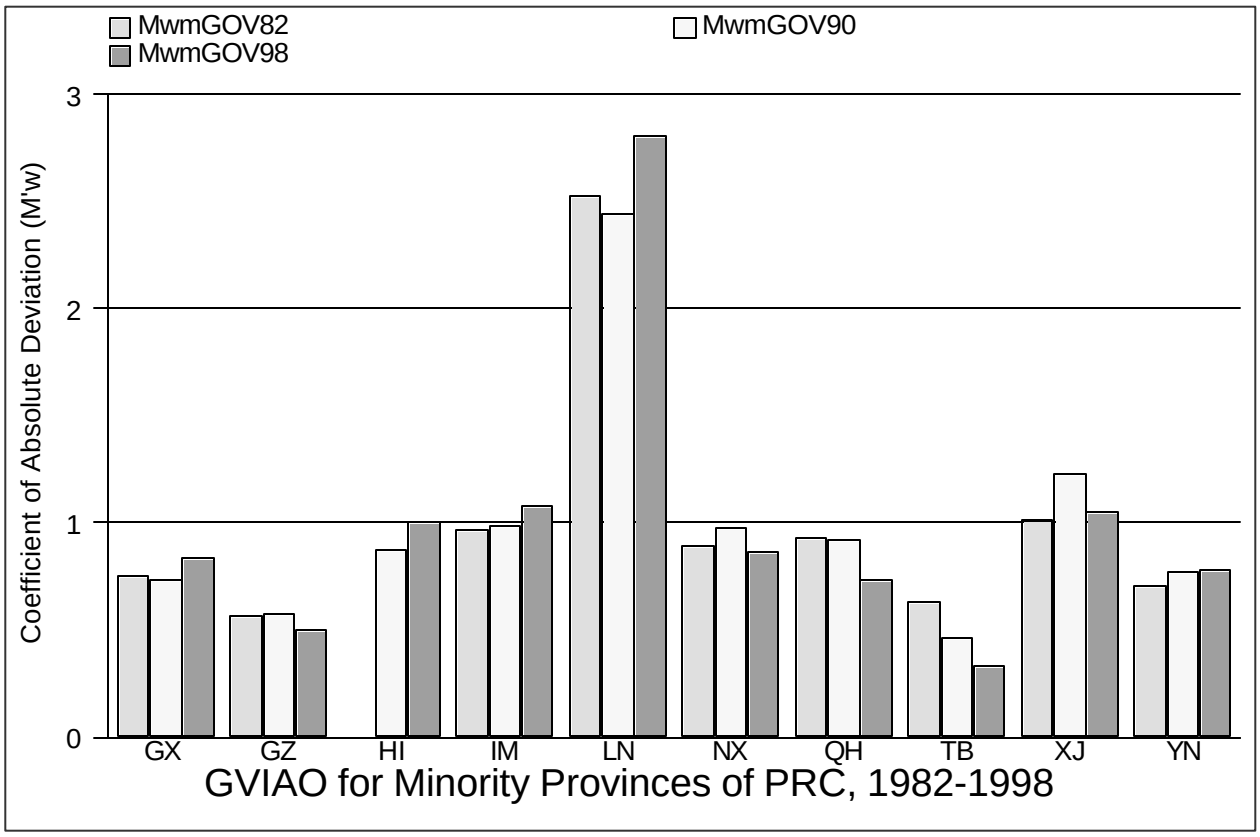


Figure 8.1. This graph displays the coefficients of absolute deviation of Gross Output Values of Industry and Agriculture (GVIAO) for the minority provinces of the PRC from 1982 to1998. The letter codes used are as follows: Guangxi, GX; Guizhou, GZ; Hainan, HI; Inner Mongolia, IM; Liaoning, LN; Ningxia, NX; Qinghai, QH; Tibet, TB; Xinjiang, XJ; and Yunnan, YN.

state owned enterprises in Liaoning. While the models depict a weak relationship between state ownership and GDP per capita, the inefficiency of the current industrial enterprises in Liaoning may actually account for its weak performance. Figure 8.2, displaying the GVIAO of all the provinces of the PRC, shows that Liaoning is not as prominent as other eastern provinces. More worrying is the stagnation in the growth of GVIAO in Liaoning; while other eastern provinces such as Guangdong, Fujian, Shandong, and Zhejiang actually start at a much lower level, their logarithmic growth in succeeding years demonstrate a dynamic participation in the economic expansion of the PRC that Liaoning does not. That largest block of investment in fixed assets is currently and consistently going to Liaoning (Figure 8.3) has not yet shown the desired increased in the economic expansion.

Relative to the majority provinces of the PRC, the minority provinces had become more unequal: in all cases, to the detriment of the minority provinces. Figure 8.4 shows Liaoning as the only minority province well above the minority mean in a chloropleth map using five roughly equal distant classes in 1990. Keeping these same classes for comparison to the absolute deviations of 2004, we observe in Figure 8.5 that all progress in GDP per capita is considerably lower than the majority provinces. This trend is confirmed by the average annual growth rates in GDP per capita (Table 6.1) and the graph of both curves in Figure 6.11. As already observed by the changing shapes of the starplots, it seems apparent that other processes are affecting the minority provinces.

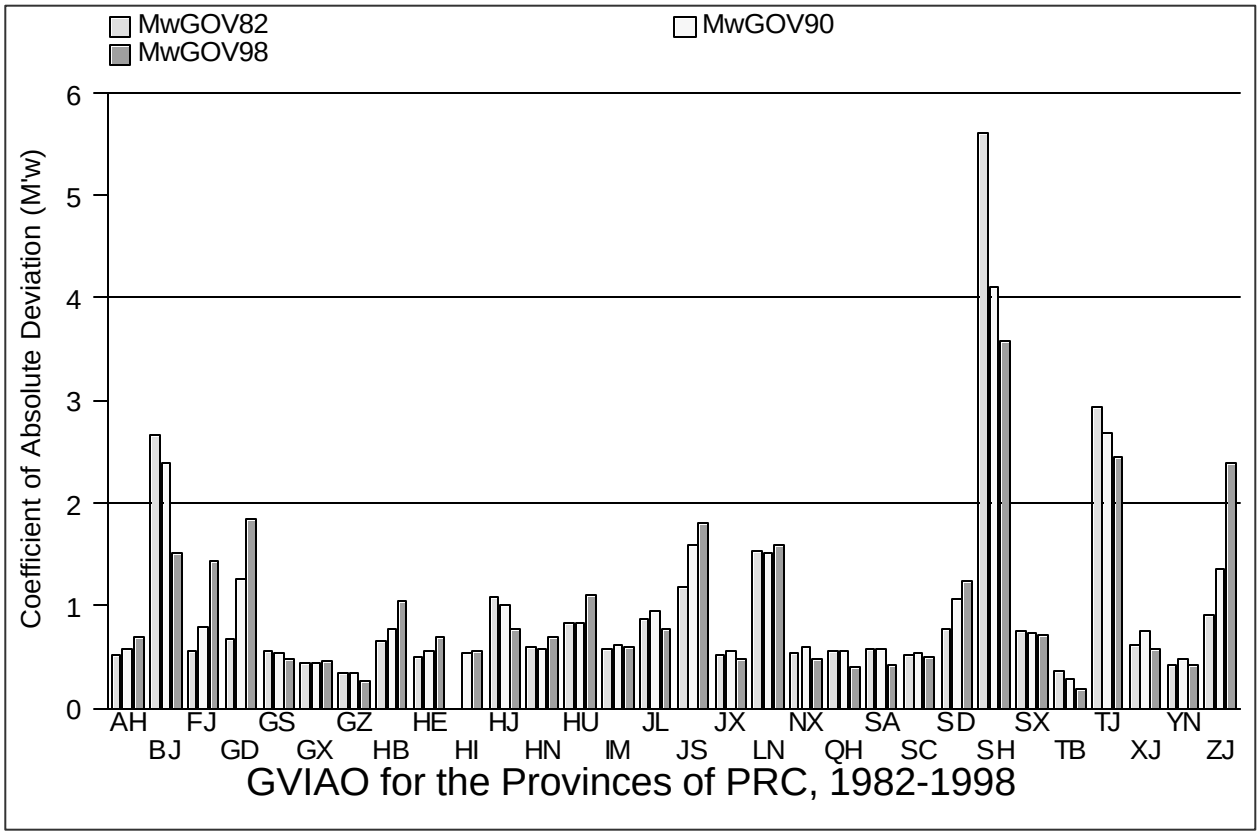


Figure 8.2. This graph displays the coefficients of absolute deviation of Gross Output Values for Industry and Agriculture (GVIAO) for all provinces of the PRC from 1982 to1998. The letter codes used are as follows: Anhui, AH; Beijing, BJ; Fujian, FJ; Gansu, GS; Guangdong, GD; Guangxi, GX; Guizhou, GZ; Hainan, HI; Hebei, HB; Heilongjiang, HJ; Henan, HE; Hubei, HU; Hunan, HN; Inner Mongolia, IM; Jiangsu, JS; Jiangxi, JX; Jilin, JL; Liaoning, LN; Ningxia, NX; Qinghai, QH; Shaanxi, SA; Shandong, SD; Shanghai, SH; Shanxi, SX; Sichuan, SC; Tianjin, TJ; Tibet, TB; Xinjiang, XJ; Yunnan, YN; and Zhejiang, ZJ.

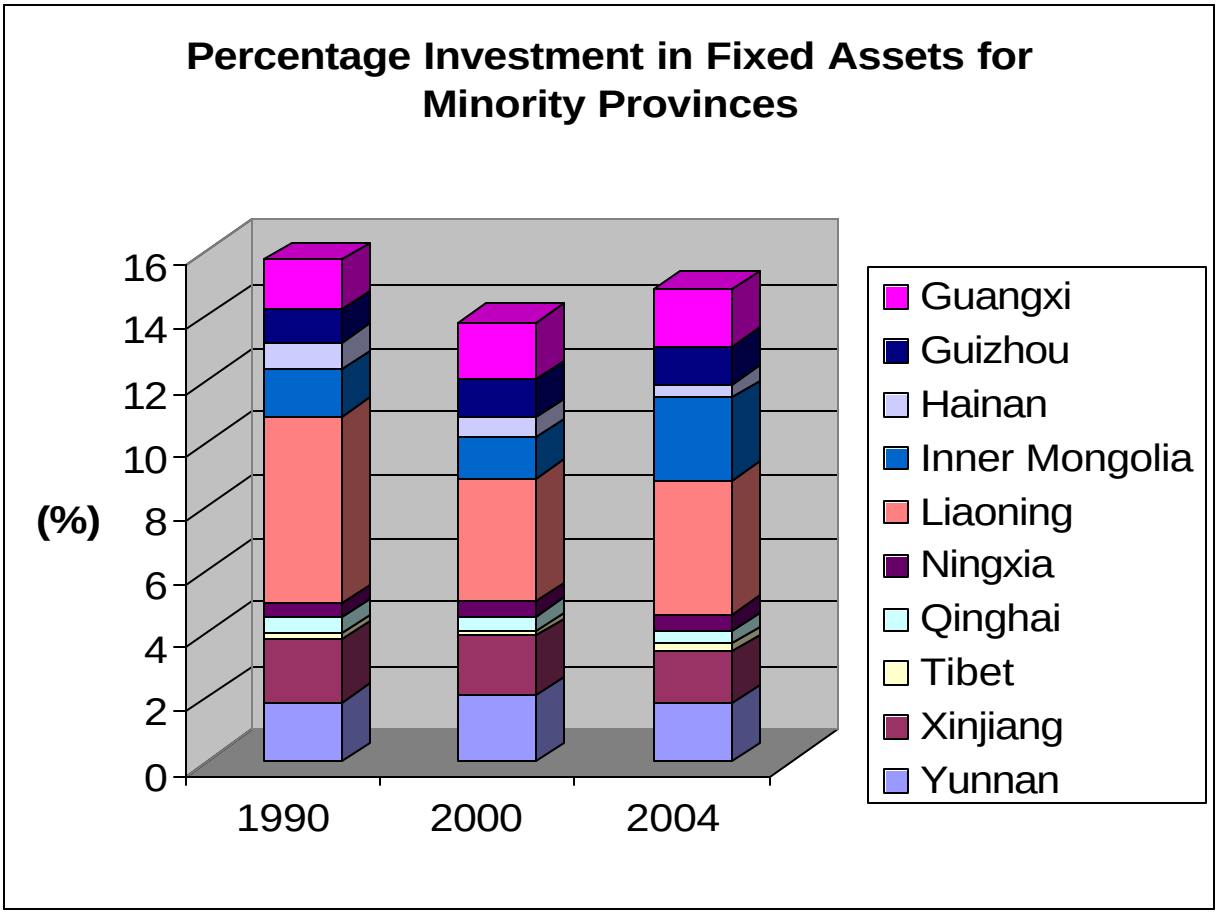


Figure 8.3. The graph displays the Percentage of Investment in Fixed Assets for Minority provinces of the PRC from 1990 to 2004. Each of the minority provinces is stacked on to one bar per year; the whole bar representing the relative amount of investment in all of the minority provinces for that year.

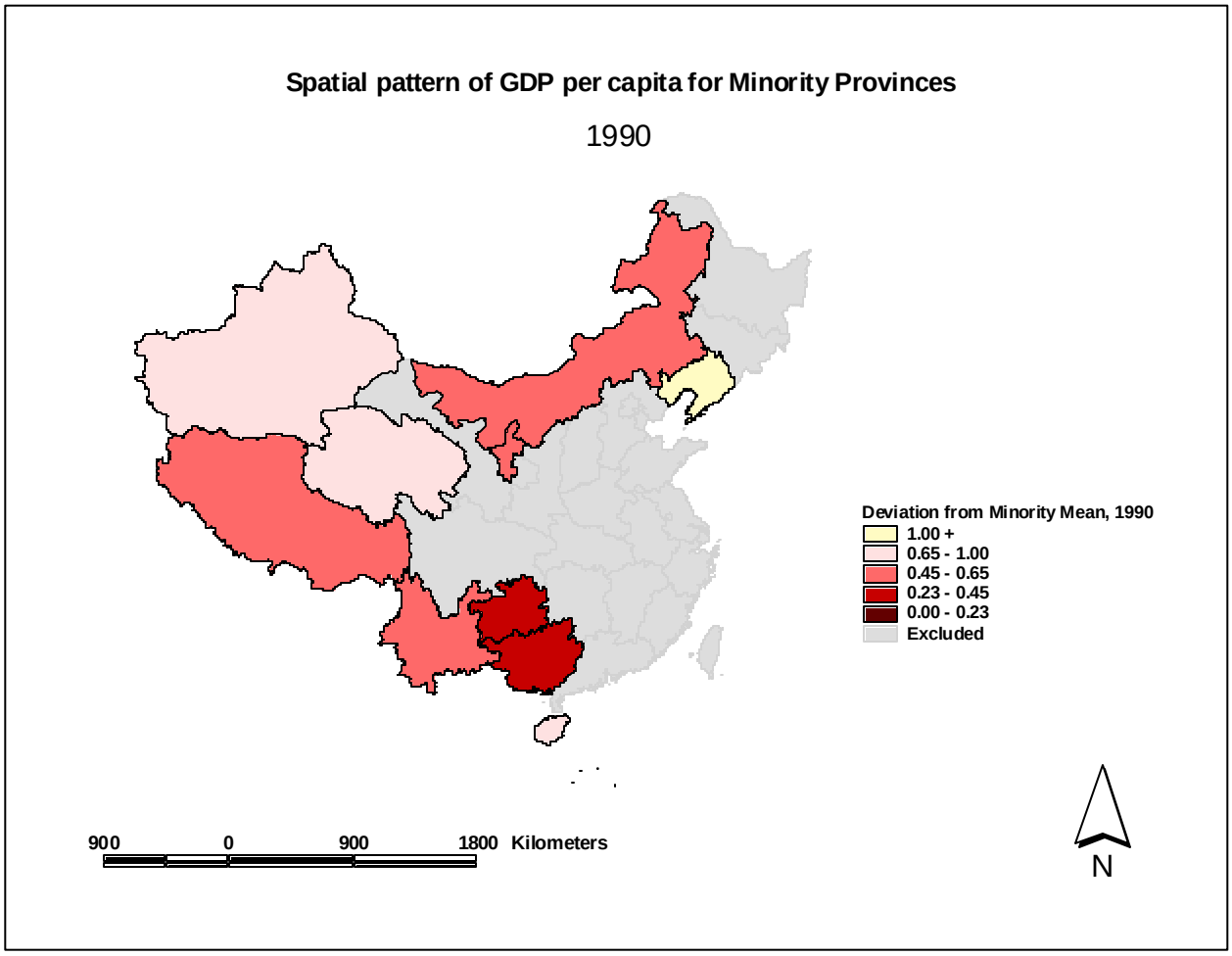


Figure 8.4. This map depicts the spatial distribution of absolute deviation of GDP per capita from the minority mean in 1990.

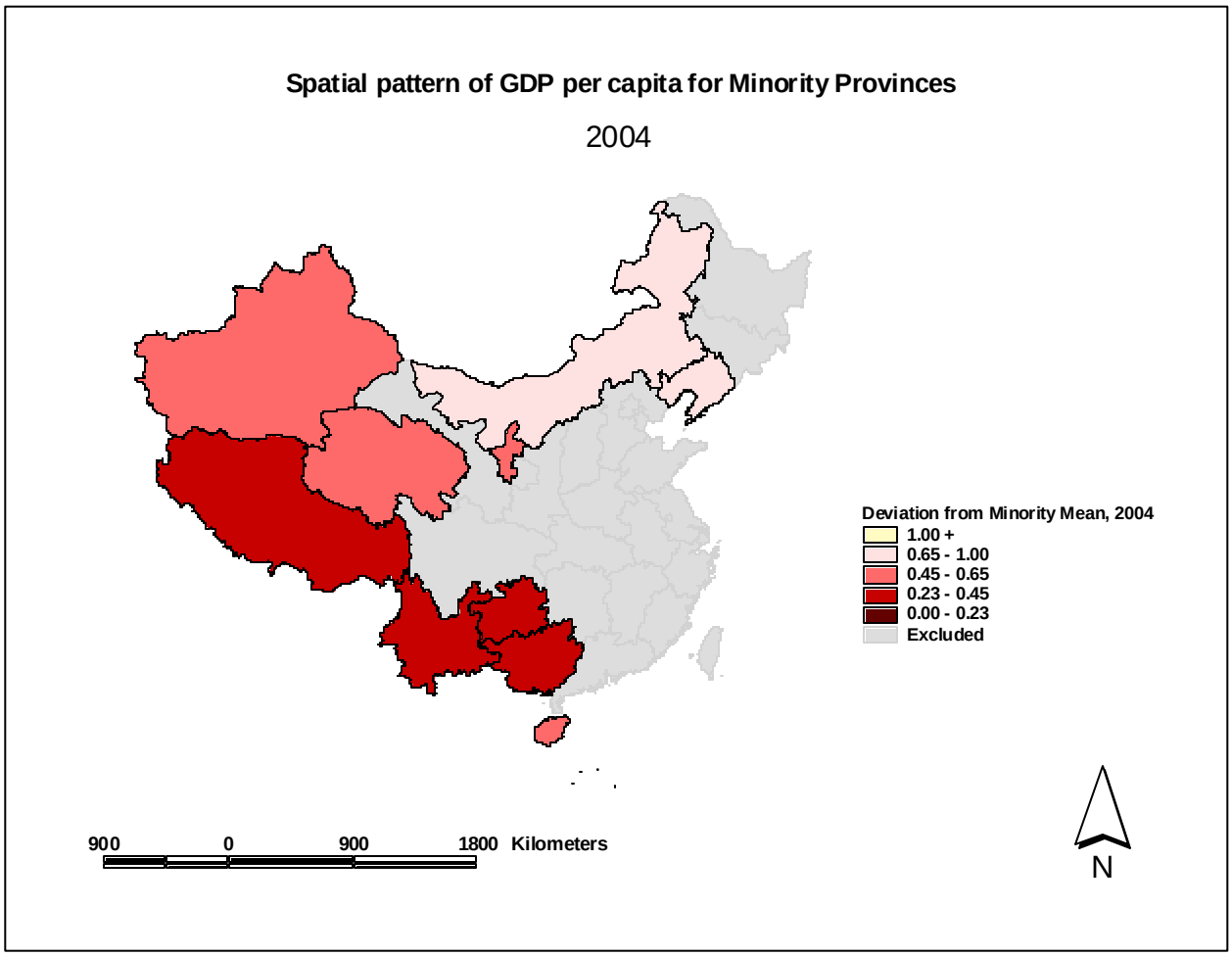


Figure 8.5. This map depicts the spatial distribution of absolute deviation of GDP per capita from the minority mean in 2004.

Figure 8.6 plots the absolute deviations of each of the minority provinces from the national mean GDP per capita from 1990 to 2004. The first observation is the relative decline of Liaoning among the minority provinces that either indicates a decline in the GDP per capita in Liaoning or an increasing prosperity in the other minority provinces. Nothing conclusive can be said of the minority provinces in general since some are deviating toward the mean while others away from the mean. Figure 8.7 plots the absolute deviations of each of the minority provinces from the minority mean GDP per capita from 1990 to 2004. With the exceptions of Inner Mongolia, Qinghai and Tibet, the minority provinces are deviating toward the minority mean, indicating that they are following the general trend of minority provinces in growing more unequal from the rest of the PRC. Of the exceptions, Tibet's share of national GDP per capita is decreasing while Inner Mongolia's share of GDP per capita is growing. Only time will demonstrate whether the growing prosperity in Inner Mongolia is an anomaly or if Inner Mongolia is the first beneficiary of the recent "go west" economic strategy of the PRC.

The Original Focus of this Study

It might be significant that the four minority provinces originally selected for focus in this project, namely Guangxi, Guizhou, Xinjiang and Yunnan, all display a downward slope in the plot of deviations of absolute deviations from both the national and minority means of GDP per capita (see Figures 8.6 and 8.7); the only exception to this trend is the brief uptick Guangxi has in the

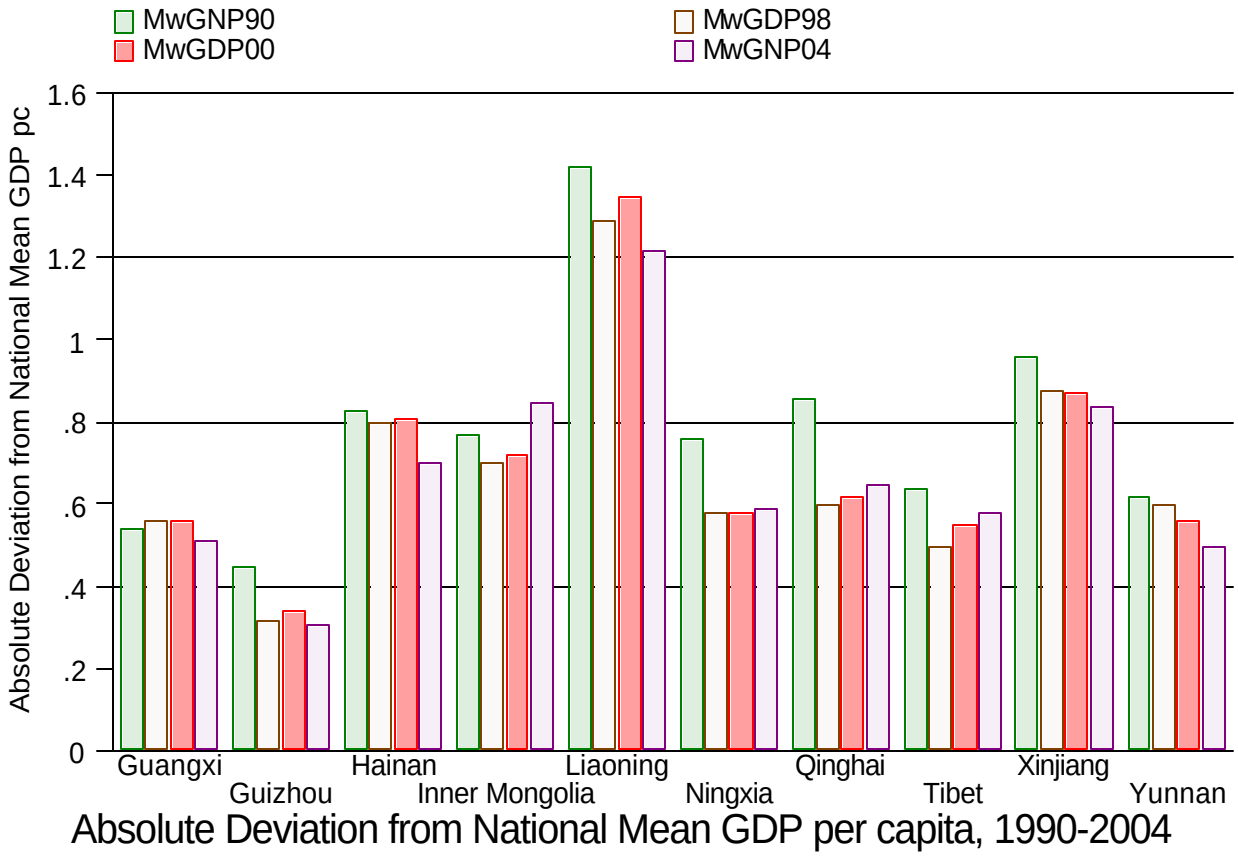


Figure 8.6. This graph displays the absolute deviations of GDP per capita from the *national* mean of all the minority provinces from 1990 to 2004. With the exceptions of Inner Mongolia, Qinghai and Tibet, the minority provinces are deviating away from the national mean, indicating that they growing more unequal from the rest of the PRC. Of the exceptions, Inner Mongolia's GDP per capital is growing toward the mean.

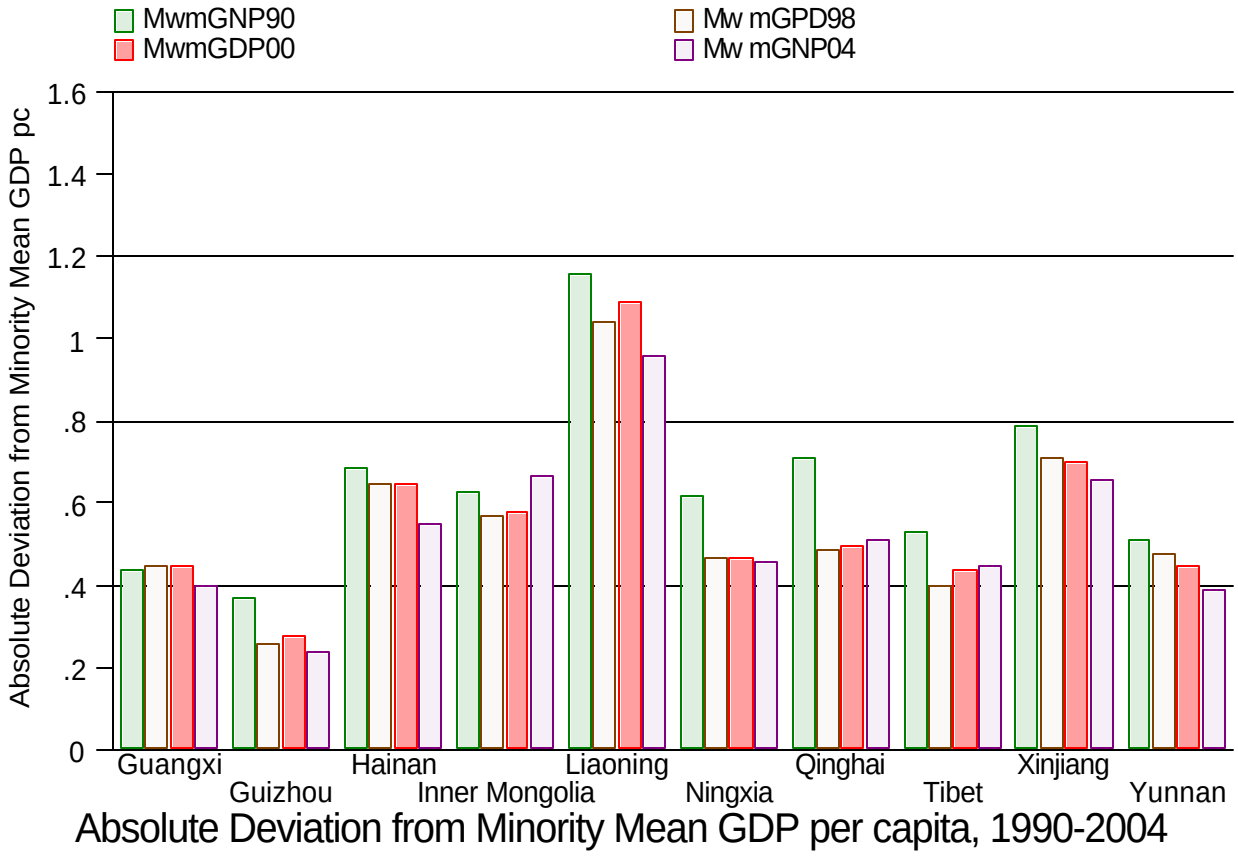


Figure 8.7. This graph displays the absolute deviations of GDP per capita from the *minority* mean of all the minority provinces from 1990 to 2004. The patterns observed here mirror that of the previous graph. With the exceptions of Inner Mongolia, Qinghai and Tibet, the minority provinces are deviating toward the minority mean, indicating that they are following the general trend of minority provinces in growing more unequal from the rest of the PRC. Of the exceptions, Inner Mongolia's GDP per capita is growing while Tibet's is likely (but not definitively) decreasing.

year 2000. The slopes of their declines in the period 2000-2004 appear to be the same.

Observations of the relative positions of the provinces according to their compositions of Gross Output Value (GOV) from 1982 to 1998 (Figures 8.8 and 8.9) reveal that the three southwestern provinces of Guangxi, Guizhou and Yunnan occupy relatively the same positions in their composition of GOV. This is not the case for Xinjiang as this province keeps relatively the same position in industrial Gross Output Value (GVIO) but substantially increases agricultural Gross Output Value (GVAO). In addition to the products of agriculture, the GVAO of this desert province includes mineral production. This increase in GVAO is likely so since national development policy has placed special emphasis on the development of Xinjiang. Investment in basic infrastructure has probably increased market access to the surrounding region and must be in place before industrial development can take off. As can be seen in Figure 8.3, investment in fixed assets for Xinjiang was relatively larger than the other three provinces but more closely approximated them in 2004. The period from 1999 to 2004 saw a 13.7% increase in the amount of freight tons-kilometers per 10,000 people in Xinjiang while the three provinces of Guangxi, Guizhou, and Yunnan only averaged an increase of 6% increase in the amount of freight tons-kilometers per 10,000 people.[13] This likely indicates significantly more investment in the transportation infrastructure in Xinjiang than in the southwestern provinces.

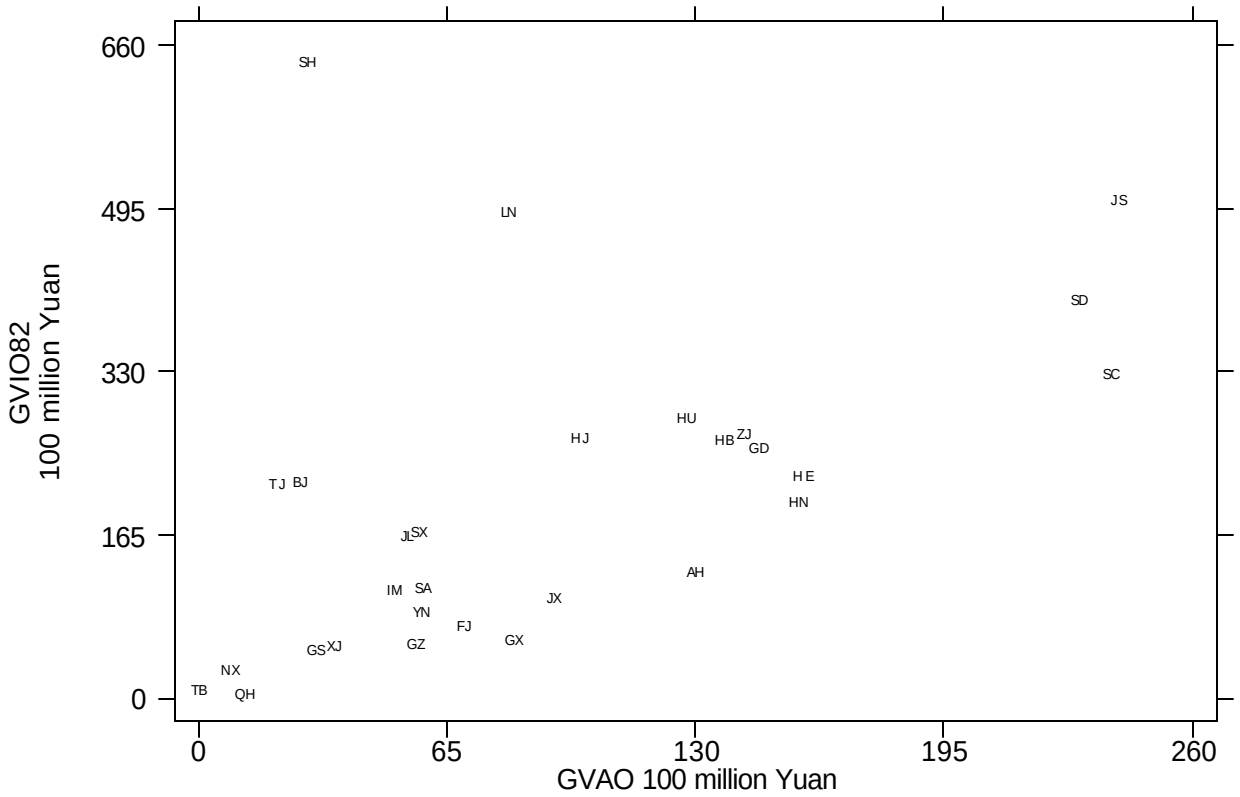
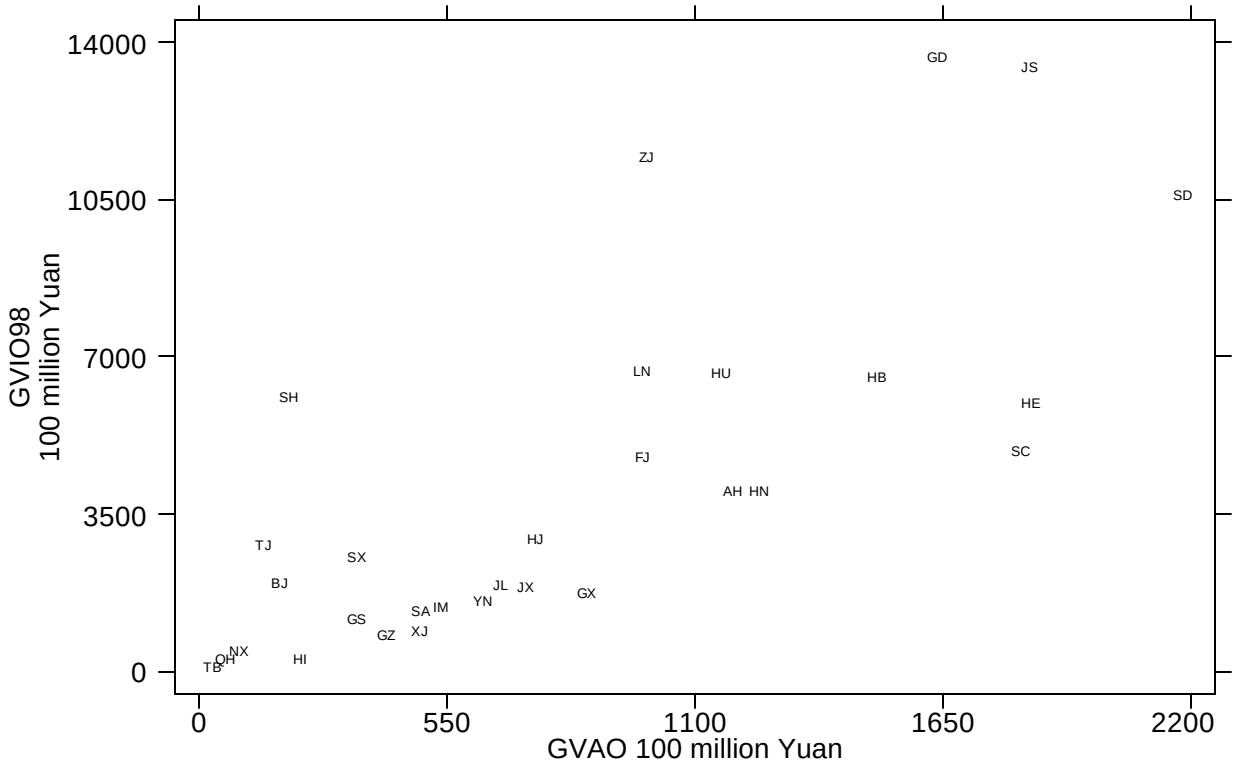


Figure 8.8. This scatterplot displays the relative positions of the provinces according to composition of Gross Output Value in 1982. The positions indicated are only approximate as the points were jittered to avoid overlap. The letter codes used are as follows: Anhui, AH; Beijing, BJ; Fujian, FJ; Gansu, GS; Guangdong, GD; Guangxi, GX; Guizhou, GZ; Hainan, HI; Hebei, HB; Heilongjiang, HJ; Henan, HE; Hubei, HU; Hunan, HN; Inner Mongolia, IM; Jiangsu, JS; Jiangxi, JX; Jilin, JL; Liaoning, LN; Ningxia, NX; Qinghai, QH; Shaanxi, SA; Shandong, SD; Shanghai, SH; Shanxi, SX; Sichuan, SC; Tianjin, TJ; Tibet, TB; Xinjiang, XJ; Yunnan, YN; and Zhejiang, ZJ.



Gross Output Value for Agriculture and Industry Scatterplots for 1998

Figure 8.9. This plot displays the relative positions of the provinces according to composition of Gross Output Value in 1998. The positions indicated are only approximate as the points were jittered to avoid overlap. The letter codes are as those used in Figure 8.8 above.

Table 8.1 collates those factors considered in the model of economic development for the four focus provinces of Guangxi, Guizhou, Yunnan, and Xinjiang. The extremes in the population density and minority percentage figures of Xinjiang may justify the extraordinary investment for the government of the PRC. Although Xinjiang consistently ranks above the southwestern provinces in education, investment in fixed assets, it ranked highly in the percentage of state owned enterprises in 1990. The southwestern provinces greatly increased their rankings in the percentage of state owned enterprises in the period 2000 to 2004.

Another significant anomaly relating to Xinjiang has been the great decrease in the percentage of minorities in the population of Xinjiang (Figure 8.10). The primary attribution for this phenomenon is the investment in fixed assets and infrastructure occurring in the province. Han migration has been encouraged as a means to bring in skilled labor. It is possible that out migration of Han from Guizhou to more prosperous regions as well as greater tolerance of exceptions to the one child policy for the more insular minorities have influenced the increase in minority percentages. Since Guizhou generally fares more poorly than the other two southwestern provinces (see ranking in Table 6.1), the perceived need for additional children by rural populations not yet ready for economic take-off may mirror the model of demographic transition theorized by Rostow, Kingsley Davis, and others (Weeks, 1999, 93-96).

In considering the economic condition of these four provinces, we find that when sorted by GDP per capita rank (Table 6.1), the three southwestern

Table 8.1 Panel Data Factors

Province	Year	Jr. Sec. School Rank	Investment Fixed Assets Rank	State Owned Enterprises Rank	Yearbook Code	Pop. Density pers./km²	Minority %
Guangxi	1990	23	23	23	20	178	39
	2000	22	21	16			
	2004	12	22	10			
Guizhou	1990	28	26	9	24	184	35
	2000	29	25	7			
	2004	25	25	3			
Xinjiang	1990	20	20	2	33	2	96
	2000	25	19	15			
	2004	20	24	8			
Yunnan	1990	29	21	21	25	94	33
	2000	28	16	4			
	2004	28	20	7			

Table 8.1. This table collates those factors considered in the model of economic development for the four focus provinces of Guangxi, Guizhou, Yunnan, and Xinjiang. The extremes in the population density and minority percentage figures of Xinjiang may justified the extraordinary investment there for the government of the PRC.

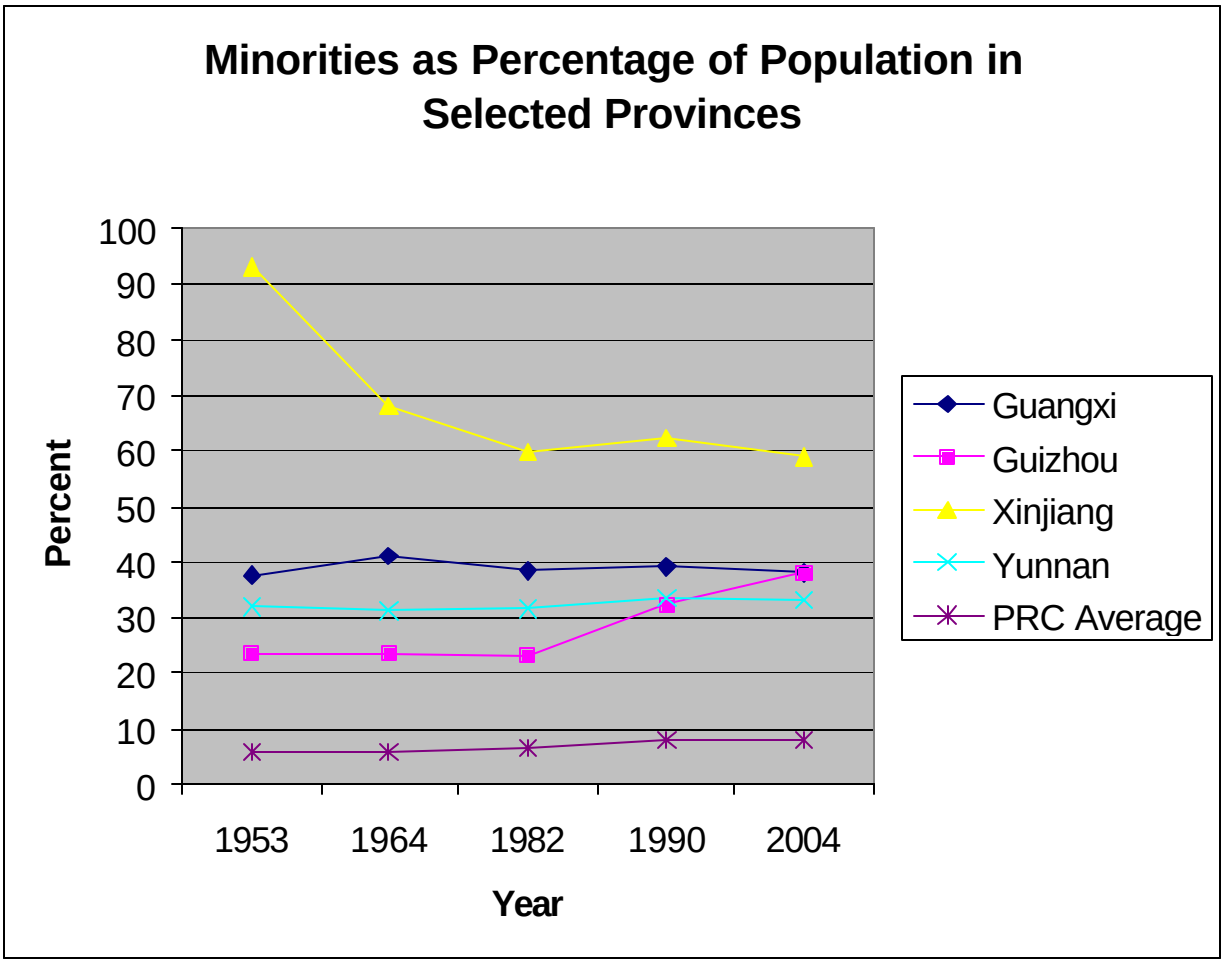


Figure 8.10. This graph plots minority percentages in the four focus provinces in the period from 1953 to 2004 as well as the average minority percentage in the PRC. The only dramatic change can be observed in the decrease of the minority percentage in Xinjiang, although there is a 15% increase of minority percentage in Guizhou from 1982 to 2004. Data for 1953-1990 were obtained from the statistical yearbooks while the minority percentages of 2004 were obtained from current Wikipedia articles on the provinces and the on-line CIA factbook article on the PRC.

provinces of Guangxi, Guizhou, and Yunnan were consistently ranked as the bottom minority provinces among all of the provinces of the PRC in the years 1990 and 2001-2004. Xinjiang ranked twelfth among all provinces in 1998 and maintained that rank in the years 2001-2003, dropping to the thirteenth in 2004.

When considered in terms of our proposed model of economic development, we find that our focus provinces have not fared well. Our model predicts with some probability that educational attainment has a minute negative effect upon GDP per capita. Compared to their rankings in 1990, all but one province have greatly improved their rankings in the number of persons with junior secondary school education. Yunnan only increased ranking by one place in fourteen years. Considering the evidence, improvement in education does not seem contribute to an increase in GDP per capita in the PRC among the minority provinces.

Of the factors considered in the model, population density has the strongest probability of having the greatest effect on the GDP per capita. Of our four focus provinces, the three southwestern provinces have gradually increased in population density to match those of the central provinces of the PRC. Xinjiang lags hopelessly behind in this respect. The next strongest factor in our model is geographic location (as manifested in the yearbook code), indicating that distance from the coast. This is significant since the majority of current economic development is located in the coastal region. As current economic development strategy is based on Growth-pole theory, little can be

done immediately to counter the effect of this factor upon GDP per capita. It will take time to build infrastructure, population density and consumer markets for these more distant regions.

Much of the increases in GDP per capita in Xinjiang has been in the extractive industries. The majority of workers benefiting from this employment has been Han and not the indigenous minorities such as Kazaks or Uygurs. While there is hope that there is "trickle down" effect for minority laborers to support these extractive industries, the reality is that it may be some time before this wealth is distributed to the minority population. Since Xinjiang has been targeted for continued investment, the path of development in Xinjiang may continue to diverge from the southwestern provinces as well as the PRC as a whole. That the data used in this study point to a gradual slump in indicators of the economic development of Xinjiang does not necessarily mean that interest is being lost in Xinjiang. Current government investment in Xinjiang far exceeds revenues (Schmidt, 2005, 102). While encouraging economic growth and the gradual transition to more of a market economy, the current government has not lost sight of many political objectives; the first of these being the political and social integration of the hinterlands into the Chinese mainstream.

One industry being encouraged and promoted for the southwestern provinces is tourism. The scenery and the rich diversity of cultures offer the potential tourists, both domestic and foreign, much. Yet, the economic realities of this region may even hinder this hope for economic development. Figure

8.11 depicts the relative trends in tourism among the majority provinces, the minority provinces, and the four focus provinces in the years 1990 to 2004. The majority provinces enjoyed a relative advantage over the minority provinces and seem to be following a logarithmic increase as these provinces continue to prosper. There seems to be little difference between the minority and the focus provinces, although the three southwestern provinces enjoyed more tourism than the other minority provinces in 1990 but might be falling behind the minority provinces as of 2004. This is a situation that should be monitored in the future.

These conclusions can only be indirect inferences on minority populations since the statistical analyses have only been made with the whole of the data for those provinces with higher minority populations. Because of current limitations in the availability of data, it is rather difficult to make any direct inferences. Further research is necessary with substantially better data directly targeting the National Minority Autonomous Areas. As mentioned in the first section of this thesis, considerable obstacles remain in the development of the three southwestern provinces. With the recent completion of the railway to Lhasa, the government of the PRC seems determined to attempt new and innovative means to achieve its objectives. Such innovation will be necessary to reach these outposts of Chinese hegemony.

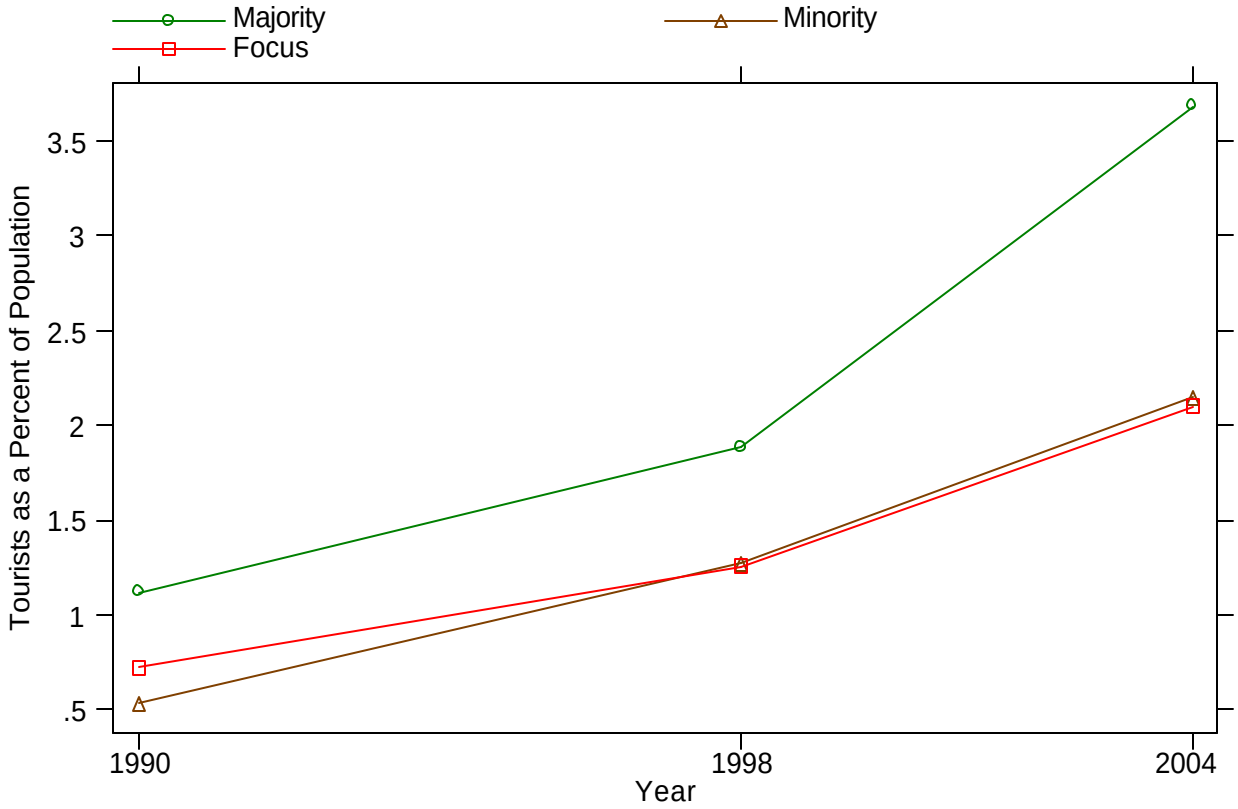


Figure 8.11. This graph plots the trends in tourism among the majority provinces, the minority provinces, and the four focus provinces in the years 1990 to 2004. The majority provinces enjoyed a relative advantage over the minority provinces that seems to be following logarithmic increase as these provinces prosper. There seems to be little difference between the minority and the focus provinces.

CHAPTER 9

CONCLUSION

The present-day minorities of the Peoples' Republic of China arose out of the periphery of those peoples that eventually became the majority Han nation, largely as a result of the innovation of agriculture and a society based on the availability and trade of resources. As the Chinese nation coalesced, minority groups were increasingly defined by difference not only in culture but also in the availability of resources. The modern state has continued to see an inequality in the availability and distribution of resources among the constituent minority populations.

This study has endeavored to not only determine the probable existence of inequality between the various constituencies in the PRC but also to examine the likely contributing factors involved in the noted inequality. Although the available data have presented considerable obstacles to analysis, some inferences are possible. Where certain factors, such as investment in infrastructure (as represented by total investment in fixed assets), inefficiency of business and manufacture (as quantified by percentage of state owned enterprises), and the educational level of the constituent workforce (as represented by the percentage of junior secondary level of education), may exert considerable influence on the economic development of some regions of the PRC, our currently accepted model of economic development depicts

circumstances where areal factors such as population density and geographic location play a much stronger role. That these factors are not as easily manipulated present considerable challenges for the development of these minority areas.

Focus on the four minority provinces of Guizhou, Guangxi, Yunnan and Xinjiang provided a platform for gleaning additional information. We have found that conditions vary even within the minority regions and may lead to divergent paths for economic development. Such a policy is being pursued in Xinjiang and the other Western provinces as the government of the PRC escalates a program for increasing investment. Aspirations for the development for the southwestern provinces are fostered through the hoped for dissemination of economic growth from the prosperous East, development of indigenous enterprises, and the encouragement of tourism.

In considering the several hypotheses proposed in the preliminary analysis of chapter 5, we reject the null hypothesis and fail to reject our primary hypothesis; namely, that the economic reforms of 1979 have made a significant change in the development of minorities in the PRC. Although conditions have generally improved in all areas of China, the inequality of economic development has vastly increased. We also accept several of the sub-hypotheses, including an improvement of minority educational level, increased investment in infrastructure in minority areas, and a subtle increase in the quality of life for minority areas. Some inferences, such as the relationship

between GDP per capita and investment in fixed assets, lack sufficient evidence to draw decisive conclusions from our current models.

As we have examined the factors used in measuring development for these minorities, we have become convinced that encumbering differences in the development of minority populations is due to the most significant factors included in the model, such as population density and geographic location, as well as other factors as yet unquantified such as a geographic barriers, trade linkages, and paucity of resources. That the error in our proposed model has the most ambiguous effect upon our dependent variable, the absolute deviation of GDP per capita, indicates that considerably more study of these minority regions is required before development is well understood.

The doctrine held by the central government since the beginning of economic reforms in 1979, that of the Growth-pole strategy of coastal development and trickling of such development into the interior, has been the economic strategy and channel for investment in infrastructure for nearly thirty years. In this time, the world has seen the PRC develop into an economic powerhouse with even aspirations for conquering the challenges of outer space. While this growth has greatly benefited many segments of the PRC, we have also seen an increasing trend toward inequality and continued economic hardship for peripheral areas such as the minority regions of the PRC. Once forbidden, economic migration is now a fact of life for millions of Chinese citizens as the rural landscapes and distant regions are abandoned for an uncertain life in eastern cities. Any benefits for the minority regions resulting

from the implementation of the Growth-pole Theory in economic reforms have yet to be seen. As noted earlier, what may work in one area of China may not work in another. The operation of a market economy based on forces of agglomeration may actually be the biggest obstacle for the development of many of the minority areas.

As a response to these new realities, the central government encouraged a “Go West” doctrine in the 2000-2004 Five Year Plan (Xinhua News Agency, 2004). Any economic benefit from this strategy has yet to assert itself; indeed, the noted rise in the absolute deviation of GDP per capita of Inner Mongolia may suggest this trend or it may be totally unaffiliated: only time will reveal this.

As this study has only been a cursory investigation into the development of minorities in the PRC, the proposed model is considered greatly lacking. This observer proposes continued monitoring of comparable economic measures in the coming years for other factors influencing development. This would include developing newer, more meaningful measures quantifiable across time. Trade linkages, geographic, cultural and social barriers, and technological levels are all issues that should be investigated and measured. Finally, those measures that were used to examine development and create the model should utilize absolute measures, such as a constant currency. Many of the measures used in this study were based on relative measures rather than absolute measures. While helpful, relative measures may not accurately

portray the true levels of economic well-being or hardship experienced by a large portion of the peoples of the PRC.

This project proposed to break new ground in analyzing the available official data on the minorities of China, a neglected aspect of Chinese geography. It is hoped that further research will also provide possible explanations for the differences in development in the minorities of China. While remedies for many of the obstacles involved may not be easily reached, an awareness of these factors may provide opportunities to develop strategies in future planning.

The history of the peoples of China has provided a unique background for the current economic and social policies of the government in Beijing to operate. Since the reforms of 1979, emphasis has been on the expansion of industry and economic growth from which, it is hoped, all will benefit. Yet, the minorities of China face unique challenges not only to economic development, but also to social integration within the greater society of the PRC while maintaining cultural survival. It has been our hope that this study provides an analysis that would prove useful to the continued existence, prosperity, and cultural diversity of all the citizens of the People's Republic of China.

ENDNOTES

[1] K. C. Chang (1976) demonstrates the increasing capacity and sophistication of Chinese agriculture since the first Neolithic cultures in the Loess region. Indeed, the ability to grow a surplus of foods allowed for the economic specialization that would advance Chinese civilization (Ho, 1975).

[2] All published population figures for minority populations refer to the Fourth National Census held on July 1, 1990. No newer data are currently available. Even current official websites list the same data (for example, see http://www.china.org.cn/e-china/population/Autonomy.htm). The source for population data of the minorities given in this section is China Statistics Press (2000a).

[3] This can be observed from population data. Note that in recent years, the relative ranks of most of the officially recognized minorities have remained the same.

[4] See Human Rights Watch, 2002 for an example.

[5] Population was data as given for the year end, according to China Statistics Press (2000b), p. 33

[6] This figure was calculated from the Beaufort scale as given in the original text; that is, 12 on the Beaufort scale.

[7] This figure was calculated from the Beaufort scale as given in the original text; that is, 8 on the Beaufort scale.

[8] This figure was calculated from 615.04 units of 10,000 tons per year, as given in the source.

[9] All published population figures for minority populations refer to the Fourth National Census held on July 1, 1990. No newer minority data are currently available. Even current official websites list the same data (for example, see http://www.china.org.cn/e-china/population/Autonomy.htm).

[10] This can be seen in the aggregate minority data in sources such as Economic and Development Department State Ethnic Affairs Commission (2000) and China Statistics Press (2000a).

[11] An example of this can be found as a footnote to the table, “Schools by Types of Minority National Autonomous Areas” stating, “This table excludes the changed factor of region. There is no comparison between years. The same below” (China’s Ethnic Statistical Yearbook, 2000, p. 547).

[12] As calculated from data found in the China Statistical Yearbook 2000 CD-ROM, Table 21-14, Hospital Beds and Medical Technical Personnel By City and County Areas.

[13] As calculated from the statistical yearbooks of 2000 and 2005 using population and freight ton-kilometer data.

REFERENCES

Ahrari, M. Ehsan (2000). "China, Pakistan, and the 'Taliban Syndrome' ". Asian Survey, 40, 4, pp. 658-671.

Amnesty International Publications 2001 (2001). "Amnesty International report 2001". On-line. http://www.amnesty.org.

Attané, Isabelle and Courbage, Youssef (2000). "Transitional stages and identity boundaries: The case of ethnic minorities in China". Population and Environment, 21, 3, pp. 257-280.

Banks, Tony (1999). "State, community and common property in Xinjiang: Synergy or strife?" Development Policy Review, 17, pp. 293-313.

Barraclough, Geoffrey (ed.) (1998). HarperCollins Atlas of World History (Second Edition). Ann Arbor, MI: Borders Press.

Brown, Malcolm (1994). "Using Gini-Style Indices to Evaluate the Spatial Patterns of Health Practitioners: Theoretical Considerations and an Application Based on Alberta Data". Social Science Medicine, 38: 1243-1256.

Brüderl, Josef (2005). "Panel data analysis". On-line. Portable Document File (PDF) downloaded from the University of Mannheim.

Castillo-Salgado, Carlos, Schneider, Cristina, Loyola, Enrique, Mujica, Oscar, Roca, Anne and Yerg, Tom (2001). "Measuring Health Inequalities: Gini Coefficient and Concentration Index". Epidemiological Bulletin, 22(1),

March 2001. Online. Accessed at the website of PAHO's Special Program for Health Analysis (SHA) at http://www.paho.org/English/SHA/be_v22n1-cover.htm.

Central Statistics Office (Republic of Ireland) (undated). "CSO—students corner: What are GDP and GNP?". On-line. Accessed on 05 July 2006. http://www.cso.ie/studentscorner/whatgdpgnp.htm.

Chang, K.C. (1976). Early Chinese Civilization: Anthropological Perspectives. Cambridge, MA: Harvard University Press.

Chang, Kwang-Chih (1999). "China on the eve of the historical period." In Loewe, Michael and Shaughnessy, Edward L., The Cambridge History of Ancient China. Cambridge: Cambridge University Press, pp. 37-73.

China Statistical Information and Consultancy Service Center (1991). China Statistical Yearbook 1991. Beijing, People's Republic of China.

China Statistics Press (1999). China Statistical Yearbook (1999). Liu Chengxiang (ed.). CD-ROM. Beijing, People's Republic of China.

China Statistics Press (2000a). China Statistical Yearbook (2000). Liu Chengxiang (ed.). CD-ROM. Beijing, People's Republic of China.

China Statistics Press (2000b). China Population Statistics Yearbook--2000. Liu Chengxiang (ed.). Beijing, People's Republic of China.

Coates, B. E., Johnston, R. J., and Knox, P. L. (1977). Geography and Inequality. Oxford: Oxford University Press.

Conover, W. J. (1999). Practical Nonparametric Statistics (3rd ed.). New York: John Wiley & Sons, Inc.

Dillon, Micheal (ed.). (1998). China: A Historical and Cultural Dictionary. Surrey, UK: Curzon.

Dutta, Sujit (2003). "China's emerging ties with Central Asia". In Joshi, Nirmala (ed.). Central Asia: The Great Game Replayed. Delhi: New Century Publications, pp. 142-165.

Easterly, William (1999). "The ghost of financing gap: testing the growth model used in the international financial institutions." Journal of Development Economics, 60: 423-438.

Economic and Development Department State Ethnic Affairs Commission & Department of Integrated Statistics State Statistical Bureau People's Republic of China (1991). China's Ethnic Statistical Yearbook (1949-1990). Beijing: Ethnic Publishing House.

Economic and Development Department State Ethnic Affairs Commission & Department of Integrated Statistics State Statistical Bureau People's Republic of China (2000). China's Ethnic Statistical Yearbook. Beijing: Ethnic Publishing House.

European Parliament (2000). "European Parliament resolution on Tibet". On-line. http://www.europarl.eu.int/meetdocs/delegations/chin/20020326/006A.pdf.

Foreign Languages Press (1966). Quotations from Chairman Mao Tse-Tung. Peking (Beijing): Foreign Languages Press.

Fan, C. Cindy and Sun, Mingjie (2005). "Regional inequality in the Pan-Pearl River Delta region." Unpublished manuscript. Submitted for possible

publication in Yeung, Y.M. and Shen, Jianfa (eds.), The Pan-Pearl River Delta: An Emerging Regional Economy in Globalizing China. Hong Kong: The Chinese University Press.

Gamrab, Qoichen (1999). National Regional Autonomy in Tibet. Beijing: China Intercontinental Press.

Gastwirth, Joseph L. (1971). "A general definition of the Lorenz Curve". Econometrica, 39, 6, pp. 1037-1039.

Gustafsson, Björn and Li Shi (2001). "A more unequal China? Aspects of inequality in the distribution of equivalent income". In Rishkin, Carl Renwei, Zhao, and Shi, Li (eds.). China's Retreat from Equality: Income Distribution and Economic Transition. Armonk, NY: M.E. Sharpe, pp. 44-83.

Hjelle, Larry A. and Ziegler, Daniel J. (1992). Personality Theories: Basic Assumptions, Research, and Applications. New York: McGraw-Hill, Inc.

Ho, Ping-ti (1975). The Cradle of the East: An Inquiry into the Indigenous Origins of Techniques and Ideas of Neolithic and Early Historic China. Hong Kong: The Chinese University of Hong Kong Press.

Hsieh, Chiao-min (2004). "Afterword: China enters the twenty-first century." In Hsieh, Chiao-min and Lu, Max (eds.) (2004), Changing China: A Geographic Appraisal. Boulder, CO: Westview Press, pp. 439-446.

Hughes, David W. and Holland, David W. (1994). "Core-periphery economic linkage: a measure of spread and possible backwash effects for the Washington economy". Land Economics 70(3): 364-77 (August 1994).

Human Rights Watch (2002). "Human Rights Watch world report 2002: Asia: China and Tibet". On-line. http://www.hrw.org/wr2k2/asia4.html.

Iredale, Robyn, Bilik, Naran, and Su, Wang, (eds.). (2001). Contemporary Minority Migration, Education and Ethnicity in China. Northampton, MA: Edward Elgar.

Jaisingh, Lloyd R., Ph.D. (2000). Statistics for the Utterly Confused. New York: McGraw Hill.

Johnston, R. J. (1997). Geography and Geographers: Anglo-American Human Geography Since 1945 (Fifth Edition). London: Arnold.

Keightley, David N. (1999). "The environment of ancient China." In Loewe, Michael and Shaughnessy, Edward L., The Cambridge History of Ancient China. Cambridge: Cambridge University Press, pp. 30-36.

Knight, John, Li Shi, and Zhao Renwei (2001). "A spatial analysis of wages and incomes in urban China: Divergent means, convergent inequality". In Rishkin, Carl, Renwei, Zhao, and Shi, Li (eds.). China's Retreat from Equality: Income Distribution and Economic Transition. Armonk, NY: M.E. Sharpe, pp. 133-166.

Kuznets, Simon (1973). "Modern economic growth: findings and reflections". The American Economic Review, 60(3): 247-258.

Kwan, Chi Hung (2004). "The privatization of state-owned enterprises as the key to northeastern development". Tokyo: Research Institute of Economy, Trade and Industry (RIETI). China in Transition. On-line. http://www.rieti.go.jp/en/china/04013001.html.

Lemoine, Jacques (1989). "Ethnicity, culture and development among some minorities of the People's Republic of China", pp. 11-22 in Chiao, Chien and Tapp, Nicholas (1989) (eds.). New Asia Academic Bulletin: Special Issue on Ethnicity & Ethnic Groups in China, vol. VIII.

Lewis, W. A. (1954). "Economic development with unlimited supplies of labour". The Manchester School of Economic and Social Studies, 23(2): 139-191.

Livingstone, D. N. (1992). "A 'sternly practical' pursuit: Geography, race and empire". In Livingstone, D. N. (ed.), The Geographical Tradition: Episodes in the History of a Contested Enterprise. Oxford: Blackwell, pp. 216-259.

Lo, Chor-Pang (1990). "The geography of rural regional inequality in mainland China." Trans. Inst. Br. Geography, 15: 466-486.

Mackerras, Colin (1995). China's Minority Cultures: Identities and Integration Since 1912. New York: St. Martin's Press.

McKinley, Terry (1996). The Distribution of Wealth in Rural China. Armonk, NY: M.E. Sharpe.

Myrdal, Gunnar (1957). Economic Theory and Under-Developed Regions. London: Gerald Duckworth & Co. Ltd.

Nagel, Joan (1994). "Constructing ethnicity". Social Problems, 4, 1, pp. 152-153, 167-168.

New Star Publishers (2001). Tibet Before Its Peaceful Liberation. Beijing: New Star Publishers.

Norton, William (2000). Cultural Geography, Themes, Concepts, Analysis. Don Mills, ON: Oxford University Press.

The Office of Tibet, the official agency of His Holiness the Dalai Lama in London (1996). Untitled "white paper". On-line. http://www.tibet.com/WhitePaper/white2.html.

Park, Hun Myoung (2005). "Linear regression models for panel data using SAS, STATA, LIMDEP, and SPSS". On-line. Indiana University. Portable document file (PDF) downloaded from http://www.indiana.edu/~statmath.

Parr, John B. (1999). "Growth-pole strategies in regional economic planning: a retrospective view. Part 1. Origins and advocacy". Urban Studies 36(7): 1195-1215.

Prime, Penelope B. (1991). "China's economic reforms in regional perspective". In Veeck, Gregory (ed.), The Uneven Landscape, Geographic Studies in Post-Reform China. Baton Rouge, LA: Geoscience and Man, vol. 30, pp. 9-27. Department of Geography and Anthropology, Louisiana State University, Baton Rouge, LA.

Princeton University Library (2006). "Panel data". Princeton University Data and Statistical Services. On-line. http://libweb.princeton.edu/.

Richardson, Harry W. (1969). Elements of Regional Economics. Harmondsworth, Middlesex: Penguin Books Ltd.

Richardson, Harry W. (1975). "Growth pole spillovers: the dynamics of backwash and spread". Regional Studies, 10: 1-9.

Richardson, Harry W. (1981). "Defining urban population distribution goals in development planning". In Department of International Economic and Social Affairs, Population Distribution Policies in Development Planning, pp. 7-18. New York: United Nations.

Schaefer, Richard T. (1998). Racial and Ethnic Groups (7th ed.). New York: Addison Wesley Longman, Inc.

Schmidt, Philipp W. (2005). Structural Change and Intraprovincial Disparities in the Xinjiang Uyghur Autonomous Region. Masters Thesis, University of Georgia.

Solow, Robert M. (1956). "The theory of economic growth". Quarterly Journal of Economics, 70: 65-94. Massachusetts Institute of Technology Press.

Starr, John Bryan (2001). Understanding China (revised edition). New York: Hill and Wang.

Stata Corporation (2001). "Stata 7.0 statistics/data analysis". Software. College Station, Texas.

State Statistical Bureau (1983). Statistical Yearbook of China 1983. Hong Kong: Economic Information & Agency.

State Statistical Bureau (1991). China Statistical Yearbook 1991. Beijing: China Statistical Information and Consultancy Service Center.

Taylor, Chris, Gorard, Stephen and Fitz, John (2000). "A re-examination of segregation indices in terms of compositional invariance". In Social Research Update, 30: 1-4.

Tobler, W. R. (1970). "A computer model simulation of urban growth in the

Detroit region". Economic Geography, 46(2): 234-240.

Todaro, Michael P. (2000). Economic Development (7th ed.). Reading, MA: Addison-Wesley.

Toops, Stanley Winfield (1983). The Political Integration of Yunnan. Masters Thesis, University of Washington.

United Nations Development Programme, China (1999). The China Human Development Report. New York: Oxford University Press, Inc.

U.S. Department of State, Released by the Bureau of Democracy, Human Rights, and Labor (February 26, 1999). "China country report on human rights practices for 1998". On-line. http://www.state.gov/www/global/human_rights/1998_hrp_report/china.html.

Wagner, P. L. and Mikesell, M. W. (1962). Readings in Cultural Geography. Chicago: The University of Chicago Press.

Weeks, John R. (1999). Population, An Introduction to Concepts and Issues (Seventh Edition). Belmont, CA: Wadsworth Publishing Company.

Wilkinson, Endymion (2000). Chinese History: A Manual, Revised and Enlarged. Cambridge, MA: Harvard University Asia Center for the Harvard-Yenching Institute.

Williamson, J. G. (1965). "Regional inequality and the process of national development: a description of the patterns". Economic Development and Cultural Change, 13(4): 1-84.

Wu, David Y. H. (1989). "Culture change and ethnic identity among minorities in China". In Chiao, Chien and Tapp, Nicholas (1989) (eds.). New Asia

Academic Bulletin: Special Issue on Ethnicity & Ethnic Groups in China, vol. VIII, pp. 11-22.

Xie, Xiangfang (ed.) (1991). Xin Jiang Wei Wu Er Zi Zhi Qu Jing Ji Di Li [*Xinjiang Uygur Autonomous Region Geographic Earth Science*]. Beijing: Xinhua Chu Ban She.

Xinhua News Agency (2004). "Going-west still a top development strategy" People's Daily Online. On-line. http://www.chinadaily.com.cn/english/doc/2004-03/22/content_316800.htm.

Xin Liu (2000). In One's Own Shadow, An Ethnographic Account of the Condition of Post-Reform Rural China. Berkeley: University of California Press.

Zhang, Yuxin (1999). 40 Years of Cultural Relics Protection in Tibet. Beijing: China Intercontinental Press.

Zhao, Songqiao (1992). Geography of China, Environment, Resources, Population, and Development. New York: John Wiley & Sons, Inc.

Zhou, Shunwu (1992). China Provincial Geography. Beijing: Foreign Languages Press.

Zhu, Rongji (2001). "Report on the outline of the Tenth Five-Year Plan for national economic and social development". On-line. http://www.china.org.cn/english/8722.htm.

APPENDIX A

DATA USED IN PANEL ANALYSIS AND MODELING

Region	Group	yrbk_ord	location	min_prv	minpct	year	jrscsh	tifxas	pcfxas	stownd	stopc	mwgnp	popdens
Anhui	3	12	Coastal S	Han	1	1990	19967	125.2	2.81	67.93	54.26	0.6220412	405.4
Anhui	3	12	Coastal S	Han	1	2000	32780	803.97	2.44	428.76	53.33	0.6248122	427.6
Anhui	3	12	Coastal S	Han	1	2004	36518	1935.25	2.75	716.54	37.03	0.5610048	461.5
Beijing	1	1	North Cen	Han	4	1990	30551	190.81	4.29	152.03	79.68	2.683432	646.1
Beijing	1	1	North Cen	Han	4	2000	34391	1280.46	3.89	758.06	59.2	2.20796	822.2
Beijing	1	1	North Cen	Han	4	2004	32352	2528.21	3.59	734.37	29.05	2.160722	888.3
Fujian	3	13	Coastal S	Han	2	1990	16867	108.54	2.44	64.69	59.6	0.8927246	249.5
Fujian	3	13	Coastal S	Han	2	2000	33708	1112.2	3.38	407.19	36.61	1.390285	285.2
Fujian	3	13	Coastal S	Han	2	2004	30369	1892.92	2.69	571.9	30.21	1.298462	288.5
Gansu	6	28	Northwest	Han	8	1990	16851	56.24	1.26	46.12	82.01	0.604948	49.7
Gansu	6	28	Northwest	Han	8	2000	23925	395.4	1.2	277.82	70.26	0.472496	56.4
Gansu	6	28	Northwest	Han	8	2004	28127	733.94	1.04	446.67	60.86	0.4483017	57.7
Guangdong	4	19	South Cen	Han	1	1990	23041	406.71	9.14	269.46	66.25	1.349852	356.5
Guangdong	4	19	South Cen	Han	1	2000	36690	3145.13	9.55	1260.84	40.09	1.376347	485.5
Guangdong	4	19	South Cen	Han	1	2004	34473	5870.02	8.33	1719.25	29.29	1.454728	466.5
Guangxi	4	20	South Cen	M	39	1990	19141	68.57	1.54	41.16	60.03	0.5365604	180
Guangxi	4	20	South Cen	M	39	2000	32339	583.34	1.77	314.77	53.96	0.5622101	189.7
Guangxi	4	20	South Cen	M	39	2004	37254	1236.51	1.75	535.79	43.33	0.5114585	206.6
Guizhou	5	24	Southwest	M	35	1990	14645	45.6	1.02	36.15	79.28	0.453261	187.8
Guizhou	5	24	Southwest	M	35	2000	20480	396.98	1.21	247.73	62.4	0.3469657	202.6
Guizhou	5	24	Southwest	M	35	2004	28683	865.23	1.23	504.16	58.27	0.3071039	224.4
Hainan	4	21	South Cen	M	17	1990	22528	39.21	0.88	30.59	78.02	0.8340293	195.3
Hainan	4	21	South Cen	M	17	2000	32502	198.87	0.6	83.14	41.81	0.8110021	231.9
Hainan	4	21	South Cen	M	17	2004	39269	317.05	0.45	100.41	31.67	0.7083626	241
Hebei	1	3	North Cen	Han	4	1990	23164	182.12	4.09	110.99	60.94	0.7748234	328.1
Hebei	1	3	North Cen	Han	4	2000	34311	1816.79	5.52	827.66	45.56	0.9289154	321.2
Hebei	1	3	North Cen	Han	4	2004	42963	3218.76	4.57	1030.8	32.02	0.9699194	362.8
Heilongjiang	2	8	Northeast	Han	6	1990	28460	162.9	3.66	134.64	82.65	1.042678	75.5
Heilongjiang	2	8	Northeast	Han	6	2000	38863	832.64	2.53	452.45	54.34	1.085526	78.7
Heilongjiang	2	8	Northeast	Han	6	2004	47155	1430.82	2.03	641.78	44.85	1.046355	81.4
Henan	4	16	South Cen	Han	1	1990	26545	207.67	4.67	108.22	52.11	0.6027561	517.9
Henan	4	16	South Cen	Han	1	2000	39392	1377.74	4.19	782.56	56.8	0.6832926	554.3
Henan	4	16	South Cen	Han	1	2004	43795	3099.38	4.4	1092.8	35.26	0.6832409	581.9
Hubei	4	17	South Cen	Han	4	1990	23164	142.5	3.2	94.17	66.08	0.8480622	292.6
Hubei	4	17	South Cen	Han	4	2000	34311	1339.2	4.07	762.24	56.92	0.8732964	324.3
Hubei	4	17	South Cen	Han	4	2004	37128	2264.81	3.21	927.94	40.97	0.7899422	323.6
Hunan	4	18	South Cen	Han	8	1990	22567	120.35	2.7	68.19	56.66	0.6673285	289.1
Hunan	4	18	South Cen	Han	8	2000	35656	1012.24	3.08	520.08	51.38	0.7057102	303.8
Hunan	4	18	South Cen	Han	8	2004	38498	2072.56	2.94	836.03	40.34	0.6310619	315.9
Inner Mongolia	1	5	North Cen	M	19	1990	25473	64.97	1.46	50.97	78.45	0.7712151	18
Inner Mongolia	1	5	North Cen	M	19	2000	34798	423.64	1.29	263.04	62.09	0.7258711	19.8
Inner Mongolia	1	5	North Cen	M	19	2004	37261	1787.95	2.54	871.04	48.72	0.8567914	19.9
Jiangsu	3	10	Coastal S	Han	0	1990	26426	361.1	8.12	129.78	35.94	1.130456	659.6
Jiangsu	3	10	Coastal S	Han	0	2000	36372	2569.97	7.81	1137.93	44.28	1.420476	725
Jiangsu	3	10	Coastal S	Han	0	2004	37986	6557.05	9.3	2003.22	30.55	1.56072	724.5
Jiangxi	3	14	Coastal S	Han	0	1990	18841	70.67	1.59	47.16	66.73	0.637225	228.7
Jiangxi	3	14	Coastal S	Han	0	2000	33219	516.08	1.57	279.78	54.21	0.5956079	248.5
Jiangxi	3	14	Coastal S	Han	0	2004	35072	1713.2	2.43	724.01	42.26	0.6146018	257.1
Jilin	2	7	Northeast	Han	10	1990	26308	93.51	2.1	66.94	71.59	0.9232829	132.5
Jilin	2	7	Northeast	Han	10	2000	35687	603.51	1.83	318.52	52.78	0.8218179	145.6
Jilin	2	7	Northeast	Han	10	2004	41664	1169.1	1.66	456.36	39.04	0.8224307	144.6
Liaoning	2	6	Northeast	M	16	1990	32321	260.36	5.85	215.44	82.75	1.415602	271.7
Liaoning	2	6	Northeast	M	16	2000	40082	1267.68	3.85	649.42	51.23	1.35623	290.3
Liaoning	2	6	Northeast	M	16	2004	46484	2979.59	4.23	930.59	31.23	1.227439	288.8
Ningxia	6	30	Northwest	M	33	1990	20274	20.56	0.46	16.08	78.21	0.7559853	70.8
Ningxia	6	30	Northwest	M	33	2000	27830	157.52	0.48	97.88	62.14	0.5817112	84.6
Ningxia	6	30	Northwest	M	33	2004	29049	376.2	0.53	137.88	36.65	0.5896443	88.6
Qinghai	6	29	Northwest	M	42	1990	17761	21.52	0.48	19.19	89.17	0.8610533	6.2
Qinghai	6	29	Northwest	M	42	2000	21661	151.14	0.46	96.07	63.56	0.6264175	7.2
Qinghai	6	29	Northwest	M	42	2004	26293	289.18	0.41	148.97	51.51	0.6507658	7.5
Shaanxi	6	27	Northwest	Han	0	1990	24359	101.16	2.27	69.69	68.89	0.6579131	161.3
Shaanxi	6	27	Northwest	Han	0	2000	33203	653.67	1.99	428.82	65.6	0.5671633	175.3
Shaanxi	6	27	Northwest	Han	0	2004	36180	1508.89	2.14	810.64	53.72	0.5861551	180.2
Shandong	3	15	Coastal S	Han	1	1990	25182	334.79	7.52	184.59	55.14	0.9128744	542
Shandong	3	15	Coastal S	Han	1	2000	36634	2531.1	7.69	1167.85	46.14	1.158267	579.4
Shandong	3	15	Coastal S	Han	1	2004	39474	6970.62	9.89	1750.2	25.11	1.270892	585.8
Shanghai	3	9	Coastal S	Han	0	1990	31592	227.09	5.1	192.23	84.65	3.241589	2108.8
Shanghai	3	9	Coastal S	Han	0	2000	36803	1869.38	5.68	826.83	44.23	3.346805	2640.4
Shanghai	3	9	Coastal S	Han	0	2004	31632	3050.26	4.33	909.31	29.81	3.221092	2747.6
Shanxi	1	4	North Cen	Han	0	1990	29237	120.45	2.71	88.67	73.62	0.7995069	185.8
Shanxi	1	4	North Cen	Han	0	2000	38928	548.16	1.67	347.21	63.34	0.6137583	211.3
Shanxi	1	4	North Cen	Han	0	2004	46306	1443.88	2.05	556.82	38.56	0.6870704	213.8