# Regional Disparity of Internet Development in China : A Policy Dilemma[1]

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## บทคัดย่อ

*การปฏิวัติทางเทคโนโลยีข่าวสารได้เปลี่ยนแปลงชีวิต การสื่อสารและการคิดเป็นอย่างมาก ในขณะที่ผู้คนได้รับประโยชน์จากเทคโนโลยีสารสนเทศ นักวิชาการเป็นห่วงเป็นใยเกี่ยวกับความไม่เท่าเทียมกันในการเข้าถึงอินเทอร์เน็ตระหว่างประเทศที่พัฒนาแล้วและประเทศที่กำลังพัฒนา รวมทั้งภายในประเทศด้วย บทความนี้ตรวจสอบพัฒนาการเมื่อเร็วๆนี้ของอินเตอร์เน็ตในประเทศสาธารณรัฐประชาชนจีนและสำรวจว่า การปฏิรูปและนโยบายเปิดประตูของจีนทำให้เกิดช่องว่างในการพัฒนาอินเทอร์เน็ตระหว่างภูมิภาค สิ่งที่ส่อแสดงในนโยบายสำหรับการพัฒนาทางเศรษฐกิจในอนาคตก็ได้รับการถกเถียงเช่นกัน*

## Abstract

*The information technology revolution has significantly changed the way we live, communicate, and think. While people enjoy the benefits of this information technology, scholars are concerned about the inequality of Internet accessibility between developed and develop-*

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*ing countries, as well as inequality within a country. This article examines current Internet development in China and explores how the Chinese reform and open door policy has attributed to the regional Internet development gap. Policy implications for future economic development in China are also discussed.*

**Keywords** : Internet Development, Reform and Open Door Policy, Regional Disparity

In the last decade of the twentieth century, the world has witnessed an unprecedented information technology revolution, which has significantly changed the way we live, communicate, and think (Castells, 2000). One major manifestation of this information technology revolution is the rapid growth of the new telecommunication technology—the Internet. It is estimated that by mid-2001, the number of Internet users reached about seven hundred million in more than two hundred countries (Castells, 2000). While the Internet has enhanced the quality of life and reduced communication costs for many people in the world, scholars share concerns about the inequality of Internet accessibility between developed and developing countries, as well as inequality based on social-economic status and geographic locations within a country (Castells, 2000; Moss, 1998; Townsend, 2001; Hoffman and Novak, 1998). Most of the studies on Internet inequality issues focus on developed countries, and little attention has been paid to the developing world. To fill in the gap, this article will focus on the regional disparity of Internet development in China, the largest developing country in the world.

The Internet was first available to the public in China on April 20, 1994[3], when the National Computational and Facility of China (NCFC) project

[3] Early in 1986, the Chinese Academic Network (CANET), an international networking project, has been launched in joint effort with the University of Karlsruhe in Germany. In November 1989, the National Computing and Networking Facility of China (NCFC), a World Bank credit project, was launched in China, and in December 1993, the backbone network construction of the NCFC was accomplished. Before 1994, networks were mainly serving educational and research purposes in academic institutions in China. See The Internet Timeline in China, Ref. 3.

opened a 64K international leased line to the Internet through Sprint Co. Ltd. of the United States[4]. Since then, China has experienced phenomenal growth in the number of registered domain names, websites, and Internet users. Statistics reports from the China Internet Network Information Center have shown that by July 2004, there were more than 382,200 registered domain names, 626,600 websites, and eighty seven million Internet users in China, compared to only 4,066 domain names, 1,500 websites, and 620,000 Internet users in October 1997[5]. Despite the overall rapid growth of the Internet in China, statistics have also shown that the spatial distribution of the domain names, websites, and Internet users were significantly unbalanced—mainly clustered in the big prosperous cities and provinces along the east coast. This regional disparity of Internet development is mainly caused by China's uneven economic development policy—favoring eastern and southern China—during the last two decades[6].

The article will examine current Internet development in China and explore how the Chinese reform and open door policy[7] has attributed to the regional development gap. The article is divided into three sections. The first section provides a historical review of China's reform and open door policy. The second section focuses on the Internet economy in China and how its geographic distribution is related to the development policy. Finally, the last section discusses the policy implications for future economic development in China.

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[4] Since 1994, China has been officially recognized as a country with full functional Internet accessibility.

[5] The annual growth rate for the number of domain names, websites, and Internet users during 1997 and 2004 are 91%, 137%, and 102%, respectively.

[6] For development purposes, national planners divided the country into the eastern, the central, and the western regions. The eastern region consists of twelve provincial units (from the north to the south): Liaoning, Hebei, Beijing, Tianjin, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, Guangxi, and Hainan.

[7] In Chinese, *GaiGeKaifangZhengCe*. It is also translated as the "opening up and economic reform" policy; see Wall, Jiang, and Yin, 1996, and Ho and Huenemann, 1984.

**The Reform and Open Door Policy:**
**Institutional Context of Internet Development**

When the ten-year Cultural Revolution finally ended in 1976, the Chinese economy was totally devastated by the command-and-control decision-making structure and the closed economic system. People in China were equally poor, as most of the goods were rationed and income differences were minimized. Mr. Deng Xiaoping, the designer of the Chinese economic reform, rose to power in the end of the 1970s and made economic development the primary goal of the nation (Wall, et al 1996). He suggested that in order to make China economically strong, the Chinese government had to allow some people to get rich first[8]. Following his ideas, the Chinese government embarked on economic reform and experimentation. The "historical turning point" was the Third Plenary Session of the Eleventh Central Committee of the Chinese Communist Party in December 1978. In this meeting, the Chinese government announced to the world that it would be "actively expanding economic co-operation on terms of equality and mutual benefit with other countries" and it would be "striving to adopt the world's advanced technologies and equipment." In addition, "Four Modernizations"—national objectives of modernizing agriculture, industry, defense, and science and technology—were officially included in the Constitution (Ho, et. al., 1984).

To avoid dramatic changes in the economic and political structure, and to ease the oppositions from conservative leaders during the early stage of this reform, Chinese economic reform was characterized as a series of gradual and steady open door policies.

During the first stage, only four special economic zones (SEZ) in southern China—Shenzhen, Zhuhai, Shantou and Xiamen--were open to foreign

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[8] According to the economic theory, when a developing country is in the early stages of changing to a market economy, it is very difficult to have people become equally rich a short period of time. Some scholars argue that having some people get rich first has been used to stimulate enthusiasm and initiatives for the rest. From Taejoon Han, China: A Shared Poverty to Uneven Wealth? Online, http://www.gwu.edu/~econ270/Taejoon.html, accessed on Dec. 2nd, 2005.

investment[9] (Wall, et al 1996). These four SEZs were all in important strategic locations—close to Hong Kong, Macao, and Taiwan—and had historical connections to overseas Chinese. They became the experimental fields and the benchmark of future implementation of the market economy in other regions of China. By imposing geographic limits on activities involving foreign investment and business, the Chinese government could easily maintain control and avoid economic and political instability if the experiments failed. To make the experiments successful in terms of attracting foreign investment, stimulating trade, and fostering overall economic growth and modernization, the central government, together with state-owned or municipal enterprises, invested significantly in the infrastructure of the four cities. In addition, the central government granted SEZs preferential policies, such as tax exemptions or reduction, import license exemptions for capital goods and low land-use fees, and greater autonomy and flexibility in approving both domestic and foreign investment proposals.

A few years after designating the SEZs, political opposition to foreign involvement in the Chinese economy became muted. In addition, the economic performances of the SEZs were so impressive that many other provinces, cities, towns, and even villages also wanted to establish economic zones, offering incentives to attract investment and business, and this led to the second stage of the open door policy, from 1984 to 1989 (Wall, et. al, 1996). In April 1984, the Chinese Communist Party Central Committee and the State Council sanctioned 14 more cities along the eastern coastline of China as new open economic zones, named Coastal Open Cities (COCs)[10] (See Figure I).

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[9] Shenzhen, Zhuhai, and Shantou SEZs, located in Guangdong Province, were established in 1979 and Xiamen SEZ, in Fujian province, was established in 1980. The fifth Special Economic Zone—Hainan Province was established in 1988, almost a decade later.

[10] The fourteen cities, from north to south along the coast, are Dalian (Liaoning Province), Qinhuangdao (Hebei Province), Tianjin, Yantai (Shandong Province), Qingdao (Shandong Province), Lianyungang (Jiangsu Province), Nantong (Jiangsu Province), Shanghai, Ningbo (Zhejiang Province), Wenzhou (Zhejiang Province), Fuzhou (Fujian Province), Guangzhou (Guandong Province), Zhangjiang (Guangdong Province), and Beihai (Guangxi Province).

These fourteen cities did not have the same level of preferential treatment as the SEZs. However, they were granted greater local authority and more preferential policies in attracting foreign investment than cities in the inland areas. Moreover, Economic and Technological Development Zones (ETDZs) were also approved in the 14 COCs. In 1985, Coastal Open Economic Regions (COER) were established, which included the Yangtze River Delta Area[11], the Zhujiang Delta Area[12], and the Delta of Xiamen, Zhangzhou, and Quanzhou in Fujian Province. Later, Liaodong Peninsula, Shangdong Peninsula, and the Bohai Area were also included in the COER. In 1986, the central government further divided the nation into three economic belts (at the province level): the Eastern Economic Belt[13], the Middle Economic Belt[14], and the Western Economic Belt[15] (Zhang, 2001). This division reflected the different economic development strategies the central government applied in the areas.

The third stage of the open door policy, which began in 1990 and continues today, was characterized by the establishment of Free Trade Areas (FTAs), Hi-Tech Development Zones (or Science Parks) (HTDZs), and the "open-up" of the inland region. In 1990, the first FTA was approved in the Waigaoqiao of Pudong Development District of Shanghai. In the following few years, nine additional FTAs were approved[16]. Global technological development pushed the upgrade of the sector structures that foreign investment focused on. At the early stage of open up, most of the foreign direct investment in China was in the labor-intensive industry. However, in the 1990s the Chinese government

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[11] Including Shanghai and part of Jiangsu and Zhejiang Provinces.

[12] In Guangdong Province, close to Hong Kong.

[13] From north to south along the coast, it includes 11 provinces: Liaoning, Beijing (not on the coast), Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian, Guangdong, and Guangxi.

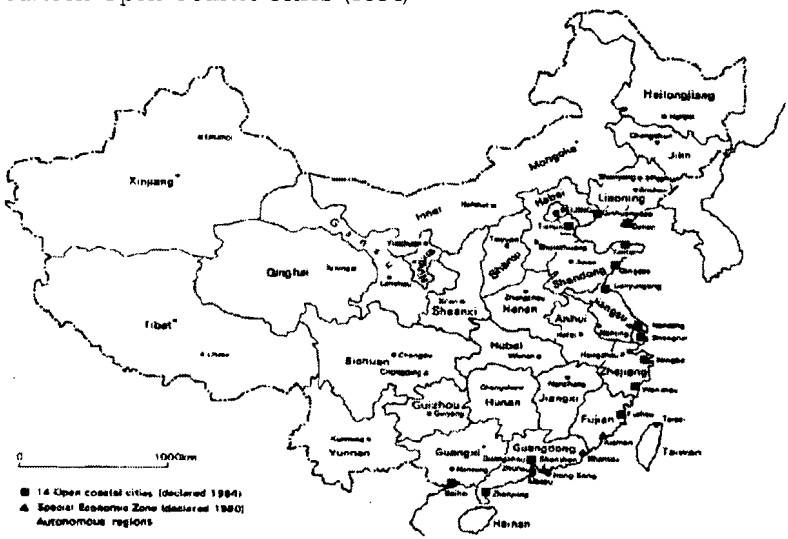
[14] From north to south, it includes 9 provinces: Heilongjiang, Jilin, Inner Mongolia, Shanxi, Henam, Anhui, Hubei, Jiangxi, and Hunan.

[15] From north to south, it includes 9 provinces: Xinjiang, Ningxia, Gansu, Qinghai, Shaanxi, Sichuan, Xizang, Guizhou, and Yunnan.

[16] The nine FTAs are located in Shenzhen (Guangdong), Haikou (Hainan Province), Tianjin, Xiamen (Fujian), Shantou (Fujian), Dalian (Liaoning), Qingdao (shandong), Zhangjiangang (Jiangsu), and Ningbo (Zhejiang).

re-directed preferential policies to attract investment in high-tech industry. By mid-1993, fifty HTDZs had been set up with the approval of the State Council[17]. The HTDZs are homes for government and foreign-sponsored research institutes, as well as international hi-tech companies. They enjoy slightly greater tax reductions than enterprises in the ETDZs (Wall, et. al. 1996). As Castells has argued, the development of new information technology has liberated industry from location constrains (Castells, 2000). In China, about half of the designated HTDZs were not coastal cities but the inland capital cities of each province.

**Map 1 :** China: Province-level Administrative Divisions, Special Economic Zones, and Fourteen Open Coastal Cities (1984)




[17] Beijing, Wuhan, Nanjing, Shenyang, Tianjin, Xi'an, Chengdu, Weihai, Zhingshan, Changchun, Harbin, Changsha, Fuzhou, Guangzhou, Hefei, Chongqing, Hangzhou, Guilin, Zhengzhou, Lanzhou, Shijiazhuang, Jinan, Shanghai, Dalian, Shenzhen, Xiamen, Haikou, Suzhou, Wuxi, Changzhou, Foshan, Huizhou, Zhuhai, Qingdao, Weifang, Zibo,Kunming,Guiyang, Nanchang, Taiyuan, Nanning, Urumqi, Baotou, Xiangfan, Daoqing, Baoji, Jilin, Mianyang, Baoding and An'shan.

The above historical review of the reform and open door policy indicates that Chinese economic development was characterized as a regional tile strategy, which favored the Eastern and Southern coast of China. Twenty-years of implementation of the policy has exacerbated the disparate economic growth patterns between the eastern and western regions and has caused significant regional imbalance (Zhang, 2001). The disadvantages to the inland regions caused by the open door policy include the following. First, during the first ten years of the open-era, foreign investments were blocked from inland provinces. With low domestic investment and foreign investment, the inland areas were facing a "double jeopardy." Consequently, the physical infrastructures in the region lagged behind the needs of further economic development, the overall economy lacked an impetus for growth, and the cities lacked the jobs created by new businesses. Secondly, Chinese enterprises in the western region were put in a less competitive position by paying a fifty-five percent tax rate, compared to foreign-invested enterprises paying only fifteen percent in the economic zones, and thirty-three percent outside the economic zones. Without the preferential policies enjoyed by the SEZs and the COCs, inland domestic enterprises carried a heavy tax burden. This situation did not change until 1994, when the Chinese government finally reformed its tax policy and equalized the tax rate to thirty-three percent (Wall, et. al. 1996). Thirdly, the quick development of the eastern region during the past two decades has drawn significant numbers of both skilled and unskilled labor from the inland area, leaving those regions with a shortage of human resources (Cannon, 2000). As Internet development relied heavily on the economic and institutional environment—a well-developed telecommunication infrastructure, an open economy and a competitive tax system, and a pool of well-educated people as both suppliers and consumers of the Internet economy—the inland provinces were left at a dire competitive disadvantage after two decades of the reform and open door policy.

**Internet Development and Its Regional Disparity in China**

Ever since China achieved its full-functional connection to the Internet in 1994, the number of Internet users and domain names had more than doubled yearly during 1997 to 2004. Despite the overall rapid growth of the Internet in China, the inland provinces still lagged significantly. In this section, the regional disparity of Internet development will be presented based on the data collected by the China Internet Network and Information Center (CNNIC)[18]. Two measures of Internet development—the number of Internet users[19] and the number of domains per 100,000 (100K) population, respectively, in a province[20] —will be used in the study.[21] In addition, two disparity indexes—a province's national share of Internet users and domains, respectively, relative to its share of the total population—will be used? for each province.

The number of Internet users per 100K population reflects the Internet accessibility and the diffusion of the Internet in people's daily life. Figure 1 shows that in 2004, the national distribution of Internet users per 100K population varied dramatically, from 2,533 to more than 27,600—an eleven-fold difference between the lowest and the highest provinces in China (see Table 1 for detailed data)[22]. Beijing, Shanghai, Tianjin, Guangdong, and Zhejiang were among the provinces with the highest number of users—with more than eleven percent of the population having Internet access—and all the five provinces, expect Beijing, were located along the east coast of China, which had opened

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[18] CNNIC have conducted a semiannual survey on Internet Development in China in each January and July since 1998.

[19] CNNIC defines Internet users as Chinese citizens who use the Internet at least one hour per week.

[20] In addition to provinces, China has four provincial-level cities and five autonomous regions. In this paper, they are generally called provinces.

[21] Zook (2000) has discussed how to compare regions in terms of their use of the Internet. He suggested the use of "domain names per capita," rather than "host per capita," as an indicator of the distribution of information across the Internet.

[22] The differences in the number of Internet users per 100K population among provinces have narrowed significantly since 2000. According to the CNNIC data, the highest number of Internet users per 100K population, which is in Beijing, is about eighty times that of the lowest, which is in Tibet, in 2000.

up to the global economy before the 1990s. The total number of Internet users in the five provinces accounted for thirty percent of the Internet users in China, while their population was only thirteen percent of the national total. Figure 2 shows that Guangdong province alone contributed to thirteen percent of the Internet users in the country. In contrast, the five provinces with the lowest number of Internet users per 100K population—Anhui, Jiangxi, Henan, Tibet, and Guizhou—were all located in the middle or west region of the country. They accounted for less than nine percent of the total Internet users in China, while they represented twenty percent of the Chinese population. The disparity index in Table 1 further illustrates that twelve provinces had equal or higher shares of Internet users compared to their shares of the population, while nineteen provinces had lower shares. It is noteworthy that none of the nineteen provinces, except Hainan and Hebei, were granted favorable economic development policies in the 1980s.

**Figure 1 :** The Number of Internet Users per 100K Population in China, 2004

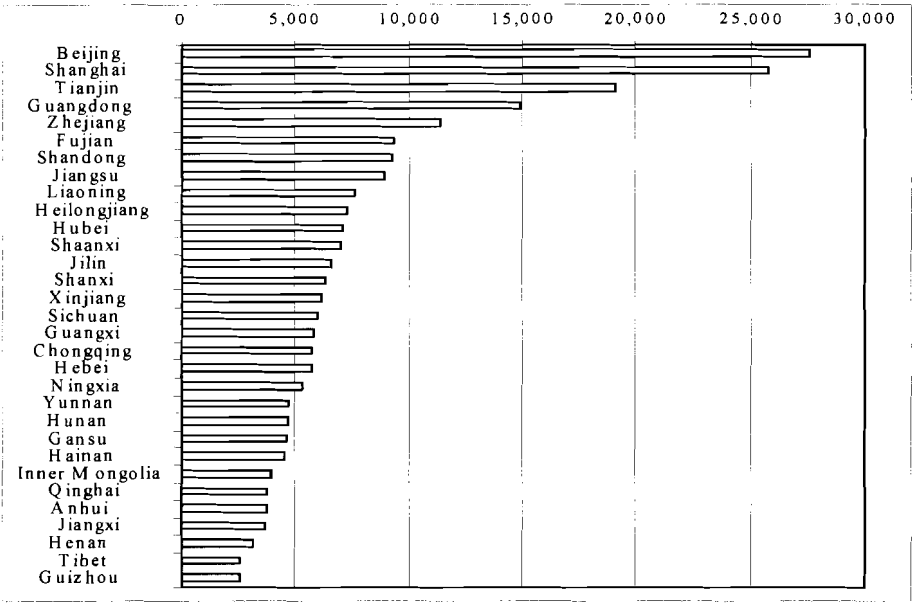


**Figure 2 :** Each Province's Share of Internet Users in China, 2004

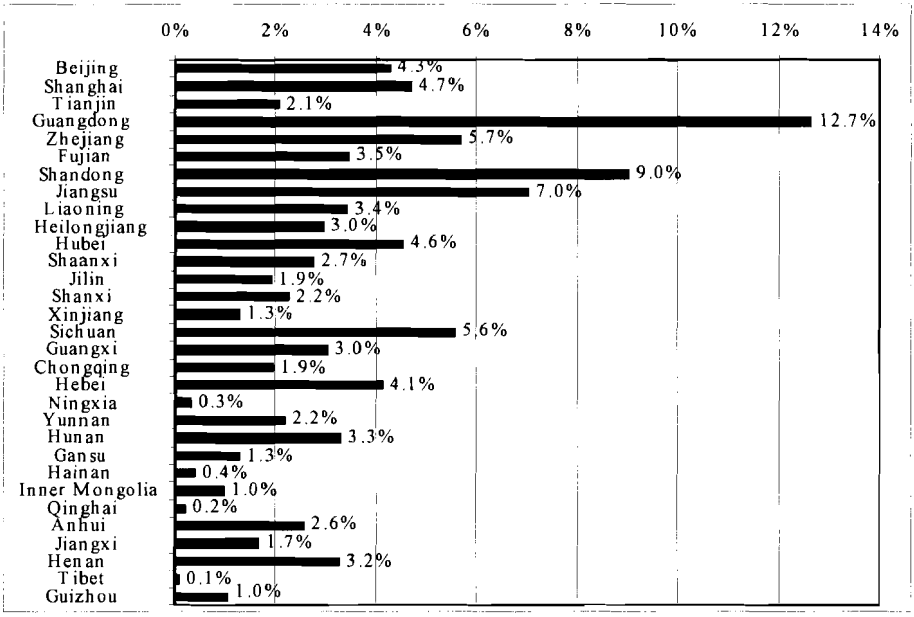

**Table 1 :** Provincial Data on the Number of Internet Users in China, 2004 say "users" in graph below, 5th column

| No. | Region | Total Population (In 1,000) | Share of Total Population (%) | Number of Internet User (1,000) | Per 100K Internet Users | Share of Total Internet Users (%) | Disparity Index* |
|---|---|---|---|---|---|---|---|
| 1 | Beijing | 14,564 | 1.13 | 4,020 | 27,602.3 | 4.28 | 3.8 |
| 2 | Shanghai | 17,110 | 1.33 | 4,410 | 25,774.4 | 4.70 | 3.5 |
| 3 | Tianjin | 10,113 | 0.79 | 1,930 | 19,084.3 | 2.06 | 2.6 |
| 4 | Guangdong | 79,542 | 6.20 | 11,880 | 14,935.5 | 12.65 | 2.0 |
| 5 | Zhejiang | 46,796 | 3.65 | 5,340 | 11,411.4 | 5.69 | 1.6 |
| 6 | Fujian | 34,880 | 2.72 | 3,260 | 9,346.3 | 3.47 | 1.3 |
| 7 | Shandong | 91,250 | 7.11 | 8,480 | 9,293.2 | 9.03 | 1.3 |
| 8 | Jiangsu | 74,058 | 5.77 | 6,610 | 8,925.4 | 7.04 | 1.2 |
| 9 | Liaoning | 42,100 | 3.28 | 3,220 | 7,648.5 | 3.43 | 1.0 |
| 10 | Heilongjiang | 38,150 | 2.97 | 2,780 | 7,287.0 | 2.96 | 1.0 |
| 11 | Hubei | 60,017 | 4.68 | 4,290 | 7,148.0 | 4.57 | 1.0 |
| 12 | Shaanxi | 36,895 | 2.87 | 2,580 | 6,992.8 | 2.75 | 1.0 |
| 13 | Jilin | 27,037 | 2.11 | 1,790 | 6,620.6 | 1.91 | 0.9 |
| 14 | Shanxi | 33,143 | 2.58 | 2,110 | 6,366.4 | 2.25 | 0.9 |
| 15 | Xinjiang | 19,340 | 1.51 | 1,190 | 6,153.2 | 1.27 | 0.8 |
| 16 | Sichuan | 87,004 | 6.78 | 5,230 | 6,011.2 | 5.57 | 0.8 |
| 17 | Guangxi | 48,570 | 3.78 | 2,850 | 5,867.8 | 3.04 | 0.8 |
| 18 | Chongqing | 31,300 | 2.44 | 1,810 | 5,782.7 | 1.93 | 0.8 |
| 19 | Hebei | 67,694 | 5.27 | 3,870 | 5,716.9 | 4.12 | 0.8 |
| 20 | Ningxia | 5,803 | 0.45 | 310 | 5,342.1 | 0.33 | 0.7 |
| 21 | Yunnan | 43,756 | 3.41 | 2,050 | 4,707.9 | 2.19 | 0.6 |
| 22 | Hunan | 66,628 | 5.19 | 3,120 | 4,682.7 | 3.32 | 0.6 |
| 23 | Gansu | 26,033 | 2.03 | 1,200 | 4,609.5 | 1.28 | 0.6 |
| 24 | Hainan | 8,105 | 0.63 | 370 | 4,565.0 | 0.39 | 0.6 |
| 25 | Inner Mongolia | 23,796 | 1.85 | 930 | 3,908.2 | 0.99 | 0.5 |
| 26 | Qinghai | 5,338 | 0.42 | 200 | 3,746.7 | 0.21 | 0.5 |
| 27 | Anhui | 64,100 | 4.99 | 2,400 | 3,744.1 | 2.56 | 0.5 |
| 28 | Jiangxi | 42,542 | 3.31 | 1,560 | 3,666.9 | 1.66 | 0.5 |
| 29 | Henan | 96,670 | 7.53 | 3,050 | 3,155.1 | 3.25 | 0.4 |
| 30 | Tibet | 2,702 | 0.21 | 70 | 2,591.0 | 0.07 | 0.4 |
| 31 | Guizhou | 38,697 | 3.01 | 980 | 2,532.5 | 1.04 | 0.3 |

* *The Disparity Index is the quotient of the share of total Internet users and the share of the total population.*

***Source :*** *(1) China Internet Network Information Center. Survey Report on the Internet Development in China by Provinces, 2004, Online, Available at: http://www.cnnic.net.cn/html/Dir/2005/05/12/2939.htm, Accessed on Dec. 2nd, 2005;*

*(2) Population data are from the National Bureau of Statistics of the People's Republic of China, China Statistical Yearbook 2004, Table 4-3: Total Population and Birth Rate, Death Rate and Natural Growth Rate by Region (end of 2003) Accessed on Dec. 2nd, 2005; Note: The military personnel were excluded from the regional total population.*

Another important measurement of Internet Development is the number of registered domain names in a region, especially the domain names with the suffix '.com', which is for commercial sites. It represents the diffusion of Internet technology in daily business. Due to the lack of province-level data on the number of .com domain names in China, a proxy—the total number of domain names per 100K population, which included all the domain names with the non-EDU suffix—will be used in the analysis. Figure 3 shows the provincial distribution of the number of domain names per 100K population in 2004. Its regional disparity was even greater than that of Internet users. Beijing, Shanghai, Gungdong, Tianjin, and Zhejiang remained on the top of the list. Sixty percent of the domain names in China were concentrated in the five provinces. Beijing alone accounted for more than a quarter of registered Chinese domain names. It had more than six hundred domain names per 100K population, which was three times that of the second highest province—Shanghai—and the number was significantly higher than any other province. This is mainly attributed to the fact that most of the international businesses, government and nongovernmental agencies, and their domestic counterparts, had headcounters or branch offices in Beijing, the capital of China. These organizations were normally the harbinger of adopting new technologies. At the low end, eleven provinces had less than 10 domain names per 100K population and all of them, except Guangxi, were excluded from the early open-up preferential policies. The disparity index in Table 2 further shows that only eight provinces had equal or higher shares of domain names relative to their shares of the population, and all of them were among the provinces that enjoyed preferential economic development policies before the 1990s.

**Figure 3 :** The Number of Domain Names per 100K Population in China, 2004

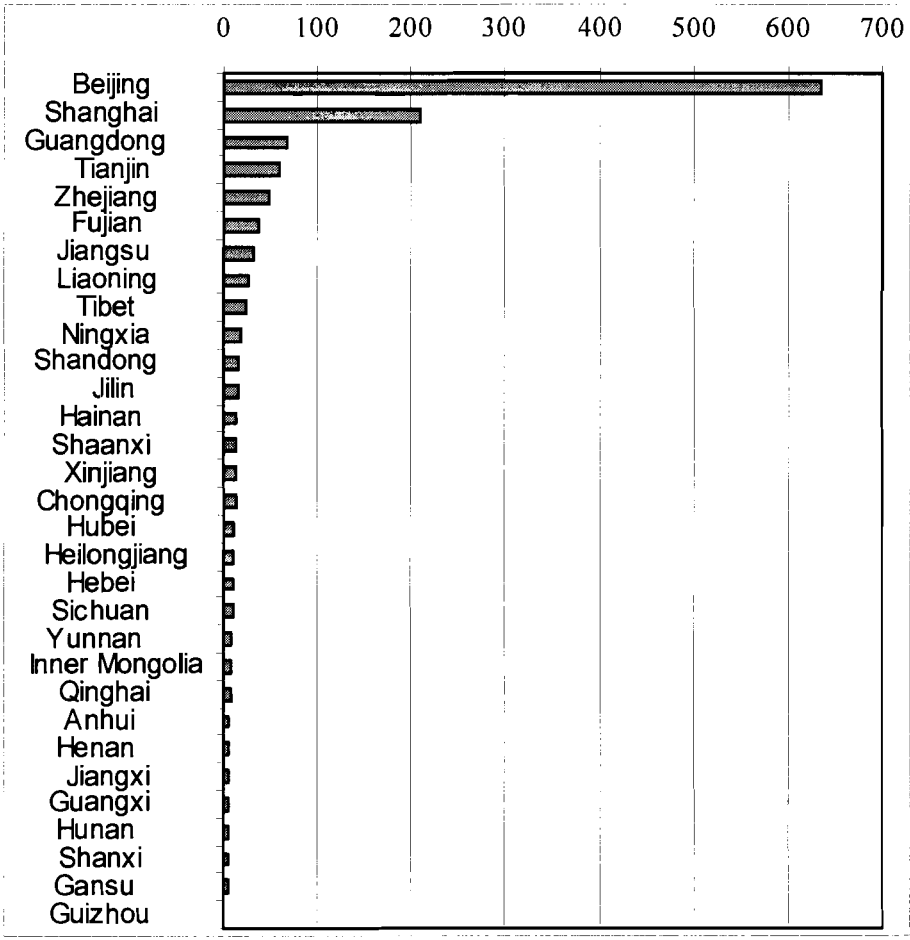

**Table 2 :** Provincial Data on the Number of Domain Name in China, 2004

| No. | Region | Total Population (in 1,000) | Share of Total Population (%) | Number of Domain Names | Per 100K Domain Names | Share of Total Domain Names (%) | Disparity Index* |
|---|---|---|---|---|---|---|---|
| 1 | Beijing | 14,564 | 1.13 | 92,429 | 635 | 26.4 | 23.3 |
| 2 | Shanghai | 17,110 | 1.33 | 35,861 | 210 | 10.3 | 7.7 |
| 3 | Guangdong | 10,113 | 0.79 | 54,200 | 68 | 15.5 | 2.5 |
| 4 | Tianjin | 79,542 | 6.20 | 6,049 | 60 | 1.7 | 2.2 |
| 5 | Zhejiang | 46,796 | 3.65 | 22,984 | 49 | 6.6 | 1.8 |
| 6 | Fujian | 34,880 | 2.72 | 12,784 | 37 | 3.7 | 1.3 |
| 7 | Jiangsu | 91,250 | 7.11 | 23,335 | 32 | 6.7 | 1.2 |
| 8 | Liaoning | 74,058 | 5.77 | 11,319 | 27 | 3.2 | 1.0 |
| 9 | Tibet | 42,100 | 3.28 | 640 | 24 | 0.2 | 0.9 |
| 10 | Ningxia | 38,150 | 2.97 | 1,161 | 20 | 0.3 | 0.7 |
| 11 | Shandong | 60,017 | 4.68 | 15,094 | 17 | 4.3 | 0.6 |
| 12 | Jilin | 36,895 | 2.87 | 4,328 | 16 | 1.2 | 0.6 |
| 13 | Hainan | 27,037 | 2.11 | 1,143 | 14 | 0.3 | 0.5 |
| 14 | Shaanxi | 33,143 | 2.58 | 4,870 | 13 | 1.4 | 0.5 |
| 15 | Xinjiang | 19,340 | 1.51 | 2,548 | 13 | 0.7 | 0.5 |
| 16 | Chongqing | 87,004 | 6.78 | 4,001 | 13 | 1.1 | 0.5 |
| 17 | Hubei | 48,570 | 3.78 | 7,125 | 12 | 2.0 | 0.4 |
| 18 | Heilongjiang | 31,300 | 2.44 | 4,123 | 11 | 1.2 | 0.4 |
| 19 | Hebei | 67,694 | 5.27 | 6,531 | 10 | 1.9 | 0.4 |
| 20 | Sichuan | 5,803 | 0.45 | 8,331 | 10 | 2.4 | 0.4 |
| 21 | Yunnan | 43,756 | 3.41 | 4,066 | 9 | 1.2 | 0.3 |
| 22 | Inner Mongolia | 66,628 | 5.19 | 1,932 | 8 | 0.6 | 0.3 |
| 23 | Qinghai | 26,033 | 2.03 | 421 | 8 | 0.1 | 0.3 |
| 24 | Anhui | 8,105 | 0.63 | 4,157 | 6 | 1.2 | 0.2 |
| 25 | Henan | 23,796 | 1.85 | 6,029 | 6 | 1.7 | 0.2 |
| 26 | Jiangxi | 5,338 | 0.42 | 2,595 | 6 | 0.7 | 0.2 |
| 27 | Guangxi | 64,100 | 4.99 | 2,911 | 6 | 0.8 | 0.2 |
| 28 | Hunan | 42,542 | 3.31 | 3,913 | 6 | 1.1 | 0.2 |
| 29 | Shanxi | 96,670 | 7.53 | 1,931 | 6 | 0.6 | 0.2 |
| 30 | Gansu | 2,702 | 0.21 | 1,361 | 5 | 0.4 | 0.2 |
| 31 | Guizhou | 38,697 | 3.01 | 1,505 | 4 | 0.4 | 0.1 |

* The Disparity Index is the quotient of the share of total domain names and the share of the total population.

***Source :*** *(1) the China Internet Network Information Center. Survey Report on the Internet Development in China by Provinces, July 2004, Online, Available at: http://www.cnnic.net.cn/download/2004/2004072003.pdf, Accessed on Dec. 2nd, 2005;*

*(2) Population data are from the National Bureau of Statistics of the People's Republic of China, China Statistical Yearbook 2004, Table 4-3: Total Population and Birth Rate, Death Rate and Natural Growth Rate by Region (end of 2003)*

***Note :*** *Military personnel were excluded from the regional total population.*

Analysis of both indicators of Internet Development has shown that Beijing, Shanghai, Tianjin, Guangzhou, and Zhejiang had the highest level of Internet development in China. These provinces had even reached a level of Internet penetration comparable to some developed countries. However, provinces such as Guizhou and Shanxi were still struggling to get connected to other regions through the Internet. This significant regional disparity in Internet development was mainly a consequence of the unbalanced economic development based on past Chinese development strategies[23]. If they fail to catch up in Internet development during the next decade, these provinces will lag even further behind economically since they will miss out on the enormous benefits of Internet technology, such as reduced transaction costs and shortened communication time. Therefore, creating opportunities for economic and Internet development for these less-prosperous provinces has become an urgent task for Chinese policymakers.

**The Policy Dilemma of Narrowing the Regional Gap**

As Manuel Castells stated in *The Rise of the Network Society* (2000), one can never truly understand the growth of an Internet economy in a region without looking into its institutional context, historical development, and cultural impact. An historical review of the reform and open-door policy provides an insight into the current geographic distribution of Internet usage in China.

[23] Studies carried out in other countries have shown significant correlations between income level and the number of Internet users in a region (see Moss, 1998).

Although the twenty-year economic development policy in China has brought remarkable economic growth to the eastern region of the country, the policy is also responsible for the enlarged development gap between the coastal and interior provinces. This disparity of Internet development is one of the best manifestations of inequality in the Information Age, and it will have long-standing consequences on the region's competitive advantage (Castells, 2000)[24].

In 1995, during the meetings over the Ninth Five-Year Plan, leaders from several western provinces urged the central government to adopt policies to reduce the alarming disparity. Under the rising political pressures and escalating social unrest in the interior regions, the Chinese government promulgated the "Western Region Development Strategy" (Lu and Nelson, 2004) in 1999, directing domestic and international investment to the western region. Since then, China had started five multi-billion dollar infrastructure development projects in the western regions: the Qinghai-Tibet railroad, West (Xingjiang)-to-East (Shanghai) natural gas transportation, West-to-East electricity transmission, the South-to-North water diversion project, and the ecological environment construction project. While they had brought some benefits to the west, these projects were intended to benefit the nation as a whole and thus kept widening the East-West gap. Take the West-to-East gas transportation and electricity transmission projects as examples. Natural gas and water-electricity are both dominant resources needed in the western region. The two projects would certainly benefit the eastern economy more by providing it with clean, cheap energy and chemical raw materials. As a matter of fact, diverting electricity from the west might even potentially harm the economic and Internet development in the region. Similarly, take the investments of the five projects as other examples. About forty percent of the investments were used to purchase equipment and materials from China's eastern and central provinces because the western regions were unable to produce them.

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[24] During the Industrial Revolution Age, the countries that mastered industrial technology first were the countries leading the world today (Castells, 2000).

Therefore, the western region is more of a benefactor than a beneficiary of the new development strategy, while the eastern region is more of a beneficiary than a benefactor (Lin and Liu, 2004). Furthermore, from the perspective of Internet development, the strategy failed to address the East-West digital divide since none of the five projects focused on improving the telecommunication system in the west.

In addition, the western region development strategy has not been very successful in attracting domestic and international investment. Since the return on investment in the west is not yet comparable to that of the coastal region, financial investment from foreign and domestic sources is still limited and, meanwhile, local capital continues to flow out of the region to the east (Niu and Chen, 2004). The current major investor in the west is the central government. The concern is that in a few years, the investments from the central government will decrease and by then, the impetus for the capital-driven growth in the west will be suppressed. Without strong investment in the manufacturing industry and the growing consumer purchasing power, the western region cannot achieve long-term economic growth.

Moreover, deficiency in human capital is another major obstacle for the regional economic and Internet development in interior China. Statistical reports by CNNIC in 2004 indicated that education level had a high correlation with Internet use—less than fifteen percent of the Internet users in China have "under high-school education." Compared to the more developed areas in the east, people in the west, especially rural residents, generally receive less education and vocational training. The current development strategy recognized the significance of the educational investment in the west. However, the Chinese government still needs to develop more concrete policies to improve the education system in the less developed areas.

Based on the above review of the current Chinese "Western Region Development Strategy," the following policy adjustments are deemed necessary to further reduce the economic disparity and to balance the uneven spread of Internet usage on the national level.

First, the central government needs to adjust its investment structure and tostrengthen investment in the western manufacturing industry and telecommunications. It is right to make infrastructure investment a priority, but infrastructure construction must develop along with the manufacturing industry and based on the needs of manufacturing and other industries suitable for the western region (Lin and Liu, 2004). Low cost labor is one of the main competitive advantages of the less developed provinces; thus the government can invest directly investments in the labor-intensive industry first and later upgrade to the technology-intensive industry. In the Information Age, fast communication and easy access to information are the keys to successful business. Therefore, to attract more investments, the central government definitely needs to improve the telecommunication system in the west, mainly in the populated areas.

Second, the local governments in the west need to identify their own competitive advantages and improve the investment environment in order to attract more capital from domestic and foreign sources. The western region development strategy granted local governments autonomy in using preferential policies to purse development. Many localities have promulgated preferential policies for specific sectors and projects in the region. These policies have focused mainly on offering lucrative incentives, such as tax concessions, tariff exemptions or repatriation of profits. However, to be effective, preferential policies must be "special" in nature. They would no longer be preferential if everyone could receive similar treatment everywhere and certainly would become less effective over time. Therefore, local governments must first identify their advantages in attracting investment and then apply preferential policies accordingly. Studies show that the biggest attraction of the region to investors includes the huge and rapidly growing market, the abundance of raw materials, and cheap labor. Local governments can promote their own unique strengths and integrate preferential policies with local characters. In addition, in order to attract more investment to the region, the government's endeavors should go beyond the narrow confines of financial and fiscal incentives. They

should also focus on improving government efficiency and reducing bureaucratic red tape (Mao and Zhang, 2004).

Third, the government should invest heavily in education and make an effort to retain professionals and skilled workers in the region. It is widely acknowledged that human resources are one of the major factors in obtaining a competitive advantage in the Information Age (Castells, 2000). Overall, the western region of China lags behind the east in terms of both elementary and high education. Many children in the west still cannot afford to finish the nine-year compulsory education and many elementary schools do not even have a computer. To improve the elementary education in the west, the central government should guarantee funding for compulsory education and also encourage schools in the eastern region to help schools in the west by donating equipment and providing training or short-term teacher exchange. In terms of high education, the central government can subsidize universities in a few large western cities—Chengdu (capital of Sichuan Province), Chongqing municipality, and Xi'an—for providing graduates to the inland area. Currently, the inland areas are still not attractive to well-educated labor due to its poor living conditions, harsh environment, and slow economic development. To retain and attract professionals and skilled workers, local governments must provide high monetary incentives, such as subsidies and low-interest or even zero-interest housing mortgage loans.

At the dawn of the twenty-first century, as the Internet is becoming a significant driving force for the local and global economy, the Chinese government can no longer ignore the economic gap and digital divide between the coastal and inland provinces. Long-term and consistent commitment to the development of the inland provinces is the only way to narrow the alarming regional disparity in Internet development, as well as other social and economic development. Overall, only a balanced economy is the guarantee for long-term stability and prosperity.

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