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Yingqi Wei and Xiaming Liu

The Department of Economics
Lancaster University Management School
Lancaster LA1 4YX
UK

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Convergence or Divergence? Debate on China's Regional Development

Yingqi Wei[a] and Xiaming Liu[b]

[a]International Business Research Group,
Department of Economics,
Management School,
Lancaster University,
Lancaster, LA1 4YX
UK
Tel: 01524 593 178
Fax: 01524 594 244
E-mail: y.wei@lancaster.ac.uk

[b]School of Management,
University of Surrey
Guildford,
Surrey, GU2 7XH
UK
Tel: 00 44 (0)1483 683 09
Fax: 00 44 (0)1483 683 106
E-mail: x.liu@surrey.ac.uk

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Abstract

This paper investigates the evolution of regional disparity over the period 1980-2001, reviews the debate on its causes, discusses future development strategies, and draws relevant conclusions for policymakers. Our study confirms that overall regional disparity declined in the 1980s but increased in the 1990s. The gap between the inland and coastal regions was the dominant contributor to the overall regional disparity. There was no club convergence within the inland and coastal regions. Economic, geographical and historical factors put the coast in a better position than the inland for growth. Regional development strategies and policies, globalisation and economic liberalisation, and factor market distortions, which are closely linked with each other, have played an important role in regional disparity. It will be a long-term task to significantly reduce regional disparity. The Chinese central government needs to (1) allow a similar degree of openness and economic liberalisation across regions; (2) work out detailed procedures to remove barriers to the movement of factors of production; (3) provide industrial development guidelines; and (4) help the establishment of better infrastructure in the inland and especially the west, and encourage resource allocation based on comparative advantages.

I. Introduction

While China's macroeconomic performance has been impressive since the 1980s, her economic growth seems to be very unevenly spread across regions. Regional inequality is a great concern to the Chinese government as it affects economic prosperity, social stability and unity (Wei 1999; Demurger 2001). Given its importance, there has been an on-going debate on whether China's regional disparity has been widened or reduced over the reform period, what the causes are, and accordingly, what regional development strategies should be implemented to promote balanced growth. Studies published within and outside China provide mixed results.

This paper attempts to contribute to the debate by (1) providing a literature review on whether regional disparities exist in China[1], and if so, why they exist, as well as how regional disparities can be corrected; (2) offering our own insightful information on China's regional development trends with the most updated data set and a newly developed method for Gini coefficient decomposition (Dagum 1997); and (3) discussing our views on the causes and important regional development strategies for the future.

The remainder of this paper is organised as follows. Section 2 examines selected studies and provides further evidence on the evolution of China's regional disparities during the period 1980-2001. Section 3 explores the possible causes for regional disparities. Future development strategies or policies are discussed in section 4. Finally, section 5 draws relevant conclusions for policymakers.

II. Chinese Regional Disparities during the Reform Period

The debate on China's regional development is first concerned with whether regional disparities between the coastal and inland (or central and western) regions have widened or narrowed, or whether there has been regional convergence or divergence. Previous studies usually make use of two approaches to studying this issue. One is to use classical indices and provides detailed descriptive analysis. The other focuses on econometric estimations. The advantage of the second approach is that it can differentiate between the

effects of different causes of regional development, though it has its own problems as identified by Quah (1993).

Table 1 summarises key results of some recent studies. The mixed results from descriptive studies are due to a number of reasons. One set of reasons relates to the availability and quality of data, and the measures of regional inequality employed. Different measures include, for instance, gross value of output (GVO), material product (MP), national income utilised (NI), GDP per capita, and consumption expenditures (CE). There is no consensus on which measure is the most appropriate. GVO includes intermediate inputs and may result in double counting in industrial sectors. GDP per capita is good as it includes services, but like GVO, MP, and NI, it may not reflect the living standards across different regions (Kanbur and Zhang 1999). Based on household surveys, CE is a better proxy for living standards. However, the sample size of a survey is often too small to be representative of Chinese regions and the limited availability of data for merely several years excludes any dynamic analysis (Wu 2002).

Put Table 1 here.

Table 1. Summary of Selected Recent Studies on Regional Disparities in China

A second issue is the periods covered in different studies. Regional disparity is evolving. Studies based on different periods tend to provide different results. Finally, different methods are employed. The most popular methods are the coefficient of variation (CV), the Gini index and the Generalised Entropy (GE) class of measures, especially the Theil index. In many cases, details of calculation methods for these indicators are not given. In addition, some authors use nominal instead of real data, or use national rather than regional price deflators to obtain incomes in constant prices. All of these lead to different results (Wan 2001, Lu and Wang 2002,Wu 2002).

By comparison, real GDP per capita with a sufficient time period seems to be a good measure for the evolution of regional disparities in income, although it is not the 'best' indicator of living standards. In terms of methodology, one important criterion associated with an inequality measure is its property of decomposability, i.e. whether it can be decomposed into components of within and between sub-populations (in the case

of this paper, regions). CV is not decomposable. The decomposition of the Theil index only takes into account the differences in means of subpopulations but not the distributions of sub-populations (Dagum 1997). The Gini coefficient had been traditionally deemed to be not decomposable unless the intensity of transvariation between the subpopulations was assumed to be zero[2] until a new method was developed by Dagum (1997).

We have estimated and decomposed both Gini and Theil indices for 28 Chinese provinces over the period 1980-2001[3]. Following a common practice in the literature, the country is divided into three regions – the coast (or the east), and the inland (the central and the western regions). The descriptions of data sources, variable measurements and methodology are provided in Appendices A and B. Although both the Gini and Theil indices show similar overall patterns of regional disparity, their decomposed components provide somewhat different evolution processes of "between-region" and "within-region" disparities. Only the Gini index and its composition are reported here because of the reasons discussed above[4].

Table 2 reports provincial GDP per capita at 1990 prices. The acceleration of economic growth in China has been very broadly based. The average annual growth rates of GDP per capita in Chinese provinces were at least as high as 6% over the sample period. With the exception of six provinces – Yunan, Xinjiang, Guizhou, Inner Mongolia, Shaanxi, and Ningxia, the growth rates of Chinese provinces were higher in the period 1991-2001 than 1980-1990. In geographical terms, not all coastal provinces grew faster than inland ones.

The Gini coefficient and its decomposed components are provided in Table 3[5]. Inter-provincial inequality showed a moderate decline during 1980-1990 and rose steadily and sharply after 1990. This result is in line with the findings in several previous studies, as shown in table 1. If we consider convergence as the reduction of inter-provincial income differences, clearly there was no overall convergence among 29 provinces over the entire sample period.

Put Tables 2 & 3 here.

Table 2: GDP per capita at 1990 prices, 1980-2001

Table 3: Decomposition of the Gini Index, 1980-2001

Within the inland and coast, the regional disparity showed a downward trend before 1994 and an upward trend afterwards, although the figures for 2001 were still lower than those for 1980. Therefore, there was no club convergence in China either. The inequality within the coast was severer than within the inland. The gap between the inland and coast showed a general upward trend, although it slightly reduced during the short periods 1980-1983 and 1988-1990.

The decomposition analysis shows that the contribution to overall inequality by the "within inland-coast" component decreased up to 1994 but was on the rise from 1995. On the other hand, the contribution by the "between inland-coast" component increased up to 1995 but declined from 1996. Table 3 also shows that the contribution of transvariation was relatively small, ranged between 0.9% and 5.6%, with a decreasing trend up to 1995 and a slightly increasing trend from 1996. This finding suggests that the proportion of rich people in the inland who were better off than poor people in the coast was small. In other words, there was a clear divide between the inland and coast. The overall inequality in the entire country was larger than in both inland and coastal regions after 1990, but the inequality in the coast was the largest before 1990. The table also shows that the overall inequality in China was mainly due to income differences between the inland and coast during the sample period.

In summary, the Gini decomposition in this study shows the following: (1) the inter-provincial disparity in the coast was severer than in the inland; (2) the gap between the inland and coast was the dominant contributor to the overall regional inequality; and (3) there was no club convergence within the inland and coast. In addition to this new insightful information, our overall Gini (and Theil) index confirms the important finding in the recent literature: overall regional disparities declined in the 1980s but increased in the 1990s. Of course, this finding is based on the use of per capita GDP as the proxy for regional income.

As mentioned earlier, the second approach to regional development in China focuses on regional disparities within the context of convergence process. Most studies, using different methodologies (cross-section, time series, or panel data), find conditional but not absolute convergence, though different variables are used to control for differences in steady state. This implies that technological and other factors vary across Chinese regions and they would not be expected to converge to the same steady state. The lack of absolute convergence suggests that regional disparity is still an on-going phenomenon in China. The results about controlling variables in conditional convergence studies provide crucial insights for identifying causes of regional disparities, which will be explored in the next section.

III. Possible Causes of Regional Disparities in the Reform Period

The second important aspect of the on-going debate is the causes of regional disparities. Many factors have been discussed in the literature, including but not restricted to, government policies, macroeconomic factors, unequal endowment of resources, lack of factor mobility, and globalisation. However, these factors are not exclusively exogenous and are often interrelated with each other. This makes it difficult to identify the fundamental causes.

III.1 Regional development strategies and policies

The Chinese government's regional development strategies and the corresponding policies are the most often mentioned factor leading to regional disparities. However, our following analysis of the evolution of the central government's regional strategies shows that their role in the process of regional development is not clear-cut. It is more likely that they are only a necessary but not sufficient condition.

Since the establishment of the People's Republic in 1949, China has undergone a number of radical policy changes in regional development. During 1949-1972, China adopted an equal growth strategy to serve the purpose of national security. The priority of economic development was given to the backward inland regions and especially the so-called "Third Front". During 1973-1978, China adjusted its strategy and the priority

began to be shifted from the inland to the east (Liu and Liu 2002). Immediately after the adoption of economic reforms and the open-door policy, the Sixth Five-Year Plan (FYP) (1981-1985) outlined that regional development should be based on comparative advantages. While the coast should upgrade their industrial structure, tackle the infrastructure bottleneck and engage in foreign trade and investment, the inland should develop energy, transportation and raw material industries to support the coast (Chen, 2000). This shows that the government still meant to have balanced regional development in the early 1980s.

The Seventh FYP marked a significant shift in China's regional strategy. It was based on the so-called "step ladder development", i.e. the Chinese version of 'trickle-down' development. Its theory was that economic development should be gradually carried forward from the coast to inland. Following this, the "coastal development strategy" was formulated in 1988, and the coast was allowed to establish 5 special economic zones, 14 coastal open cities, 13 economic and technical development districts, 3 economic development areas and Shanghai Pudong New District. Foreign trade and investment were highly encouraged to help the development of high-tech and outward-oriented industries and service sectors in the coast. State-owned enterprises (SOEs) and fiscal and financial reforms and the development of town and village enterprises (TVEs) in the coast were also allowed to go ahead of the inland.

The development strategies in both the Eighth (1991-1995) and Ninth (1996-2000) FYPs clearly focused on the co-ordinated development and the reduction in regional disparity (Chen, 2000). A number of measures were taken to promote the development of the inland, including increasing investment in infrastructure, education and training, facilitating the inflow of foreign capital, making more anti-poverty efforts in the inland and promoting cooperation between the coast and inland. The western development strategy was formulated in September 1999 to improve infrastructure and the business environment and attract foreign direct investment (FDI) in the west (http://www.cnxbinfo.com/xbdkf/zcfg.htm).

In summary, it seems that regional strategies during most of the reform period have meant to stimulate balanced or co-ordinated regional growth. Strictly speaking, only the coastal development strategy in the second half of the 1980s was designed to widen

the regional gap in the short run. For various reasons, the effect of the balanced or co-ordinated regional development has not been felt yet since 1990s (Chen, 2000).

Empirically, Song et al (2000), among others, suggest that the government's favourable policies for the coast were an important reason for the increase in regional disparities. Because of these policies, the coast has attracted more FDI and experienced quicker economic development. According to Zhang (2001), however, the concentration of FDI in the coast can be explained by their inherent local comparative advantages. Government policies only help the realisation of these advantages. In addition, a large share of FDI actually promoted income convergence rather than divergence.

As indicated in table 2, although the coastal development strategy offered preferential policies to coastal provinces, some coastal provinces grew more slowly than certain inland provinces. In addition, after 1994, the regional disparity within coastal provinces increased (Table 3). Therefore, regional characteristics other than regional development strategies may have played an important role in the regional disparity.

III.2 Globalisation and economic liberalisation

A second factor, which is closely related to the first, is globalisation and economic liberalisation. Both globalisation and economic liberalisation promote economic growth. As summarized by Fujita and Hu (2001), exports and FDI, as external demand and capital input respectively, contribute directly and indirectly via multiplier effect to growth. Economic liberalisation, in the form of the progressive removal of price control and the obstacles to trade and factor mobility, the development of product and financial markets, decentralisation, the reduction of the scope of state intervention, the decline of SOEs and the growth of non-SOEs, fosters growth through efficient resource allocation and utilisation and competition effect. A number of studies show that globalisation and economic liberalisation have significant influence on regional growth (e.g. Lin 2000; Sun and Parikh 2001; Wei et al. 2001; Brun et al. 2002; Zhang and Zhang 2003).

However, if regions are not integrated, globalisation and economic liberalisation are believed to expand regional inequalities due to regional differences in their involvement in the globalisation or liberalisation process and their level of development. Regions with higher share of trade and FDI tend to grow faster than those with lower

share. Regions at a low level of development, due to the lack of social capability which governs knowledge diffusion, resource mobility and investment, may not benefit from globalisation or liberalisation process (Jia 1998). Poncet (2003) shows that Chinese regions are not well integrated indeed and Chinese provinces' great involvement in international trade went hand in hand with a decrease in intra-national trade flow intensity between 1987-1997.

III.3 Factor market distortions

According to the neoclassical growth theory, region-biased policies, globalisation and economic liberalisation have limited impact on regional disparity if factors of production are mobile across regions because factor movements tend to equalise rates of returns across regions. In China, there are no effective capital and labour markets (Jia 1998) and factor mobility is still restrictive (Xu 2002). Though various reforms have been implemented to create a better environment conducive to factor market formation and factor movements, serious inhibitions still exist. They include direct and indirect support to SOEs, constraints on local enterprises for hiring migrant labour, explicit regulation on labour mobility, and preferential treatment for local residents via the social security and welfare systems such as health care and education arrangements (Cai et al. 2002; Yang 2002).

III.4 Regional specific factors

The regional specific factors are mainly the natural and historical heritages and the basic infrastructure. Demurger (2001) and Demurger et al. (2002) show that differences in geographical location, transportation, and telecommunication facilities account for a significant part of the observed variation in the growth performances of provinces. Ye and Yao (2003) suggest that the west is geographically more difficult than the east to develop. This is partially related to fetters of the traditional economic system in the west. The economic bases in the west were established mainly in the first FYP and the Third-Front Construction periods. These bases are biased towards heavy and national defence industries which are inconsistent with the resource endowments in these regions. As a result, these industries are actually industrial enclaves, and cannot bring about the

development of local economies. Non-state economic elements are weak and people are used to sticking to old ways of doing business. Furthermore, the requirement of environmental protection prevents the west from quick economic development.

III.5 Cumulative causation process

Several studies suggest that the existence of some persistently less competitive provinces in China may result from a cumulative causation process. Golley (2002) argues that some Chinese regions are able to develop their industries faster than others. Industrial development then feeds into industrial agglomeration. Regional disparity in industrial development has an automatic tendency to persist, and is a fairly 'natural' consequence of economic development in a market economy. Fujita and Hu (2001) find that, driven by geographical advantages, most manufacturing sectors show an increasing trend of agglomeration, even labour-intensive ones. Wei (2000) also agrees that, with better economic conditions and preferential policies, the coastal provinces are able to accumulate more capital resources and generate better investment returns.

After examining the 5 possible causes identified in the literature, we feel that China's regional disparity has been caused by various factors which are closely linked with each other. Economic, geographical and historical factors made the coast better off than the inland in terms of infrastructure, industrial bases, scientific and technological levels and living standards even before economic reforms and the open door policy were initiated. Barriers to factor movements across provinces and ineffective factor markets seem to hinder the inland from catching up with the coast.

The trickle-down strategy in the second half of the 1980s allowed the coast to realise and further develop their competitive advantages, making the regions benefit from large FDI inflows, increased foreign trade, as well as market-oriented reforms. This has contributed to high economic growth, low unemployment and high fiscal revenue and spending in the coast. Therefore, this has partly led to an increased gap between the inland and coast which became the dominant contributor to the overall regional inequality in the 1990s as detected in our own empirical results reported in the preceding section.

Other reasons for the increased regional disparity after 1990 include the new wave of investment and growth in Shanghai and other coastal regions after Deng Xiaoping's

famous southern tour in 1992. During this period, human capital and domestic and foreign capital poured into the coast. In addition, the ease in energy supply and relatively cheap imports of raw material, e.g. iron ore, in the coast reduced the importance of the inland as the production bases. The environment protection in the inland has been regarded as the most important to achieve sustainable growth in the whole country, and this has slowed economic development in the inland in the short run. These, together with factors discussed above, increased the regional disparity in the 1990s (Chen, 2002).

However, even if the government had not applied the trickle-down strategy in the 1980s, the actual processes of globalisation, economic reforms and performance would still have been substantially different across regions. Given the same national policy framework, most foreign investors would still have tended to choose the coast as their business locations because of better infrastructure, better industrial bases and higher technological capabilities there. In this sense, the cumulative causation hypothesis may be more plausible. Scale economies and complementarity and agglomeration externalities had made investment and industrial development concentrate in the coastal provinces from the beginning. This led to divergence in per capital income across provinces. The trickle-down policy may simply accelerate this process.

Both the trickle-down theory and the cumulative causation hypothesis recognise possible spillover effects from fast-growing regions to slow-growing ones. However, the empirical evidence with regard to such effects is mixed. Zhang and Felmingham (2002) find that output growth spills over from the east to the central and the west regions and from the central to the west regions. However, Brun et al. (2002) only find spillovers from the east to the central, but not to the west regions. Jia (1998) finds that spillovers from the east to the inland appeared to have been limited during the period 1978-94. Yao and Zhang (2001a) argue that the trickle-down process is possible, but it may take a long time for the inland to catch up.

IV. Future Development Strategies

The final main aspect of the debate is future development strategies. Given the regional disparity, the Chinese government's regional development strategy in the tenth FYP

(2001-2005) is to "put into effect the development of the west, accelerate the regional development of the central and the western regions, rationally adjust regional economic distribution, and promote co-ordinated regional development".

As for the development of the west, the government wants to see significant progress in infrastructure construction and ecological environment protection. There should also be a substantial advance in science, technology and education. The west should open to the outside world and the rest of the economy, develop the local economies with a multiple ownership structure, and use both foreign and domestic capital for growth. For the central areas, the government wants to increase the levels of industrialisation and urbanisation, strengthen their superior position in agriculture, and industrialise the agricultural sector. Finally, the east should stand in the forefronts of the system innovation, scientific and technological innovation, and opening to the outside world and economic development. The priority should be given to high and new technological industries, modern services and export sectors. In the tenth FYP, the central government also calls for the implementation of the urbanisation strategy to promote simultaneous progress in urban and rural areas.

These are the guidelines from the Chinese government. In the academic literature, the following policies are suggested: globalisation, economic liberalisation, efficient resource reallocation and utilisations across the regions, and labour mobility. Not surprisingly, most of these options come from the respective studies of the possible causes of the regional disparity. The majority of the policy options are consistent with the Chinese government's general regional development strategies.

IV.1 Globalisation and economic liberalisation in the inland

This policy is based on the belief that economic reforms and opening to foreign trade and FDI help economic growth. Fujita and Hu (2001) argue that the central government should improve the accessibility of the inland to international markets by increased public investments in infrastructure. In addition, special policies should be provided to promote FDI and private capital from the coast to the inland. Economic liberalisation in the inland helps reduce regional disparity. Demurger (2001, 2002) and Yao and Zhang (2001a, b) agree that the west needs more openness, more education, and above all more

investments in order to catch up the east. Chen (1999) also emphasises the importance of economic liberalisation and calls for some adjustments in the ownership structure in the central and western regions. This includes the encouragement of foreign and private capital and technologies from both foreign countries and the coast in China, the establishment of a modern enterprise system for SOEs and quick development of non-state economies in the inland. Chen also proposes some detailed procedures for the ownership adjustment in the central and western regions.

IV.2 East-West co-ordinated development

Closely related to the globalisation and economic liberalisation policies, a number of authors (especially within China) are in favour of the so-called 'east-west co-ordinated action' strategy. Based on regional comparative advantage analysis, Wang (2000) and Lu et al (2000) argue that the eastern and western economies are strongly complementary to each other. The east should not only open to the outside world, but also link its own development to that of the west. The east should focus on new and high technological industries and transfer traditional industries to the west. During this transfer process, the east should help raise the technological standards of these traditional industries. Given that the west is bounded by many foreign countries, the east can establish production bases in the west for Asian and European markets. The west should improve its investment environment to attract capital and technology from both the east and foreign countries. Only when both areas develop together, can the overall efficiency and competitiveness be raised. In this co-ordinated process, the central government needs to promote the marketisation, science, technology and education, and speed up the development of infrastructure and regional trade centres and growth poles in the west to support the simultaneous development of the eastern and western regions.

The co-ordinated development may need government's financial support. Tian (1999) and Yao and Zhang (2001a, b) suggest that the government should accelerate growth of backward interior regions by deepening market-oriented reforms, and help residents in these regions by strengthening fiscal transfers from rich to poor regions. As reported by Wu (2000), several leading Chinese economists argue that the development of the west needs a large amount of capital, but the central government's fiscal support is

limited. Thus, there is a need to establish a western development bank. In addition, issuing construction lottery and local government bonds and establishing venture capital funds to facilitate the development are also suggested. On the other hand, Golley (2002) suggests that the south-east regions in recent years experienced rising labour and land costs, difficulties in obtaining raw materials for processing industries and environmental degradation. Eventually, even in the absence of active government policy, regional inequalities should reverse themselves as firms seek alternative lower cost locations for production.

Although the central government in its tenth FYP calls for the acceleration of the development of the central regions, Liu (2003), among some economists in China, worries that the central regions may be neglected during China's future development process. If the trickle-down strategy continues to be followed, and if there are industrial exchanges between the east and west, then resources in the central regions could be attracted to the east and west. This may result in collapse in the central regions. To prevent this, Liu suggests that the central regions should follow a so-called "anti-trickle-down" strategy, developing high value-added or high-tech industries and services, and improving technical ladder of traditional agriculture and industry. It is perceived that the growth poles in Wuhan, Zhengzhou, Changsha, Hefei and Nanchang have already been in place, and that optical fibre techniques in Wuhan and new materials and life science technologies in Changsha are already the leading high-tech sectors at least within China. Liu (2003) feels that the quick development of these growth poles and new industries not only helps the development of the central regions themselves but also promotes the growth of the coast and west.

IV.3 Labour mobility and urbanisation

Cai et al (2002) suggest that the state should remove the obstacles to the development of labour markets by abolishing the *hukou* (household registration) system, and reducing local protectionism and rural-urban discrepancies in social security protection. Lu and Wang (2002) also suggest that labour mobility is instrumental in alleviating urban-rural disparity. Regarding the urban-rural income gap as the major cause of the regional disparity, Chang (2002) suggests that the most effective way to reduce the disparity is to

accelerate urbanisation in China. The ultimate cure for the urban-rural gap is to absorb all rural surplus labour to the modern urban sector.

These proposals again match the Chinese government's regional development strategy. In the tenth FYP, the central government feels that raising the level of urbanisation and transforming rural population are important measures for the virtuous development of the national economy and co-ordinated social development. The government is determined to reform the hukou system and eliminate the restrictions of rural labourers to urban areas for employment, but emphasises an ordered transfer of surplus labour between urban and rural areas and between regions.

The achievement of co-ordianted regional development is never an easy task. Some authors are not optimistic about the future development. Yao and Zhang (2001a, b) argue that whatever actions are taken by governments, regional inequality will remain a serious issue into the foreseeable future. Renard (2002) suggests that the WTO accession results in gains in economic efficiency but the gains are not evenly distributed: the provinces specialising in agriculture will be the main losers. Furthermore, the reform of SOEs will be accompanied by greater unemployment. Given that SOEs are concentrated in the inland, the reform may increase the regional disparity.

In our opinion, it is a long-term task to significantly reduce regional disparity. The disparity has been caused by economic, geographical and historical factors as well as policy influences. The geographical and historical influences are either impossible or very difficult to be corrected. It is important to alleviate the regional differences but it is unrealistic to pursue an absolutely balanced regional development strategy, as no country in the world has ever experienced such development. A co-ordinated regional development strategy needs to be based on comparative advantages. The central government's general strategy provides an overall guideline for the division and collaboration of economic activities across the macro regions, but it is too general to reflect the comparative advantages of individual regions. Each province needs to form its own development strategy based on its resource endowments. The central government then assesses these individual provincial strategies and co-ordinate them on the national basis.

Given this, the first strategy for the central government is to extend the reforms and opening to the outside world to every part of the country. If all parts of China are allowed a similar degree of openness and economic liberalisation, and if barriers to factor movements are removed across regions, then growth in the central and western regions will catch up. Reforming SOEs will lead to large unemployment in the inland. But this is unavoidable in the short run and the unemployed can be absorbed by the development of non-state sectors. The central government needs to work out detailed procedures to facilitate reforms and promote efficiency.

The second strategy is to help the establishment of better infrastructure in the central and especially the west regions and encourage resource allocation based on comparative advantages. The central government needs to use its limited fiscal resources to support the inland to improve infrastructure, and encourage the local authorities to mobilise all available resources to do so in order to upgrade the investment environment. Although we agree that rising labour and land costs, and environmental degradation will naturally encourage firms in the coast to relocate their production to the inland, the central government's support by providing industrial relocation guidelines and helping improving infrastructure in the inland, would accelerate the reversion of the regional disparity.

V. Conclusions

There is a growing literature which attempts to measure and explain China's regional disparity. However, previous studies have not agreed upon any common approach to measuring disparity, nor have they reached a consensus. Based on the use of per capita GDP as the proxy for regional income, our Gini (and Theil) index confirms the finding in the literature that overall regional disparities declined in the 1980s but China has faced a pronounced problem of regional disparity since 1990. We also find that the gap between the inland and coast regions was the dominant contributor to the overall regional inequality; and that there was no club convergence within the inland and coast regions. In addition to this new insightful information, we feel that the regional disparity has been caused by various factors. Economic, geographical and historical influences put the coast

in a better position than the inland for growth and development from the beginning of the reform. Regional development strategy and policy, globalisation and economic liberalisation, regional specific factors and factor market distortions as identified in the literature are closely linked with each other and have played some role in regional disparities.

In our opinion, it is a long-term task to significantly reduce the regional disparity. The central government's co-ordinated regional development strategy provides an overall guideline for the division and collaboration of economic activities across the eastern, central and western regions, but it is too general to reflect the comparative advantages of individual regions. Each province needs to develop its own development strategy based on its resource endowments. The central government can then assess these individual provincial strategies and co-ordinate them on the national basis.

It is important for the central government to

- allow a similar degree of openness and economic liberalisation so that the central and western regions can catch up;
- work out detailed procedures to remove barriers to the movement of factors of production to facilitate reforms and promote efficiency;
- provide industrial development guidelines to avoid repeated construction and wasted resources; and
- help the establishment of better infrastructure in the inland and especially the west, and encourage resource reallocation based on comparative advantages.

Although various policy options are discussed in the literature and adopted by the central government, in our opinion, the above are the most important for co-ordinated regional development in China.

Appendix A

Our data are obtained from two sources: *Comprehensive Statistical Data and Materials on 50 Years of New China* and *China Statistical Yearbook* 2000, 2001 and 2002. Regional GDP deflators are calculated based on nominal GDP values and real GDP indices. Then regional real GDP per capita data are obtained by deflating nominal GDP

per capita data. This is an important improvement over many existing studies since they either use nominal data or use one single deflator for all China's regions or provinces.

The spatial coverage is 12 provinces in the coastal regions (Guangdong, Jiangsu, Shanghai, Fujian, Hainan, Shandong, Liaoning, Tianjin, Zhejiang, Hebei, Beijing and Guangxi) and 16 provinces in the inland regions (Henan, Shanxi, Hubei, Heilongjiang, Jilin, Shaanxi, Anhui, Hunan, Sichuan, Jiangxi, Yunnan, Inner Mongolia, Guizhou, Xinjiang, Gansu Qinghai and Ningxia). Tibet is omitted due to a lack of reliable data. Chongqing City was not separated from Sichuan until 1996 and thus is included as one combined province.

Appendix B

The Gini index is defined as

$$G_t = \frac{1}{2N^2 \bar{y}_t} \sum_{j=1}^{k} \sum_{h=1}^{k} \sum_{i=1}^{n_j} \sum_{r=1}^{n_h} \left| y_{jit} - y_{hrt} \right| \tag{1}$$

where y_{jit}(y_{hrt}) is the real per capita GDP for economy I(h) (I, h = 1, …, N) which locates in geographical area j(h) at time t, N is the total number of economies (= 29), k is the number of geographical areas in the sample (= 2), n_j(n_h) is the number of economies locating in j(h), and $\bar{y}_t = \frac{1}{N} \sum_{j=1}^{k} \sum_{i=1}^{n_j} y_{ijt}$. The values of Gini vary between 0 and 1. The bigger the value, the wider the regional inequality.

The above Gini index is decomposed into three components using the Dagum (1997) method, which measure respectively the contribution of the Gini inequality within the jth region (G_w), the Gini inequality between regions net of transvariation (G_{nb}) and the intensity of transvariation between regions (G_{tr}).

The Gini index within the j^{th} region is

$$G_{jjt} = \frac{1}{2n_j^2 \bar{y}_{jt}} \sum_{i=1}^{n_j} \sum_{r=1}^{n_j} \left| y_{jit} - y_{jrt} \right| \tag{2}$$

The contribution of the Gini inequality within regions is calculated as

$$G_{wt} = \sum_{j=1}^{k} G_{jjt} p_j s_{jt} \tag{3}$$

where $p_j = \frac{n_j}{N}$ and $s_{jt} = \frac{n_j \bar{y}_{jt}}{N\bar{y}_t}$. Gw can be interpreted as a weighted average of the Gini indices within regions.

The Gini index between regions j and h is

$$G_{jht} = \frac{1}{2n_j n_h (\bar{y}_{jt} + \bar{y}_{ht})} \sum_{i=1}^{n_j} \sum_{r=1}^{n_h} \left| y_{jit} - y_{hrt} \right| \tag{4}$$

The contribution of the Gini inequality between regions j and h and that of the intensity of transvariation between regions j and h are measured, respectively as

$$G_{nbt} = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jht} (p_j s_{ht} + p_h s_{jt}) D_{jht} \tag{5}$$

$$G_{trt} = \sum_{j=2}^{k} \sum_{h=1}^{j-1} G_{jht} (p_j s_{ht} + p_h s_{jt})(1 - D_{jht}) \tag{6}$$

where D_{jht} is defined as relative economic affluence between the jth and the hth regions at time t, with $\bar{y}_{jt} > \bar{y}_{ht}$. Mathematically speaking, $D_{jh} = \frac{d_{jh} - p_{jh}}{d_{jh} + p_{jh}}$, where $d_{jh} = \int_0^\infty dF_j(y) \int_0^\infty (y - x) dF_h(x)$ and $p_{jh} = \int_0^\infty dF_h(y) \int_0^\infty (y - x) dF_j(x)$. $F_h(F_j)$ is the h^{th} (j^{th}) cumulative distribution function.

$$G_t = G_{wt} + G_{nbt} + G_{trt} \tag{7}$$

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[1] Many existing studies also focus on assessing inequalities between rural and urban areas and within the rural and urban households in China. Kanbur and Zhang (1999) argue that the contribution of rural-urban disparities to regional disparities far exceeds the contribution of inland-coastal disparities, but the contribution of the latter has increased dramatically. Therefore, due to space constraint, attempt is mainly made in this paper to review research in regional disparity between the inland and the coast.

[2] In other words, there is no income overlap between the sub-populations.

[3] A free program by Mussard et al (2003) has been used to calculate the Gini and Theil coefficients.

[4] Results for the Theil index and its composition can be available upon request.

[5] We have also obtained results for the Gini index and its composition by dividing China into three geographical regions – the coastal, the central and the western regions. For lack of space, results are not included in the paper but can be available upon request.

Table 1. Summary of Selected Recent Studies on Regional Disparities in China

Authors	Sample	Indicators	Methods	Key Results	Sources/Causes
Lyons (1991)	1952-87	GVO/CE	CV	Disparity↓(CE); Disparity↑(GVO)	
Lee (1994)	1984-90	NI	Growth equation	Disparity in export contribution	
Hu et al. (1995)	1978-94	GDP	CV	Disparity↓ but large regional disparity by international standard	
Wei (1995)	1952-91	NI	Gini/CV	Disparity↑(1952-78) ↓(1978-91)	
Chen and Fleisher (1996)	1978-93		Growth equation	Regional convergence	
Fu and Li (1996)	1978-94	GDP per capita	CV	Disparity↓	Market-oriented economic reforms have promoted effective economic incentives and relaxed restrictions on resource transfers.
Jian et al. (1996)	1952-93	Real GDP per capita	Regression	Convergence (1978-85). Convergence disappeared (1985-93).	Rise in rural productivity before 1985. Coastal provinces started to grow faster than the interior in the 1990s
Tsui (1996)	1978-89	Real GDP per capita	Gini/ CV/GE	Disparity↓ early 1980s ↑late 1980s	Reforms of the industrial sector
Fleisher and Chen (1997)	1978-93	TFP/TFP growth	Regression		Investment in high education and FDI helps explain the productivity gap between coastal and non-coastal regions.
Research Team (1997)	1978-96		Gini	Disparity↑ but still low by international standards	

Lin et al. (1998)	1978-95	GDP/household income	Gini/Theil	Disparity↑ between regions, ↓ within regions	
Tsui (1998)	late 1980s	Rural household data	Theil	Regional disparities	
Duncan and Tian (1999)	1952-95	Real GDP per capita/ real CE per capita/real per capita income	CV	Disparity↓(output) Disparity↑(livelihood)	
Kanbur & Zhang (1999)	1983-95	CE per capita	Gini/GE	Regional disparity↑ overall; the urban-rural gap is much higher than the coast-inland gap; the coast-inland gap increases more rapidly than the urban-rural gap.	
Tian (1999)	1978-95	Real GDP per capita/ real CE per capita/real per capita income	CV/ Regression	Disparity↓(output) Disparity↑(livelihood)	Regional development strategy and policy
Dayal-Gulati and Husain (2000)	1978-97	Growth rate of GDP per capita	Growth equation	Conditional convergence	FDI and structural characteristics of the regions indicated by investment, the prevalence of SOEs and bank loan-deposit ratios are important determinants of regional growth and convergence.
Lin (2000)	1983-96	Growth rate of real GDP	Growth equation	Conditional convergence	The allocation of resources between state and non-state enterprises, openness to trade and human capital are crucial for economic development.

Wei (2000)	1978-92	Growth rate of NI per capita	Growth equation		Regional development strategy and policy and investment
Zhao and Tong (2000)	1985-95	GDP per capita/ household income per capita	Gini/CV	Disparity in the provincial, regional, urban, rural and urban-rural dimensions↑ since 1985 and exacerbated in the 1990s.	Business cycles, uneven distribution of financial and human capital, other factors such as institutional reform and infrastructure development.
Zheng et al. (2000)	1978-95	GDP per capita	CV/Gini	Disparity↓ in the 1980s, ↑ in the 1990s	Differences in location and the industrial structure and regional development policy
Demurger (2001)	1978-98	Real GDP per capita	Growth equation	Disparity↓ in the 1980s, ↑ in the 1990s No absolute convergence, only conditional convergence.	Physical and human capital, reforms, FDI and infrastructure networks
Fujita and Hu (2001)	1985-94	GDP and GDP per capita	CV/Theil/ Regression	Disparity↑ between Inland and Coast and no absolute convergence	Regional development policy, globalisation, economic liberalisation, and industrial agglomeration.
Kanbur and Zhang (2001)	1952-99	Real CE per capita	Gini/GE/ polarisation index/ Regression		Regional inequality is explained in the different phases by three key variables – the ratio of heavy industry to gross output value, the degree of centralisation and the degree of openness.
Wei et al. (2001)	1986-95	GDP per Capita	Growth equation	Conditional regional convergence	
Yao and Zhang (2001a)	1952-95	Real GDP per capita	Growth equation/ Unit root test (stochastic convergence)/Gini	Divergence of regional incomes across three regions – Eastern, Central and Western regions.	

Yao and Zhang (2001b)	1978-95	GDP per capita	Gini/ SD/ Growth equation	Convergence (Divergence) within (between) economic clubs	Regional effects, population growth, investment in both physical and human capital, the degree of openness and transportation
Zhang (2001)	1952-95	Real GDP per capita	CV/ Growth equation	Disparity↓ or unconditional convergence between 1978-84, after 1984 disparity↑ across the three regions, but no change across provinces	International trade and FDI. Government's policies towards coastal area were a necessary but not sufficient condition.
Zhang and Kristensen (2001)	1988-96	Real GDP per capita	SD/ GE/ Regression	No obvious unequal growth in China, disparity↓ in the coastal area, ↑ in the western area.	The unequal distribution of FDI does not contribute to regional disparity.
Brun et al. (2002)	1981-98	Growth rate of real GDP per capita	Growth equation	Conditional convergence	
Cai et al. (2002)	1978-98	GDP per capita	Gini/Theil/ Growth equation	Disparity↓ in the 1980s, ↑ in the 1990s	Interregional disparities Labour market distortion
Chang (2002)	1978-2000	GDP per capita	CV/Gini/ Urban-rural income ratio	High income disparity but not of widening	Main reason for disparity is rural-urban income gap
Demurger et al. (2002)	1952-98	Real GDP per capita	CV/ Regression	Disparity↑ since 1992 No absolute convergence.	Geography and policy.
Golley (2002)	1978-1998	Real GDP growth/ growth rates of GVIO	Shift-share analysis	Disparity	'circular and cumulative causation'
Herrmann-Pillath et al.	312 prefectures	GDP per capita/ rural	Gini/CV/ GE/ Max-	Rural-urban inequalities account for 50% of total	

(2002)	for 1993 and 1998	per capita net income/urban per capita disposable income/total income per capita	Min/ Hoover	regional disparity.	
Lu and Wang (2002)	1978-98	GDP/CE	CV/Gini/ Theil	Interprovincial and regional disparities↓ between 1978-90, but ↑ in the 1990s	The levels of regional inequalities appear to be sensitive to changes in government development strategies and regional policies.
Shan (2002)	1955-98	GDP per capita	CV/Gini/ Theil/VAR	Disparity↑	Fiscal spending and unemployment widens income disparity
Wu (2002)	1953-97	GDP per capita	Gini/CV/ Theil	Disparity↓ in the 1980s and ↓ within each region in the 1990s, but ↑ between the coastal provinces and the rest in the 1990s	
Bhalla et al. (2003)	1952-97	Real GDP per capita	GE/The Markov chain matrix	Convergence within the pre-defined geo-economic sub-regions, but not between the regions.	

Notes: CV, SD, Gini, Theil and GE stand for the coefficient of variation, standard deviation, Gini coefficient, Theil index and generalised entropy methods, respectively. "Disparity↑" and "Disparity↓" indicate disparity reducing and disparity enhancing. GVO, GVIO, GDP, NI and CE represent gross value of output, gross value of industrial output, gross domestic product, national income and consumption expenditures.

Table 2. GDP per capita at 1990 prices, 1980-2001

	GDP per capita (RMB)					Annual Growth rate (%)	
	1980	1985	1990	1995	2001	1980-1990	1991-2001
Central Region							
Anhui	527	967	1182	2129	3585	8.1	10.1
Hubei	737	1242	1556	2634	4619	7.5	9.9
Heilongjiang	1156	1558	2028	2839	4598	5.6	7.4
Henan	516	833	1091	1896	3182	7.5	9.7
Hunan	666	967	1288	1986	3344	6.6	8.7
Jilin	773	1236	1746	2793	4692	8.1	9.0
Jiangxi	566	862	1134	2021	3394	7.0	10.0
Inner Mongolia	614	1023	1478	2210	3710	8.8	8.4
Shanxi	756	1231	1528	2268	3830	7.0	8.4
Western Region							
Gansu	547	758	1099	1591	2541	7.0	7.6
Guizhou	380	637	810	1158	1734	7.6	6.9
Ningxia	700	1078	1393	1879	2906	6.9	6.7
Qinghai	938	1325	1558	2090	3342	5.1	6.9
Shaanxi	548	874	1241	1782	2933	8.2	7.8
Sicuan	573	891	1134	1864	3132	6.8	9.2
Xinjiang	739	1262	1799	2761	4358	8.9	8.0
Yunnan	524	851	1224	1848	2808	8.5	7.5
Coastal Region							
Beijing	2463	3553	4878	8210	14038	6.8	9.6
Fujian	707	1207	1763	3927	6957	9.1	12.5
Guangdong	899	1482	2537	5557	8669	10.4	11.2
Guangxi	640	868	1066	2005	3037	5.1	9.5
Hainan	622	1107	1589	3342	4739	9.4	9.9
Hebei	721	1087	1465	2763	4878	7.1	10.9
Jiangsu	801	1420	2103	4394	7896	9.6	12.0
Liaoning	1375	2017	2698	4260	6810	6.7	8.4
Shandong	797	1323	1815	3770	6318	8.2	11.3
Shanghai	3264	4743	5910	10721	19763	5.9	11.0
Tianjin	2076	3015	3621	6063	10194	5.6	9.4
Zhejiang	820	1550	2122	4929	7880	9.5	11.9
Average						7.5	9.3
(standard deviation)						(1.4)	(1.6)

Table 3. Decomposition of the Gini indices, 1980-2001

Year	Total	Within		Between	% of contribution of		
		Inland	Coast	Inland-Coast	the within-group component	The net between-group component	transvariation
1980	0.2883	0.1410	0.3219	0.3444	38.74	55.64	5.62
1981	0.2813	0.1372	0.3089	0.3385	38.27	57.24	4.49
1982	0.2714	0.1432	0.2941	0.3247	38.81	56.49	4.70
1983	0.2700	0.1356	0.2991	0.3236	38.71	56.32	4.97
1984	0.2713	0.1333	0.2992	0.3269	38.36	56.68	4.96
1985	0.2698	0.1262	0.2958	0.3285	37.65	58.07	4.27
1986	0.2692	0.1261	0.2935	0.3285	37.52	58.13	4.35
1987	0.2700	0.1259	0.2855	0.3331	36.76	59.25	3.99
1988	0.2720	0.1243	0.2828	0.3385	36.14	59.71	4.15
1989	0.2688	0.1200	0.2798	0.3358	35.90	60.14	3.96
1990	0.2683	0.1217	0.2774	0.3352	35.91	60.26	3.83
1991	0.2767	0.1262	0.2684	0.3514	34.60	62.59	2.81
1992	0.2820	0.1209	0.2527	0.3692	32.29	65.86	1.85
1993	0.2882	0.1139	0.2403	0.3880	30.10	68.60	1.30
1994	0.2963	0.1121	0.2386	0.4033	29.10	69.90	1.00
1995	0.3039	0.1147	0.2447	0.4127	29.14	69.96	0.90
1996	0.3074	0.1164	0.2488	0.4164	29.29	69.72	0.99
1997	0.3118	0.1196	0.2527	0.4211	29.44	69.47	1.09
1998	0.3158	0.1211	0.2539	0.4268	29.31	69.63	1.06
1999	0.3173	0.1231	0.2569	0.4273	29.56	69.31	1.13
2000	0.3193	0.1243	0.2610	0.4284	29.80	68.99	1.21
2001	0.3192	0.1250	0.2642	0.4266	30.11	68.63	1.26