Labor Market Distortions and Economic Growth: Examining Institutional Components of Regional Disparity in China

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工作论文系列十
Working Paper Series No. 10

July 2001

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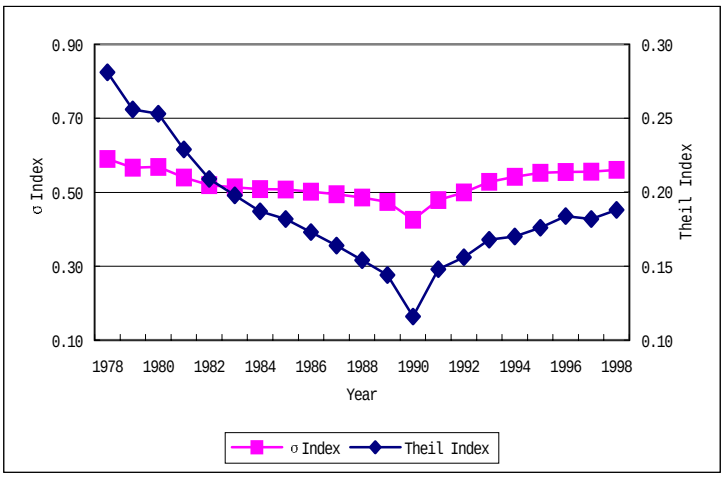
1. Introduction

It is widely observed that the income gap between regions in China has widened with economic reform. More careful examination of income disparity shows that it first narrowed and then widened drastically (see for example Jian et al. 1995). Scholarly studies have tried to examine political, historical, and geographic factors causing increasing disparity across regions and warned of possible severe consequences that could shake the political regime (see Wang et al. 1999). Other studies have argued that regional disparity can be attributed to differences in resource endowments between eastern, central and western parts of the country (Lin et al. 1999). We believe that the widening regional disparity of during the reform period can be understood through the analysis of two trends.

First, we can view the trend through changes in inequality calculated by province. As shown in Figure 1, during the period from 1978 through the late 1980s and early 1990s, regional disparity decreased to its narrowest level with a sharp drop in the coefficient of log income (σ Index) from 0.59 in 1978 to 0.43 in 1990 and in the Theil Entropy Index from 0.28 in 1978 to 0.12 in 1990. From the early 1990s, the income gap increased again to a high of 0.56 (σ index) and 0.19 (Theil Entropy), respectively, in 1998. Over the entire post-

reform period the measures of income disparity among Chinese provinces has shown a "V" shaped path characterized by decline first and an increase later.

Figure 1 The Trend of Regional Disparities of Per Capita GDP in China, 1978-98



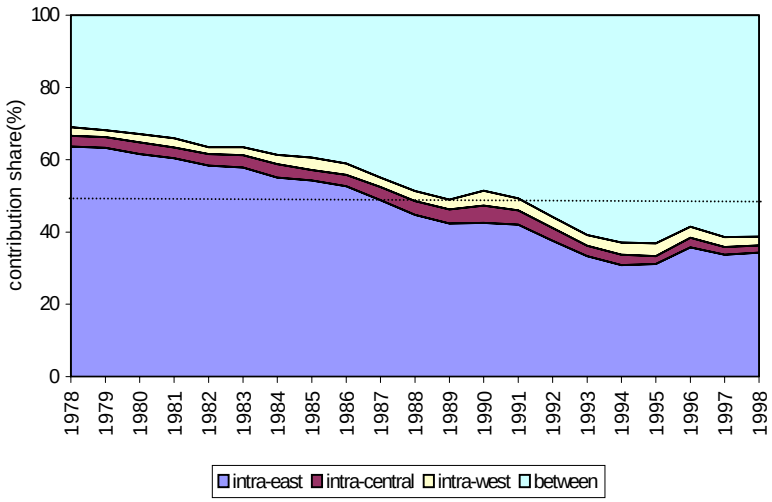
Source: Authors' calculation based on the *Provincial Data in 50 years of Peoples Republic of China*: China Statistic Press, 2000

The second trend worth analyzing involves looking at changes in the components of regional disparity by decomposing measures of inequality into four sources – intra-eastern, intra-central, intra-western, and interregional disparities. While the general regional disparity has experienced a pattern of fall and rise in the past 20 years, inter-provincial disparities within all three (eastern, central and western) regions have narrowed – so called club convergence, implying a dominant role for interregional disparity (Lin et al. 1999 and Cai et al. 2000). Further decomposition of the Theil Entropy Index[1] identifies the contribution of within and between region effects to income inequality, and demonstrates that intra-western and central contributions have been insignificant, ranging from a combined contribution proportion of 5.34 percent in 1978 to 2.19 percent in 1998, while intra-eastern and interregional disparities have counted

[1] See Shorrocks (1980) for the technical details of the decomposition.

for over 95 percent of the total disparity (see Fig. 2). While examining relative importance of sources of overall regional disparity, we found a boundary in the late 1980s and early 1990s dividing the whole period into two periods with a dominant role of disparity within eastern region in the first period and of disparity among the three regions in the second period. Drawing a horizontal line at the 50 percent contribution level clearly demonstrates the ebb-and-flow of changing contributions from two sources of inequality. Since we are concerned with the effects of various reform measures during the entire period of rapid economic growth, the explanation of regional inequality should be consistent with this process. In the mean time, both the phenomena of V-shaped disparity pattern and club convergence should also be integrated in the same framework.

Figure 2 The Contributions of Intra- and Inter-Regional Disparities to Income Inequality in China, 1978-98.



Source: Authors' calculation based on the *Provincial Data in 50 years of Peoples Republic of China*: China Statistic Press, 2000

Growth economists have long tried to explain differences in economic performance across nations and regions. Since the mid-1980s, several tests of conditional convergence have lent support to predictions of neoclassical growth theory. Assuming diminishing returns to capital, neoclassical growth theory predicts a convergent

growth trend among nations or regions, i.e. poor countries or regions tend to grow faster than rich ones (Mankiw et al. 1992). Earlier empirical studies found that the convergence could not exist among all nations or regions without condition, but only exist when those nations or regions concerned are homogeneous and share similar steady state characteristics. This finding is appropriately termed "club convergence" (Baumol 1986). By holding constant a set of variables characterizing differences in steady-state, later studies found convincing evidence of "conditional convergence." Hypothesizing a host of factors characterizing steady state, and thus with an impact on economic growth paths, more than 60 variables have been employed and found to be significant in at least one regression (Sala-i-Martin 1997)[1]. Results from studies of conditional convergence literature imply that (1) poor economies tend to grow faster than rich ones, and (2) changes in conditions may be the possible way to speed up the growth of poor economies.

Effects of institutions and policies on growth among regions have been given scholarly attention in the literature. In addition to Barro's works in which various variables of institutions and policies are employed, Chari et al. (1997) and McGrattan et al. (1998) have also introduced government policies in models explaining the impact of policy on regional growth. Based on a neoclassical two-sector model and assuming that capital goods sector is distorted by government over-investment, and that the consumption goods sector is relatively free from policy intervention, they show that distortions reduce factor productivity (e. g. technical level in Cobb-Douglas production function) in the investment goods sector. Therefore, $A_c/(1+\lambda_x)$ denotes the productivity factor in investment goods sector to be differentiated from A_c, the productivity factor in the consumption goods sector. The additional production loss in investment due to distortions by government policies (the distorting degree is expressed by λ_x) can be used to analyze policy distortions,

[1] Such variables as the starting level of per capita income, human capital, rate of saving, fertility rate, political stability, and degree of democracy are widely used and considered by economic theory to be relevant (Barro 1998).

such as low efficiency of government investment, rent seeking in the process of the competition of firms for scarce resources, and trade protection. These researchers take the relative price of investment goods to consumption goods as the proxy variable for distortion caused by government investment. A statistically significant correlation coefficient between the relative price of investment goods and relative GDP per worker is -0.65（McGrattan et al. 1998）. We found this analysis very relevant toward a study on China's case in terms of regional growth.

From the standpoint of growth theory, regional disparity can be either expressed as β divergence – regional disparity of growth rates that causes the disparity, or σ divergence – regional disparity of per capita income, a resulting indication of the disparity. Therefore, analytical framework of convergence is a good tool for examining the economic inequality among China's regions. One of the legacies of Chinese traditional development strategy is immobile labor market between rural and urban areas segregated to the extent that the same phenomenon is found nowhere in other developing countries and former planned economies. Thus, an institutional analysis of labor market distortion is also needed to add to the convergence framework. This paper tries to investigate effects of China's reform on economic growth, especially focusing on the impact of lagged reform of labor market on regional disparity. In particular, we want to explain why the contributions of disparity between three regions to the overall disparity become dominant at the later stage of the reform and, consequently, widened the general gap in income among regions. Within the literature of growth economics, evidence of absolute convergence is seldom found and instead, there has been more divergence. This observation has been interpreted as evidence of different steady states in which determinants of economic growth simultaneously determine the position of steady state and its change (Sala-i-Martin 1996). From this point, we can explain the different patterns of regional disparity in the two periods of reform through investigating the differences and relative changes in steady states between eastern and central and western regions. In particular, this paper tries to find the answers to the increase in contribution of

disparity between the three regions to overall regional disparity and the V-shaped changing pattern of regional disparity. For that purpose, the analysis will focus on growth effects in different periods of the reform and their impact on changing pattern of regional disparity.

The rest of this paper is organized as follows. Section II identifies two effects of reform – improvement in technical and allocative efficiency – and explains the possible impacts of reform at different stages on growth performance and changing patterns of regional inequality in per capita income. Section III examines the difference of labor market development among regions and its negative effect on convergence of growth. Section IV employs a set of relevant variables to estimate the effect of allocating efficiency that impedes central and western regions from catching up with coastal areas. The final section concludes with policy implications.

II. Reform effects and regional disparity

China's reform has been undertaken on two parallel fronts: (1) micro-management reform implemented by granting autonomy to and redistributing profits with SOEs in urban areas and introduction of the household responsibility system in rural areas; (2) macro policy environment reform featuring reforms of pricing, banking, fiscal system, and development of markets for final goods, commodities and factor inputs. These two features were sequenced in terms of time and geography. Dividing reform into different stages by time, one can witness that earlier stage is characterized by micro management reform while later stage by macro policy environment reform. Observing reform across regions, one can see that central and western parts of China first initiated the reform of micro-management and later coastal areas took the lead in reform of macro-policy environment. Markets for commodities and factors began to develop first in coastal areas and then gradually and slowly spread inland.

As in former centrally planned economies, China's prior heavy industry-oriented strategy and its supporting institutional components created two major problems. First low technical efficiency resulted

from lack of appropriate incentives for both managers and workers. Second, promoting an industrial structure inconsistent with the economy's comparative advantage led to low allocative efficiency (Lin et al. 1996; Desai et al. 1983). As a result, we can discuss two corresponding ways in which reform facilitated growth: through improved technical efficiency generated by enhancing incentives at the micro level, and through improved allocative efficiency generated by mobility of capital and labor among sectors and regions.

In the early 1980s, reform focused primarily on improving incentives through the household responsibility system initiated in central and western rural areas (e.g. poor areas in Anhui province and Sichuan province) and pilot reform experiments in SOE management aimed at enlarging autonomy and sharing the profits with state was also first introduced in the west (e.g. Sichuan province). There were three characteristics of this stage reform.

First of all, reform was not always implemented in a regional sequence, namely it was not the case that reforms spread from central-western to eastern regions, because the reform of micro incentive mechanisms in farm management spread rapidly from preliminary experiments in concentrated areas to nationwide implementation. For example, the total proportion of collective farm production brigades converted to household management under the household responsibility system was 1.1 percent of the total production brigades in 1980, but soon rapidly increased to 97.9 percent by the end of 1984. SOE reforms were also implemented rapidly after initial experimentation. Experiments with enterprise autonomy first occurred in 6 enterprises in Sichuan province in 1978. Half a year later, it was extended to 8 more enterprises located in Beijing, Tianjin and Shanghai. By the fall of 1980, this reform was widely adopted by over 6 thousand enterprises, which made up 16 percent of total number of state-owned industrial enterprises, 60 percent of total output and 70 percent of profit generated in state industry. A second SOE reform -- introduction of industrial responsibility system characterized by profit quota submission -- also spread throughout the country in a short period of time. Shandong

first experimented with this reform in the early 1980, but it too was soon extended to two-thirds of the SOEs in the country, and was fully implemented in 80 percent in eastern regions in August of 1981.

Second, this stage reform aimed at improving technical efficiency and, therefore, did not rely upon well functioning markets. Statistical data shows that over the period of experiment to implementation of the household responsibility system from 1978 to 1984, the annual growth rate of agricultural output reached 6.05 percent, and it was estimated that nearly one half of this agricultural growth can be attributed to the improvement of incentives generated by household responsibility system (Lin 1992).

Third, the reform at the early stage is characterized by "Pareto Improvement" - almost all regions benefited from the reform. At the time, agricultural output counted for nearly one third of total GDP, and an even higher share in central and western regions. Since the level of agricultural development was low in central and western regions, reform featured by agricultural decollectivisation was more conducive to those regions, which in tern reduced regional disparity throughout the period.

New resources available as a result of micro-management reform needed to be reallocated in sectors more profitable and consistent with both China's comparative advantage and that of each individual region. The traditional planning allocation system could not reallocate the new resources efficiently, and therefore the further reform was necessary to facilitate mobility of capital and labor. As a result of resource reallocation through balancing the industrial structure and diversifying enterprise ownership, allocative efficiency was enhanced in the country as a whole, at the same time, however, but the degree of improvement differed across China's regions. The cause of differential performance is twofold. First, as the share of agricultural output in GDP declined and proportion of rural industry increased, agriculture no longer had a dominant influence on the overall level of income. Since rural industry expanded far more rapidly in coastal areas than it did further inland, this growth effect

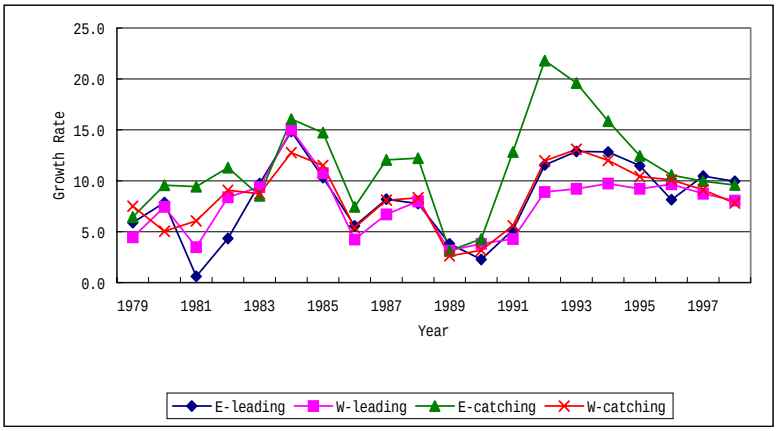
resulted in resources reallocation that was unfavorable to central and western regions. Second, the opening-up policy confined in coastal areas has endowed the east with the chance to take the lead in adjusting industrial structure and diversifying ownership[1].

The regional growth pattern in the period of reform indicates two trends consistent with club convergence -- convergence within eastern regions and within central and western regions. We divide eastern provinces into two subgroups – a leading group and following group, and do the same with central and western provinces[2]. With four groups: the eastern leading and following groups, and central/western leading and following groups. From Figure 3, we can observe that the changing regional disparities in post-reform period could be explained by the fact that the eastern following group has a greater growth rate than both the western following group and the eastern leading group. The logical result is an increase in disparity between eastern and central/western regions has increased, while there are convergence within the two regions.

[1] Opening-up policy had implemented in forms of special economic zone, coastal opening cities, and strategy of coastal opening areas before it extended into vaster areas in central and western regions as late as 1990s.

[2]Weighted by total provincial population, we calculate the average per capita GDP in eastern and central/western regions in an initial year, and then those provinces with GDP per capita over the average are defined as a leading group, correspondingly, those provinces with GDP per capita lower than the average are defined as catching-up group. The eastern leading group includes Beijing, Tianjin, Shanghai, and Liaoning; the eastern catching-up group includes Zhejiang, Jiangsu, Guangdong, Fujian, and Hainan; The western leading group includes Shanxi, Innermongulia, Jilin, Heilongjiang, Hubei, Jiangxi, Xizang, Qinghai, Ningxia, Xinjiang; The western catching-up group includes Anhui, Henan, Hunan, Sichuan, Guangxi, Yunnan, Shannxi, and Guizhou.

Figure 3 The Comparison between Leading and Following Groups by Region in China, 1978-98.



Source: Provincial Data in 50 years of Peoples Republic of China: China Statistic Press, 2000

In the 1980s, internal disparity in eastern regions played a dominant role in determining the overall regional disparity and tended to narrow throughout the post-reform period[1]. Therefore, the differential in improvement of allocative efficiency between coastal and inland regions had not reflected a change in overall disparity measured by inequality indices among provinces. If we agree on that technical efficiency improvement gained from micro management reform is indifferent between eastern and central and western regions, what we need is to examine whether and why growth effect from reallocation of resources differs among regions. In fact, resource reallocation requires the movement of capital and labor from low to high productivity sectors, which contributes to increased allocative efficiency, and equalizes returns to factors of production. As suggested in recent research, the development of factors market has always lagged behind other reforms (Lardy 1994, pp. 8-14: Yang et al. 2000). Although the improvement of technical efficiency can be

[1]The growth rate of each eastern province was negatively correlated to its starting income level in the period of 1978 and 1998, implying an absolute β convergence (Cai et al. 2000).

reached without market development, the improvement of allocative efficiency relies on factor market development. We will further discuss causes of widening gap in per capita income between eastern, and central and western regions under the assumption that there is a difference in development of factor markets across the three regions.

Assume each region *i* has a production function satisfying the following properties:

(1) $$Y_i = A_i K^{\alpha} L^{1-\alpha}$$

where, *A* picks up the impact of technology on factor productivity, and *K* and *L* are capital and labor respectively. For all K>0 and L>0, *Y*(.) represents positive and diminishing marginal products with respect to each input:

$$\frac{\partial Y}{\partial K} > 0, \frac{\partial^2 Y}{\partial K^2} < 0 \; ; \quad \frac{\partial Y}{\partial L} > 0, \frac{\partial^2 Y}{\partial L^2} < 0$$

and *Y*(.) is constant return to scale. Factor productivity is determined by technical efficiency T_i and allocative efficiency V_i:

$$A_i = A_i(T_i, V_i)$$

Factor productivity is assumed to satisfy *Inada conditions*. That is to say, technical efficiency has great marginal contributions to factor productivity when T_i is extremely depressed while its marginal contribution to factor productivity converges to a constant as technical efficiency improves:

$$\lim_{T_i \to 0}(A_{T_i}) = \infty; \lim_{T_i \to \infty}(A_{T_i}) = c \quad \text{Where, } A_{T_i} = \frac{\partial A_i}{\partial T_i}$$

Due to the three features of technical efficiency described above, the level of market development has not limited its improvement after reform and its marginal contribution to factor productivity has converged among regions:

$$\dot{A}_T^i = \dot{A}_T^j, \qquad i \neq j$$

where $\dot{A}_T^i$ stands for the change of technical efficiency in one region with respect to time.

Allocative efficiency, however, is endogenous to the level of market development. It is easy to expect that there is a low level of allocative efficiency where factor markets are distorted, and *vise versa*. Assume that, before reform all regions had a similar level of allocative efficiency under the planning system. With evolution under reform, allocative efficiency has a more prominent marginal contribution to factor productivity where the factor markets are less distorted. Hence, there are disparities in the marginal contributions of allocative efficiency to productivity among regions:

(2) $$\dot{A}_V^D < \dot{A}_V^N$$

Where A_V^D stands for marginal contributions of allocative efficiency to productivity where factor markets are distorted and A_V^N stands for marginal contributions of allocative efficiency to productivity where factors markets are well developed. Since the marginal contribution of technical efficiency converges to a constant, the difference in factor productivity is independent of changes in technical efficiency, and allocative efficiency is the main determinant of disparities in factor productivity:

(3) $$A(V_D) = \frac{1}{1+\lambda} A(V_N)$$

Therefore, output in steady states differ as a result of distortions associated with allocative inefficiency:

(4) $$\frac{y_N}{y_D} = 1 + \lambda$$

Thus, differences between technical and allocation efficiencies result

in differential in growth rates among regions. At the stage dominated by the improvement of technical efficiency, regional disparity narrowed. When economic reform reached the stage dominated by efforts to improve allocative efficiency, regional disparity widened. In next section, we will focus on whether and why the gains of allocative efficiency are different between regions, and how these differences changed the pattern of regional disparity during the reform period.

III. Regional Differential in Maturity of Markets of Production Factors

The traditional economic system in China served state strategy that gave priority to heavy industry. In a capital scarce economy, allocation of resources through the market mechanism would be unlikely to promote development of capital-intensive heavy industry. A highly centralized planning system was formed to allocate scarce resources to priority sectors. Under such a system, capital and labor were neither allowed nor necessary to migrate across sectors and regions in accordance with market signals. Consequently, the People's Commune System and Residence Registration System (*Hukou System*) were implemented to prevent mobility of capital and labor from rural to urban sectors. More precisely, any mobility of factors of production among regions, industries, and even enterprises with different ownership was deemed illegal. The *Hukou* System and attendant urban biased policies, such as rationing of food and living necessities, exclusive employment and provision of welfare, effectively prevented rural workforce from migrating to cities.

Apart from the strict control of such a policy package over labor mobility, highly capital-intensive industry lacked apability to absorb surplus laborer released with the growth of labor productivity in agriculture. Prior to the beginning of rural reform, there were no noticeable labor flows among sectors and regions. This strategy resulted in massive distortions in factor markets with an excessive concentration of capital in urban areas and of labor in rural areas. In 1978, the urban sector employed 95 million workers while the rural

sector had approximately 306.4 million laborers. In contrast, the total value of fixed assets in the state-owned enterprises (primarily urban) counted for 448.82 billion yuan while the value of the fixed assets in agriculture was only about 94.98 billion yuan (SSB, 1993). These numbers indicate a ratio of 3.2:1 in labor and 1:4.7 in capital between rural and urban sectors.

Since the late 1980s, various reforms have created opportunities and an environment conducive to factor movement from low productivity sectors to high productivity ones. The most impressive is the mass labor exodus from the countryside. It is a fact acknowledged that the transfer of previous hidden surplus rural labor to unskilled workers in urban sectors and TVEs contributed greatly to the GDP growth of the country as a whole in the post-reform period (World Bank 1997; Cai et al. 1999). However, reforms aimed at development of functioning labor markets has lagged far behind reforms in other areas. While reforms to date have created the possibility and opportunity for rural workers to move out from their home villages, other traditional institutions inhibit this process and prevent migrants from settling permanently in cities. First, the urban segregated labor market sets barriers for migrant access to a variety of jobs and posts. Second, because of the incompleteness of urban social service system reform, outside workers are not able to receive necessary housing, medical care and children's education at reasonable prices. Third, migrants without local *hukou* are often dispelled by urban authority simply because they are outsiders and, therefore, may contribute to instability and crime.

Distortions created by institutions related to *hukou* deter labor market development in two ways. First, rural-urban and inland-coastal migration has not reached a scale necessary to eliminate important distortions in allocation of resources. Secondly, the scope of labor flows is still regionally limited. Analyzing data from a 1 percent population survey in 1995 shows a large proportion of intra-provincial migration in terms of both rural-urban migration and rural-rural migration. When migrants go beyond the borders of provinces, a majority of them only migrate within eastern, central and western

areas, respectively (Table 1). If we judge labor market in terms of the relative scale and scope of mobility, the emerged labor market at most is a regionally confined other than nation-wide.

Table 1 Scope of Migration cross Regions in China (%), 1995

	Total	Rural to Urban	Rural to Rural
Intra-provincial	68.4	75.3	54.6
Intra-regional	80.4	84.8	71.7
Of which			
Within east	93.1	95.1	87.2
Within central	67.7	72.7	58.6
Within west	72.4	75.6	69.0

Source: Cai, 1999, p. 321.

In the course of reform, migrant labor has typically found employment in either the rural non-agricultural sector (primarily township and village enterprises), or the urban sector. The extent to which demand for labor matches supply differs among eastern, central and western regions due to differences in (1) the regional economies' ability to absorb surplus labor and (2) mechanisms channeling surplus labor into sectors capable of using it. As in other countries, rural migrants in China faces a host of obstacles to overcome and significant costs. Since migration costs increase with distance, migration tends to be a multi-stage process. Specifically, labor mobility is shaped as a three stage process – labor moves from agricultural to non-agricultural sectors locally in a first stage, then moves to more advanced rural areas or local small towns in a second stage, and finally to the cities in a third stage (Cai 1999). We examine below what has happened to eastern, central and western surplus laborer, respectively, as the regions proceed through each of these stages of migration experience.

Surplus laborers in different regions confront different opportunities at the initial stage of migration. Eastern regions had advantages in developing rural non-agricultural sectors due to (1) richer heritage from former commune and brigade enterprises, (2) stronger financial foundations from former collectives, and (3) favorable government policies that made these regions attractive to outside investments. As

a result, large numbers of rural laborers in coastal regions previously engaged in agriculture shifted to employment in TVEs, while rural laborers in central and western regions had fewer opportunities to change their sector of employment. Even if there were similar proportions of surplus labor among eastern, central and western regions at the outset of reform[1], after the initial migration stage, underemployment in the agricultural sector of inland areas became more serious and led to further divergence of incomes from those in coastal areas. For similar reasons, small towns in eastern regions have been more developed than those in central and western regions, contributing to further deviation in the amount of surplus labor across the three regions. The cumulative regional differential in labor allocation shaped by the first and second stages of labor mobility shaped outcomes in the third stage of labor mobility. Laborers with less mobility tended to lack migration-related physical, human and social capital, and had less ability to overcome the obstacles deterring their migration to distant destinations. With governments in large and medium sized cities and even many small towns in the east enacting various discriminatory policies against migrants from other areas, migrants from inland areas face stronger obstacles to migration from their hometowns than their counterparts from coastal areas.

On the one hand, the scale of migration depends upon the degree and level of labor market development in which suppressing policies inevitably hamper labor migration. On the other hand, the non-smoothing movement of labor force impedes labor market maturity as well. Nationally speaking, an ill-functioning labor market has a larger negative impact in central and western regions, where opportunities are fewer and costs are higher in terms of labor shifts, than in eastern regions where it is easier to find jobs in non-agricultural sectors. Sequentially, the regional discrepancy in labor shifts resulting from an ill-functioning labor market has meant that labor market development in inland areas has fallen behind. After benefiting from both technical and allocative efficiency, provinces in

[1] The fact is that the ratios of surplus labor to the total in central and western regions were higher than that in eastern regions. Refer to Carter et al. (1996) for estimates of surplus labor by province.

the east that were relatively poor in the pre-reform period have rapidly converged toward their steady states, and narrowed the disparity in income among eastern provinces. Because of the large disparity among eastern regions at the outset of reform, the contribution of intra-eastern region determined overall regional disparity in the 1980s. Consequently, overall regional disparity of the country had narrowed in the same period. When the contribution of interregional disparities dominates the overall disparity, as it has since the 1990s, overall regional disparity widens again. This result follows from lower in Western regions as a result of fewer improvements in resource reallocation.

The imperfection of labor market results in an imbalance of population distribution between rural and urban areas and of labor allocation between agricultural and non-agricultural sectors. Between 1978 and 1997, per capita GDP in China increased by 3.6 times, from 379 yuan to 1742 yuan in real term, while the agricultural share of labor is still as high as 50 per cent of total labor force. Compared to selected countries with similar per capita income to China[1], China's economic structure is atypical in terms of urbanization, agricultural share of labor and output, and productivity of agricultural labor. That is, China has lagged behind other developing countries in economic structure in association with corresponding stage of development (Table 2).

[1] In 1997, China was ranked 65 in the world by PPP measured per capita GDP, therefore we select countries ranked from 60 to 69 (World Bank 1999) which are roughly at the same development level as China.

Table 2 Comparing China's Economic Structure with Other Developing Countries (US$， %)

	Real per capita GDP	Urbanization	Share of agricultural labor	Share of agricultural output	Labor productivity of agriculture
China	3570	32	72	20	193
Bulgaria	3860	69	13	10	6240
Guatemala	3840	40	52	24	1240
Indonesia	3450	37	55	16	481
Jamaica	3470	55	25	8	1045
Jordan	3430	73	15	5	2769
Kazakhstan	3290	60	22	13	-
Latvia	3650	73	16	9	3870
Paraguay	3870	54	39	23	2204
Philippines	3670	56	46	20	780

Note: Labor productivity of agriculture is value added of agriculture per worker; Figures of share of agricultural labor are in 1990, all other figures are in 1997.

Source: World Bank 1999，pp. 190-193、204-205、212-213; IPS (ed.) 1998, pp. 465-467、478-479.

As a result of imbalance of labor allocation between rural and urban areas, the rural sector produces a smaller share of output with a larger proportion of the labor force. The other side of the coin is that urban sector produces a larger share of output with a smaller proportion of labor force. We can calculate an index – comparative productivity of labor – to indicate the degree to which the share of labor force exceeds the share of output in agriculture disproportionately: P_L = (agricultural GDP / agricultural labor)/(industrial GDP / industrial labor). A value of 100 percent indicates the case in which combinations of labor with capital are identical in both agricultural and non-agricultural sectors, while values below 100 percent indicate association of larger shares of labor with smaller share of output in agriculture. In fact, this index reflects a similar imbalance of capital allocation since any allocation refers to a combination between capital and labor. The calculated indices by region during the period of 1978 through 1998 are listed in Table 3. The meaning of the results is twofold. First, the comparative productivity of agricultural labor has been lower than 1. Second, the indices in central and western region are lower than that in eastern region, showing the resources

misallocation caused by distortion of labor market.

Table 3 Changes in Comparative Productivity of Labor by Region in China (%), 1978-98

	East	Central	West		East	Central	West
1978	10.50	15.04	11.56	1989	26.28	22.27	15.99
1979	13.16	16.64	12.04	1990	27.93	25.53	17.35
1980	13.42	15.91	12.51	1991	25.94	22.34	16.49
1981	15.11	18.53	14.20	1992	22.62	20.54	14.98
1982	19.47	19.46	14.76	1993	20.99	19.24	12.30
1983	20.55	19.64	13.72	1994	22.17	22.54	12.92
1984	22.68	20.92	14.30	1995	23.50	23.96	17.07
1985	24.83	23.25	16.72	1996	22.45	21.11	13.97
1986	26.78	23.94	17.35	1997	20.28	19.36	13.07
1987	27.52	24.20	17.61	1998	17.34	15.94	11.58
1988	28.43	23.27	16.87	-	-	-	-

Source: State Statistical Bureau, 2000.

IV. Empirical Model and Results

In order to test the effectiveness of conditional convergence in China's case, as well as to test the impact of labor allocation effect on regional growth performance, we employ the following Sala-i-Martin model (1996) to express the relationship of a set of relevant variables to growth rate:

(5) $$\gamma_{i,t} = \alpha_i - \beta \log(y_0) + \Psi \mathbf{X}_{i,t} + \varepsilon_{i,t}$$

$\mathbf{X}_{i,t}$ denotes a set of control variables for economy i in its steady state. Let α_i be the intercept term in different regions, consisting of the same intercepts in each province and different initial conditions in each province.

In order to empirically test the degree of labor market maturity and hence the impact of labor allocation effects on regional growth, we included comparative productivity of labor as an explanatory variable

in the regression model against growth rates of per capita GDP by province. In addition, we also introduce several other variables that have allocation effects in the above model.

(1) Foreign trade dependence is the ratio of total values of imports and exports to GDP. It is a good proxy of the level of opening-up and expected a positive correlation with growth rate. We found that during the entire period of reform, this indicator in eastern region has increased rapidly and much more advanced than that in central and western regions.

(2) Proportion of government consumption is calculated from the ratio of provincial governments' consumption expenditure to GDP, indicating the malfunction of government and imperfections of the market mechanism for resource allocation. We predict that it has a negative impacts on the growth rate. This indicator is characterized by the pattern that it is the highest in western region, second in central region and the lowest in eastern region, though there is a trend of increase in all three regions.

(3) Investment efficiency is represented by the proportion of fixed capital formation in total capital formation (fixed capital formation +stock increase). It reflects the development level of input and capital markets, and is expected to have a positive influence on growth rate[1]. At the early stage of the reform, China's economy was characterized by shortages in which sufficient supply of input goods was of most importance and enterprises tended to hoard as many input goods as possible. During this period, the ratio of fixed capital formation to total capital formation is not a good indicator for investment efficiency, instead it reflects the ability of enterprises to obtain scarce resources. Thus, the eastern region performed much worse in terms of this indicator than did central and western regions. As the reform deepens, however, the China economy has no longer been an economy of shortage, and this indicator has become a better measure of investment efficiency. Whereas eastern regions have progressed

[1] Wang (2000) uses the similar measure to examine investment efficiency.

with this regard, central and western regions have not, though western regions still have the highest ratio.

(4) Marketization index is an alternative measure used to examine the institutional determinants of regional growth. It is built as a combined variable consisting of the share of total commodity sales by the non-state sector, the proportion of non-state fixed capital investment in the total, the share of non-state industrial output in the total, and foreign trade dependence. This index is obtained by arithmetically averaging the above indicators and predicted a positive correlation with growth rate.

(5) Urbanization is an indicator directly reflecting distribution of population between rural and urban areas and indirectly reflecting the advance of economic structure and, therefore, should have positive impact on economic growth rate. The former central planning system not only artificially distorted the process of urbanization in the pre-reform period, but the incompleteness of the reform has also delayed this process. The current urbanization statistical indicator does not necessarily reflect the real level of urbanization because of the existence of circular migration. Due to the nature of current urbanization statistics characterized by government intervention (i. e. *hukou* and grain quota), the relative urbanization levels represented by the official figures are most likely to be overestimated in central and western regions relative to eastern regions.

Running the regression model in (5) will allow us to identify the major determinants of regional growth under an assumption of conditional convergence. Therefore, variables indicating initiative conditions are also employed in the model. First, initial per capita GDP is represented by the income levels in 1978, and should be negatively correlated with the growth under conditional convergence. Second, human capital endowment denoted by adult literacy at starting year (1978) or, alternatively, denoted by average years of educational attainment in logarithm form are expected to have a positive and lasting effect on the growth rate. Investment rate is denoted by the ratio of total value of fixed capital formation to GDP

and expected to affect growth rate positively. In addition, labor participation rate is denoted by the proportion of social workforce in total population. A higher participation rate reflects a better allocation of workforce given capital-labor ratio. A positive correlation with the growth rate is predicted.

Using data by province between 1978 and 1998, we have estimated eight regressions to test the impacts of above variables on growth rate of per capita GDP. Although each of the regressions contains different set of variables, and the significance of the coefficients differs in different regressions, estimated signs are basically consistent with our expectations (see Table 4). Take the coefficients of 4th regression as the typical results of the estimation, their signs and significance have two implications. First, holding constant the initial human capital endowment, level of employment, volume and efficiency of investment, ratio of government consumption, degree of marketization, and efficiency of labor allocation, poor regions with lower starting level of per capita income grow faster than their richer counterparts. This is the conditional convergence appearing during the course of economic reform in the past two decades. Second, those controlled explanatory variables are the factors or determinants differentiating regions into different groups by steady state and causing different growth performance across regions. We also introduced the time period dummy variable, i.e. let it equal 0 if year is before 1990, and 1 if year is after 1990 (including 1990), to test the impact of the labor market development on economic growth in the 8th regression equation. The results show that the allocative efficiency from the labor market development has a significant impact on growth rate since 1990 compared with that in the 1980s.

V. Concluding Remarks

From the empirical study, factors affecting the performances of regional economic growth can be summarized as (1) initial conditions including per capita income and education endowment, (2) institutional determinants including the scale of government consumption, the degree of market development, and the role of the

state in allocating factors of production, and (3) routine conditions of growth including levels of employment and investment. The policy implications of those results are that improving and equalizing those factors in the direction pointed out by signs of the coefficients will increase growth in lagging regions. Those conditions are supposedly conducive to increasing growth in central and western regions and to narrowing the gap between the three regions, in general, and that a well-functioning labor market is crucial for generating growth by reallocating resources among sectors and regions. Less developed labor market and attendant lack of employment opportunities in non-agricultural sectors in central and, especially, western regions have reinforced the degree to which the resources are misallocated. Which, in turn, has impeded the economic growth in central and western regions relative to eastern regions and has increased the regional gap in income between the three regions. Correspondingly, a further reform and package of policies accelerating the development of labor market and thus labor mobility across sectors and regions will help lagging regions grow faster and converge toward the more developed regions.

Regional disparity in China is not a new topic at all. There have been several similar government efforts for, explicitly or implicitly, narrowing down the regional gap before and after the reform. For example, the state strategy of constructing third front, the biased investment policy to TVEs in central and western regions, and state poverty alleviation program. Those policy efforts, however, did not effectively reach the proposed goals. In the beginning of the new century, the Chinese government has initiated a new regional policy aiming to speed up the development of western regions. Understanding the constraints that the lagging regions face certainly will help the government choose better tools to implement the strategy and find the most effective fields to invest.

Table 4 Regression results of testing the conditional convergence in China

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Initial pc GDP	-3.313	-3.337	-2.721	-3.360	-3.480	-2.275	-1.920	-3.207
	(5.23)**	(5.55)**	(4.31)**	(4.72)**	(4.79)**	(1.91)	(1.49)	(4.57)**
Initial human capital(1)	0.113	0.114	0.054					
	(3.37)**	(3.51)**	(1.53)					
Initial human capital (2)				4.526	4.532	4.730	4.602	4.121
				(2.42)*	(2.42)*	(2.52)*	(2.47)*	(2.21)*
Proportion of employment	0.180	0.182	0.163	0.164	0.177	0.153	0.151	0.149
	(4.35)**	(4.80)**	(3.66)**	(3.82)**	(3.95)**	(3.46)**	(3.45)**	(3.42)**
Comparative productivity of labor			0.070	0.064	0.069	0.077	0.076	0.042
			(2.36)*	(2.20)*	(2.34)*	(2.49)*	(2.49)*	(1.42)
Comparative productivity of labor*time period dummy								0.055
								(3.03)**
Investment rate	0.096	0.097	0.071	0.073	0.082	0.079	0.079	0.068
	(3.16)**	(3.37)**	(2.38)*	(2.53)*	(2.78)**	(2.67)**	(2.69)**	(2.30)*
Foreign trade dependency	0.025	0.025						
	(1.78)	(1.83)						
Index of marketization			0.053	0.051	0.061	0.052	0.045	0.035
			(2.53)*	(2.48)*	(2.67)**	(2.62)**	(2.19)*	(1.67)
Urbanization						-0.050		
						(1.16)		
Urbanization in starting year							-0.066	
							(1.35)	
Efficiency of investment	0.027	0.027	0.049	0.053	0.048	0.052	0.054	0.068
	(1.24)	(1.25)	(2.19)*	(2.37)*	(2.14)*	(2.32)*	(2.40)*	(2.30)*
Share of gov't consumption	-0.103	-0.101	-0.090	-0.089	-0.070	-0.084	-0.092	-0.128
	(1.84)	(1.86)	(1.70)	(1.73)	(1.31)	(1.65)	(1.81)	(2.42)*
Time trend	0.006				-0.060			
	(0.13)				(1.17)			
Constant	7.625	7.654	5.191	5.640	5.951	0.276	-1.285	7.158
	(2.30)*	(2.32)*	(1.65)	(1.84)	(1.94)	(0.05)	(0.21)	(2.36)*
Observations	580	580	580	580	580	580	580	580

Note: absolute value of z-test is in parentheses; * shows significance at 5% level, and **at 1% level.

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