

**Provincial Income Inequality in China:
Economic Reforms and Internal Migration**

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The consequences of various economic reforms and exploding inter-provincial migration on the per capita provincial income disparity in China after reforms are empirically explored. There existed absolute β -convergence in per capita provincial GDP only during early periods of reform, 78-90. However, in 90-95, per capita provincial GDP converged only conditionally on the fixed regional effects, non-state share of total investment and per capita foreign investments share of GDP and volume of international trade. While low-income agricultural provinces exhibited faster growth from rural reforms in early and mid 80s, coastal provinces were the main beneficiaries of open-door policy from mid-80s. The expansion of non-state sector promoted per capita GDP convergence within regions (coastal and interior) rather than between regions. The direction and magnitude of inter-provincial migration after reform were proven to be market-driven and the new patterns of Chinese internal migration functioned as an equalizing force to reduce the regional income disparity especially in the 90s as expected by the Neoclassical thesis.

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1. Introduction

Since late 1970s, Chinese central government adopted several economic reform in series to improve staggering economic growth in accordance with a significant changes in regional development policy.

Agricultural reform can be represented by household responsibility system (HRS) and raised procurement prices for agricultural products in the early reform period with the result of an increase in rural agricultural household income. [West and Wong(1995) and Sicular(1991)] Industrial reform, which resulted an increase in the size of non-state sector, has made township and village enterprises (TVEs) and private enterprises blossom in rural and urban cities in addition to the privatization of state-owned enterprises (SOEs). [Yao(1997) and Byrd and Lin(1990)] Foreign Trade and Investment Reform: Open-door policy allowed trade and foreign direct investment from foreign countries which would transfer foreign advanced technology. [Reynolds(1987) and Fan(1992a, 1992b)] Also gradual liberalization of internal migration resulted in exploding market-oriented internal migration from mid-80s in the opposing direction of plan-oriented migration before the reform. [Chan and Yang(1996), Fan(1996), Wong(1988)]

Under Mao's communist party the regional development strategy heavily relied on redistributive measures in an attempt to equalize regional economic development, emphasized extensive rather than intensive modes of economic growth. However, the new strategy after 1978 emphasizes regional comparative advantage, accepts regional disparities as inevitable, encourages foreign investment and international interaction, and seeks to foster technological innovation. (Uneven Development Strategy) China's post-Mao regional development strategy is clearly efficiency oriented. [Yang(1990)]

The consequences of economic reforms and changes in regional development policy discussed above on the per capita provincial income disparity in China have been discussed by various scholars. Many studies have been conducted to examine the patterns of changing regional disparity and their underlying causes. The main questions they tried to answer are, first, what was the trend of regional and provincial income inequality in China after reform? Second, how did each of the reform policies affect the trend of regional (provincial) income disparity in China after reform? Third, do the new patterns of Chinese internal migration function as an equalizing force to reduce the regional income disparity or do they contribute to increasing regional income disparity?

Most of previous researches are concentrated on the trend of provincial income dispersion (σ -convergence) and the estimation of structural equation of provincial growth (absolute and conditional β -convergence). They found that the dispersion of provincial per capita real GDP, measured by the standard deviation and/or coefficient of variation(COV) of per capita provincial GDP, started to steadily decreased after reform from 78 to 90, then the trend reverses in 90s. [Jian, Sachs and Warner(1996), Chen and Fleisher(1996)] Agricultural reform reduced rural-urban and inter-provincial income disparity in early 80s from the increased agricultural productivity and rural household income. [Jian, Sachs and Warner(1996)] By using coastal dummy variable, they showed that the open-door policy, which resulted an exploding foreign trade and investment, was strongly implemented from mid-80s and is accountable for the uneven regional growth; coastal regions with its superior endowment and locational advantage to trade with foreign countries has outperformed the interior regions significantly. [Jian, Sachs and Warner(1996), Chen and Fleisher(1996), Fan(1992)] There also has been some significant changes in the patterns(flow and magnitude) of internal migration after reform; from planned hukou migration to market-oriented non-hukou migration, from coast-inland flow to inland-coast flow, and from population deconcentrating migration(urban-rural) to population concentrating migration(rural-urban).[Chan and Yang(1996) and Fan(1996)]

However their efforts to answer the consequences of economic reform on per capita provincial income distribution can be improved. First, the previous researches on the trend of provincial income disparity measured by the standard deviation and/or COV of real per capita provincial GDP data is mostly done with nominal provincial per capita GDP depreciated by the provincial consumer price index, since province-specific GDP deflator were not available at the time of research. Now we have a set of provincial GDP deflator after 1978 newly published by the Chinese authority. Naughton(1997), in his preliminary research using province-specific GDP deflator, found that COV was quite steady during 80s and start to increase after 1991. Since it is possible to deflate GDP with province-specific GDP deflator, we hope to find more accurate estimation on the trend of provincial income inequality.¹ Second, agricultural share in provincial

¹ According to Naughton(1997), “ The retail price index covers goods sold to household, and is thus a kind of consumer price index (minus home-grown food consumed on the farm, plus some agricultural inputs). It has roughly the same weights (basket of goods) in all provinces, and thus differs significantly only to the extent that transport costs and rents differ. By contrast, the composition of GDP differs substantially across provinces, and the prices of different components of GDP has changed at very different speeds. In general, the price of agricultural commodities has increased much more rapidly than the price of industrial goods. That means that measuring in current prices over-

GDP, as an explanatory variable, which Jian, Sachs and Warner(1996) used to capture the effect of agricultural reform, is strongly correlated with another important explanatory variable of convergence, initial per capita provincial GDP. This would significantly bias estimated coefficient, And as they claim in the paper, if effect of the agricultural reform had become insignificant after mid-80s, the inclusion of agricultural share in provincial GDP is as an explanatory variable is less convincing way to search for the factors of growth in 85-95. Therefore, the construction and inclusion of structure variable, that captures inequalities in sectoral per worker income growth at provincial level, would be more appropriate. Third, coastal region in China is historically endowed with rich human capital and regarded as a light industry manufacturing base even before the reform, while inland region had been a base for heavy industry after 1949 to before the reform. The initial agricultural reform (HRS) in the late 70s itself significantly increased agricultural sector income and demand for the light industry goods nationwide. Therefore, without open door policy, the coastal region had a great potential in taking advantage of the ever increasing demand for the light industry goods. The use of coastal dummy as a proxy for open-door policy effect in the estimation of growth factors may mislead us to the exaggerated growth effect of open door policy. Therefore, foreign capital utilized and per capita volume of trade in provincial level can be regarded as an alternative to fixed regional effect (coastal dummy) in estimation. Forth, Chen and Fleisher(1996) actually estimated the structural equation of Chinese provincial growth between 78-93 and the research lacks periodic study for factors of provincial growth. The periodic research for the factors of growth looks important because the path of provincial income disparity trend is evidently different from early to late 80s to 90s. There had been significant environmental and institutional changes in 80's and 90's and the model just can not incorporate the changes without periodic studies. Also, their research is mostly on the coefficient estimation of steady-state factors of growth, physical and human capital growth rate and population growth rate, and initial per capita GDP. Therefore, further study is need for the impact of reform policies on the trend of provincial income disparity, since the steady-state factors of growth are not representing the effect of economic reform. Also non-state sector share of investment on fixed assets can be a measure of market-oriented reform and of the implementation of the reforms at provincial level. Finally, there has been no previous empirical analysis on the consequence of fiscal re-

states the relative growth of real agricultural output, and makes agricultural provinces, which are poorer, looks better. This is adequate, as stated, if we're only concerned about equity. But if we are concerned with processes of economic growth, it is completely misleading, confusing changes in relative prices with real growth."

form and exploding internal migration on the trend of provincial income disparity in China after reform.

In this paper, first, I will present empirical model of convergence estimation which can explain the impact of economic reforms to the trend of provincial income inequality. Second, I will discuss the nature of the independent variables which I used in the estimation and the result of estimation in the order of steady-state factors of growth, regional factors, foreign factors, non-state (collective and private) sector factors, and fiscal reform factors and new direction and magnitude of internal inter-provincial migration.

2. The Basic Empirical Model of Convergence Estimation²

Let's assume Cobb-Douglas production function of a province with labor-augmenting technological progress, as

$$Y_t = K_t^\alpha (A_t L_t)^{1-\alpha}$$

where Y is output, K is level of physical capital, L is labor and A is technological level. Also assume exogenous growth of labor and technology, as $L_t = L_0 e^{nt}$, $A_t = A_0 e^{xt}$, where $n(x)$ is growth rate of labor(technology).

Following Solow(1967) and Swan(1967), the assumption of identical steady-state provincial per capita GDP, the basic empirical specification of estimating average per worker income growth between period t and $t-T$ can be expressed as below

$$\frac{\ln(y_t/y_{t-T})}{T} = a - \frac{(1 - e^{-\beta T})}{T} \ln y_{t-T} + \text{other variables} + u \quad (1)$$

where y_t is per worker income at time t , and β is annual income convergence rate across province.³ And other variables, which are hypothesized to affect per capita production that may vary by province, will be explained later. Assuming technology growth and capital depreciation rate are constant across provinces, u becomes the province-specific shock. Also assuming that capital and labor growth rate are independent of u , we can estimate equation (1) with non-linear regression and expect that the estimate for the coefficient β would be positive if provincial per capita

² The basic empirical model of convergence estimation I adopted here are from Barro and Sala-i-Martin(1992).

³ See Barro and Sala-i-Martin(1992) for the derivation of above empirical specification.

income is converging.⁴ Also if an inclusion of a new explanatory variable make β smaller, then we can say that the new variable is pro-convergence, i.e. the policy represented by the new variable is promoting convergence, vice versa.

3. Empirical Estimation and Its Results

3.1 Absolute Convergence

First, I want to distinguish conditional from absolute convergence. According to Sala-i-Martin(1994), a set of economies displays conditional β -convergence if the partial correlation between growth and initial income is negative, i.e., the coefficient of initial income(β) in a cross-sectional regressions of growth on initial income holding constant a number of additional variable is positive. And if the coefficient of initial income (β) is positive in a univariate regression, the data set displays absolute convergence.

The estimation 1 in Table 1 shows the estimated β , annual income convergence rate across province, from the univariate nonlinear regression. The estimated absolute annual convergence rate had been steady from 78 to 90 with annual convergence rate between 2.5 and 2.6% and was statistically significant. However it became to almost zero in 90-95. The annual convergence rate of 2.5 to 2.4% in China during the early period of reform is quite higher than the rate before reform, especially during 70s.⁵ And the rate in 80s is in between the absolute annual convergence rate in Japan and US.⁶

The high annual convergence rate, in the early period of reform, may be due to the 2 major rural reforms in the early stages of economic reform; the shift of agricultural production from the commune system to the household responsibility system(HRS) and the establishment of in-

⁴ According to Mankiw, Romer and Weil(1992), Solow-Swan model does not predict cross-country per capita income convergence. Since cross-country per capita income can be traced to differing determinants of steady state in Solow model, the model predicts convergence only after controlling for the determinants of steady-state: conditional convergence. If there exists convergence conditional on one of the determinants of steady-state, it means that, if countries did not vary in the determinant, there could be a strong tendency for poor countries to grow faster than rich ones. However, in my paper, I assume that long-run physical and human capital growth rate and labor growth rate in the steady state are same for all provinces in China. I don't think this assumption is too strong, because the subject of my research is on cross-province income convergence. Capital, labor and technology can move more freely within country than they do across countries in the long run and the assumptions of identical preference of consumers and production technology can be more reasonable within a country.

⁵ In various researches, economists found that, after the Cultural Revolution, the decentralization of provincial level economic decision accompanied by self-reliance and self-sufficiency resulted in the increasing discrepancy in the regional and provincial income during 70s.

⁶ According to Barro and Sala-i-Martin(1992), Japan and US exhibited an annual absolute convergence rate of 2.8% and 1.7% for last 57 and 108 years.

dustrial and service enterprises outside of the central plan owned and operated by townships and villages(TVEs).

According to Jian, Sachs and Warner(1996), the two economic reforms had resulted a faster growth rates of less-developed agricultural provinces with one time spurt in agriculture productivity from the household responsibility system and the steadily growing TVEs which absorbed excess labors in rural areas. However, after mid-80s, the fact that the immediate effect of agricultural reform started to wear out, and the gradual opening of the Chinese economy, both for trade and foreign investment, are accountable to the faster growth of coastal and more industrialized provinces. But the empirical model and results of unconditional convergence estimation alone can not prove above argument statistically.

3.2 Conditional Convergence: Coastal Factors

Regional dummy variable captures the differences in the steady state of constant term in region i and $y_{e,i}^*$ (per capita income in steady state in region i) and also capture the fixed regional effects in the random term u_{it} . In this paper, I used coastal dummies for the proxy for differences in steady state values of per capita income between coastal and non-coastal regions and absorb fixed regional effect in the error term, u_{it} . When positive β with dummies is significantly larger than β without dummies, we can say that there is substantial within-region convergence.

Below are the empirical evidences from Estimation 2 in Table 1 and its implications

* *Empirical Finding*: The convergence rate with coastal dummy (β_c) in Table 1 is substantially higher than the absolute convergence rate (β).

⇒ *Implication*: There exists strong coastal effect on the provincial income convergence.

* *Empirical Finding*: The coefficient on coastal dummy variable is positive and statistically significant. And the coefficient itself and its statistical significance became very large in 90-95.

⇒ *Implication*: The income of coastal provinces had grown faster than that of interior provinces. And, the disparity of inter-regional (coastal and interior) income growth had become larger and clearer in 90s.

* *Empirical Finding*: The gap between β_c and β became larger in 90s.

\Rightarrow *Implication*: The decreasing annual provincial income convergence rate is due to the different income growth rate between coastal and non-coastal provinces. Convergence is more significant between provinces within regions (coastal and non-coastal) than between provinces in the overall economy.

Above tell us that coastal regions benefited more than non-coastal regions during reform period. And the further the reform policies were implemented, the more the coastal regions benefited. Figure 1 also confirms above results. However, empirically, we still don't know the nature of coastal effect. This empirically positive coastal effect may indirectly suggest that open-door policy provided coastal region an incentive to grow faster than the interior. However, the coastal effect may come from other sources, historically abundant skilled labor forces and infrastructures in coastal provinces, easy access to the exporting port and undeniably preferable foreign trade policies (formation of Special Economic Zones in coastal provinces), etc.

3.3 Aggregate Shocks on the Convergence

Another reason for the apparent instability of the convergence coefficients could be the existence of aggregate shock. The structural variable (S_{it}) indicates how much a state would grow if each of its sectors grew at the national average rate. The index is a weighted average of the national growth rates of each sector's output, where the weight is the initial shares in each sector, as below

$$S_{it} = \sum_{j=1}^3 \omega_{ij,t-T} \log(y_{jt} / y_{j,t-T}) / T$$

where $\omega_{ij,t-T}$ is the weight of sector j in province i 's GDP at time $t-T$, and y_{jt} is the national average of GDP per worker in sector j at time t . The sectors used in this paper are primary, secondary and service.⁷ We think of S_{it} as a proxy for common effects related to sectoral composition in the error term, u_{it} . It depends on the contemporaneous grow rates of national averages and on lagged values of own sectoral shares. If agricultural reform in early reform benefit the poor agricultural regions relatively more, 78-85 period in China would appear also as a high convergence period. Also if foreign trade and investment which start to explode during 85-95 had been advantageous to the rich industrialized coastal region relatively more, while agricultural reform ef-

⁷ Since the data of GDP composition in China had only 3 sectors in the source I can get for the time being, I had no choice to use those 3 sectors in the estimation.

fects had been dying out after mid-80s, 85-95 period in China would appear as a low convergence period.

After the inclusion of structural variable into the estimation (Estimation 3 in Table 1), I found,

* *Empirical Finding* : The convergence rate with structure variable is significantly lower than the convergence rate without structure variable in 78-85 and 90-95 and there is no difference in 85-90.

⇒ *Implication*: There exists structural shock, which jeopardize the stability of the convergence coefficient, and it had been one of the forces to accelerate the process of inter-provincial income convergence. The force had been quite strong in the early stage of reform when the agriculture reform had been implemented and in 90s when the manufacturing growth has been dominant. But it had been very weak in 85-90.

The aggregate shock possibly influencing sectoral composition and income of China after the economic reform are again

I. Agriculture shock in early reform period (78-85)

possible consequences: an increase in agriculture output and an increase in agriculture labor productivity and income in early reform associated with a massive release of agricultural excess labor (see Table 2, 3 and 5)

II. TVEs shock throughout the reform period (78-95)

possible consequences: job creation in rural area, absorption of rural excess labor and an increase in labor-intensive manufacturing output and rural income (see Table 2, 3 and 4)

III. Open-door policy in from mid-80s (85-95)

possible consequences: apart from the coastal effect, an increase in labor-intensive manufacturing output, an increase in labor in manufacturing and absorption of rural excess labor (see Table 2-5)

As I discussed earlier, the convergence during 78-85 is mainly from the agricultural reform and the establishment of TVEs (township and village enterprises) in the rural areas from the early phase of reform. The agricultural reform and TVEs made the rural per capita income increase and the provinces with higher agricultural share, which usually exhibits lower provincial per capita income, to grow faster.⁸ Then the reforms should have resulted a structural shock and

⁸ What specific effects do the coastal dummies and structural variables catches in the model?

it favored agricultural sector and rural population exclusively and gave an advantages to the provinces with higher agricultural share in provincial GDP to grow faster. The empirical result discussed confirms this.

Also it shows that the structural shock contributed to the reduction of provincial income difference in 85-90 and more in 90-95. This empirical result is somewhat disturbing because the increase in per capita income in secondary (manufacturing) sector had been dominant in the period 90-95 and it should have favored industrialized and richer coastal provinces to poor agricultural interior provinces. Also we can easily think that the sharp increase in per capita in manufacturing sector is strongly associated with open-door policy and coastal effect which was adverse to convergence, as discussed in previous section. Also, it is shown by Chen and Fleisher(1996) and Jian, Sachs and Warner(1996) that there has been strong discrepancy in intra-regional income convergence between coastal and interior region (divergence among interior provinces and convergence among coastal provinces) in the 90s and this discrepancy contributed the divergence in the distribution of per capita income across provinces. However, the empirical finding is contradicting above expectation.

Possible explanation for the aggregate convergence-promoting manufacturing shock may lie on the provincial level sectoral dynamics. Figure 2 tells us the story. At a first glance, it seems that there is negative relationship between agriculture share in GDP of region and regional income growth in 90-95. However, controlled for coastal effect, the agricultural region still grew faster in both coastal and interior regions. Also as we can see in Table 6, the manufacturing sector grew faster not in the more industrialized provinces but in the agricultural provinces. Therefore, the structural shock, which increased per worker income in manufacturing sector, was disproportionately beneficial to the agricultural and poorer provinces and accelerated the provincial income convergence in both of the coastal and interior regions. In the beginning of rural reform, while the Household Responsibility System increased the rural agricultural household income nationwide, the formation of TVEs was geographically slow. However, total TVE employment grew more rapidly in the interior than in the coastal region [Yao(1997)] in the later years, as we can see at Table 8. Therefore, this convergence-promoting manufacturing shock is probably from the increasing portion of rural industry and geographically expanding TVEs in the 90s. Com-

Maybe the coastal dummies can't catch the effect of agricultural reform, however it can tell us that the effect of agricultural reform was nation-wide because the β with coastal dummies is not much different from the β without dummies, if only if the structural variable capture the effect of TVEs.

pared to the 90s, in 85-90, the sharp increase in the agricultural productivity disappeared and the productivity of manufacturing sector was still stagnated, therefore we expect no significant impact of structural shock on the convergence rate.

3.4 Conditional Convergence: Foreign Direct Investment and Trade

The common belief on the fast growing coastal region is that the growth in coastal region is partly from the unproportional increase in foreign direct investment and trade compared to interior because coastal provinces have locational advantage in foreign trade and endowment advantage of quality labors. Therefore, the coastal provinces were the major beneficiary of open-door policy. To test above hypothesis, I constructed two variables, foreign investment index is to capture the foreign direct investment effect and foreign trade index is to capture foreign trade effect. The definition and derivation of the variables are explained in Appendix. Below are the empirical evidences from Estimation 4 and 5 in Table 1 and its implications

* *Empirical Finding* : The estimated coefficient of foreign capital and trade index is positive and became statistically more significant in 90-95.

⇒ *Implication*: Foreign investment and trade have positive effect on the growth of provincial per capita GDP and the effect has become more evident in 90-95.

* *Empirical Finding* : The difference in R-squared between the estimation of basic equation and the estimation with foreign factors became larger in 90-95 compared that in 85-90.

⇒ *Implication*: The degree of foreign factors in explaining provincial growth became larger.

* *Empirical Finding* : The R-squared of estimation are 0.46 and 0.43 in 85-90 and 0.24 and 0.18 in 90-95.

⇒ *Implication*: There exist unexplained factors of provincial growth other than foreign factors and it became to have more effect on growth in 90-95.

3.5 Conditional Convergence: Non-state Sector

Chinese enterprises are composed of three kinds of enterprises based on the ownership of the enterprises; state-owned enterprises(SOEs) [*gouying qiye*], community enterprises [*zhenban qiye*], and private enterprises [*minban qiye*]. Under community enterprises are township enterprises [*xiangban qiye*], village enterprises [*cunban qiye*], and production team enterprises [*shengchan duiban qiye*]. Private enterprises include all kinds of non-governmental enterprises:

cooperative firms, partnerships [*lianhu qiye*], and individual proprietorships [*getihu*, *geti qiye*, or *siying quie*], which may have 100 or more employees.⁹ The non-state enterprises in non-state sector I define in this paper consists of community enterprises and private enterprises. The non-state enterprises have relatively softer budget constraint than SOEs' for community enterprises and hard budget constraint for private enterprises and are getting less or no intermediate goods under plan prices, while there are competing each other including SOEs in the output and input market and their objective is more oriented toward profit maximization. Therefore, non-state enterprises are more efficient than SOEs and the share and number of non-state enterprises in aggregate production and share of total employment have been increased significantly after the reform, especially after mid-80s. The non-state enterprises were the main force in creating new jobs for rural excess labor forces and engines of growth in China in total output and employment and productivity. However, the output shares and growth rate of non-state sector are significantly differ province by province. Therefore, from the reasons I listed above, the size and growth rate of non-state sector could be another sources of provincial and regional income disparity in China after reform. The proxy for the size and growth rate of non-state sector I used in this paper is non-state sector share of total fixed investment in Chinese industry. And below are the empirical results in Table 9.(and its implications.

* *Empirical Finding* : The estimated convergence rate with inclusion of non-state fixed capital investment share is not much different to that with coastal dummy and structural variable only in 85-90 and is significantly smaller in 90-95.

⇒ *Implication*: The formation of non-state sector promote inter-provincial per capita GDP convergence only in the 90s.

* *Empirical Finding* : The coefficient for non-state fixed capital investment share is almost zero and statistically insignificant in 85-90. However, it became positive and statistically significant in 90-95. And the difference in R-squared between the estimation with non-state fixed capital investment share and the estimation with only coastal dummy and structural variable became larger in 90-95 compared to that in 85-90 and the difference in 90-95 is 0.23.

⇒ *Implication*: The effect of non-state fixed capital investment share on provincial GDP growth became more significant in 90-95 compared to that in 85-90 and non-state fixed capital investment share explains 23% of provincial growth in the 90s.

⁹ Byrd and Qingsong(1990)

According to the empirical findings, the formation of Chinese non-state sector and non-state enterprises had a very significant role in reducing provincial income difference. And the further the transition from plan to market progressed, the bigger its role on income convergence became. Li (1997) also support this argument as following,

The state sector, which possesses more than half of the assets in the industry, is less efficient than non-state-sector. And the losses of money-losing state-owned enterprises comprise about 2-4% of China's GNP. Therefore, failure to reform the state-owned enterprises can lower the growth rate significantly. If current relative growth rates of the state sector vs. the non-state sector continue, about 20 years later China will converge to a "standard" market economy. This scenario is based on the fact that in most market economies ("steady state"), state owned enterprises account for 5% to 15% of GNP and 10% to 20% of investment, while in China the corresponding figures are 30% to 40% and 55% to 65%, respectively in recent years.

Also actual growth rates are affected by endowment and structure factors, especially in the short-term. The shift of labor force from agricultural to industry can contribute greatly to growth in China. This is because about half or more of the labor force is still in agriculture, and the non-agriculture/agriculture labor productive ratio is between 4 and 5, which is unprecedentedly high. If a farmer becomes an industrial worker, his labor productivity becomes 4 to 5 times as high as before. Thus further development China's township and village enterprise is very important in this respect. The current relative growth rates of agriculture vs. Non-agriculture employment continue, then 30 years later, the agricultural labor share will shrink to about one third of the present share.

3.6 Convergence and Migration

3.6.1 Determinants of Inter-Provincial Migration

Household registration system and planned labor migration by the state were key factors in controlling the flow and magnitude of internal migration in China before reform. Before the economic reform, internal migration in China was low compared to the international counterpart and especially labor migration was strictly controlled by the central economic planning system.¹⁰ And household registration system, hukou, was the principal mechanism to control rural-urban migra-

¹⁰ Especially in inter-provincial migration. Most migration occur intra-provincially.

tion. Hukou system classifies all residents into urban and rural household. A formal permanent residential change from rural to urban would require the official conversion of registration status from “agricultural” to “non-agricultural”, which was strictly controlled by the state using a quota system.

The migration pattern changes quite dramatically after the economic reform in late 70s due to changes in three fields. First, the de facto privatization of agricultural land greatly stimulated the agricultural productivity, thus releasing huge number of “surplus” agricultural labor force, providing a strong push for out-migration.¹¹ Second, the rapid development of non-state sectors, mostly labor intensive, such as township and village enterprises, private business and foreign funded enterprises in coastal areas created great demand for unskilled labor, acting as the pull factor. Lastly the state relaxed its strict control over rural-urban migration by adopting series of new policies, thus permitting the push and pull factor to take into effect.¹²

Table 10 shows that there is a strong positive relationship between net-migration rate and provincial per capita income. The point estimate for the speed of migration is around 0.003 in 78-85 and 0.005 in 85-90 and 0.0059 in 90-95, which implies that other things equal, a 10% increase in a province’s per capita income raises net-in-migration (only) by enough to raise that province’s rate of population growth by 0.05% in 85-90 to 0.059% in 90-95 per year. Hence, even though the coefficient is strongly significant, it is quite small in magnitude. Compared to the result of Barro and Sala-i-Martin(1992), 0.05% to 0.059% are quite smaller than that of Japan and US, 0.27% for Japan and 0.26% for US.¹³ This number can tell us that Chinese central government still maintains Household Registration System which is still a strong constraint to the inter-provincial rural-urban migration of Chinese rural population, even though the coefficient of point estimate had been increased considerably. There is also another evidence of strong constraint to inter-provincial migration in China, if we look at the scattered diagram in Figure 3, there seems, during 85-95, no evidence of strong negative relationship between out-migration rate and log of provincial per capita income while there is a strong positive relationship between net-migration

¹¹ Taylor(1988)

¹² By mid-90s nearly a quarter of urban residents in China were recent migrants from other areas, often finding jobs as household help, temporary workers in factories and construction sites and day laborers. [Nee and Matthews(1996)]

¹³ Census data didn’t capture the true inter-provincial migration. Most migration are floating and is not captured by Census. Therefore, coefficient maybe underestimated.

rate and log of provincial per capita income.¹⁴ This tells us that, while the per capita provincial income is an important factor, which determines destination of migrants who once choose to move, the per capita provincial income of a source province does not influence the magnitude of out-migration from the province. This may be related to the restrictions on the internal migrations, which is still partly in effect in China.

The second explanatory variable in Table 10 is the percentage growth of non-agricultural sector share in GDP between the years. Since there has been a significant labor migration from agricultural sector to non-agricultural sector, I expected that the ability of job creation in non-agricultural sector of a province can positively affect the provincial net-migration rate. The coefficient of non-agricultural sector growth is negative in 78-85, almost zero in 85-90 and positive in 90-95. The reason for the negative relationship between net-migration rate and non-agricultural growth sector growth in 78-85 can be the fact that the degree of inter-provincial migration was substantially small during early period of reform and the migration composed of hukou and market-oriented migration.¹⁵ However, more study is needed to verify the claim. The third variable, coastal dummy, is to try to capture coastal effect. I expected the coefficient to be positive, but it is significantly negative in 85-95.

3.6.2 Inter-provincial Migration and Convergence

Estimation 2 in Table 11 shows us how the internal migration affected the annual convergence rate of provincial income. Neoclassical thesis tells us that market-driven labor migration accelerates regional income convergence by reallocating labor to more efficient sector. The empirical findings and its implications are below

* *Empirical Finding:* The estimated convergence rate with migration compared to the one without is almost same in 78-90 and is almost zero and significantly smaller. And while the estimated coefficient on migration is small and statistically insignificant in 78-90, the one in 90-95 is negative and large value and became statistically more significant.

⇒ *Implication:* While Chinese internal migration had no effect on the provincial income convergence throughout the early reform period, it became a significant force reduces annual provincial income inequality in 90s.

¹⁴ Another explanation for the out-migration pattern is that there is inverted-U shape relationship between migration and income. That is low-income household have low chance to move, because cost of migration is greater than benefit. Also, in China, remote provinces are usually low-income provinces.

¹⁵ From my data, I got migrants of 6.7 million in 78-85 compared to those of 33.3 and 33.2 million in 85- 90 and in 90-95.

Above empirical results are consistent with our expectation derived from previous subsection and Neoclassical thesis. In the early period, the forces behind inter-provincial migration are not from market incentives but mainly from redistributive plan objectives. Therefore, the internal migration was not equalizing provincial income. However, the relaxation of Household Registration System and new opportunity of better jobs in the faster growing and high-income provinces resulted in mass inter-provincial migration, which is following market forces and changed the direction of inter-provincial migration. Thus, the new direction and higher magnitude of inter-provincial migration following market system was one of the forces equalizing inter-provincial income.¹⁶

4. Conclusion and Future Perspectives

In this paper, I tried to find the consequences of economic reform and internal migration on the trend of provincial income inequality. There was a significant degree of σ -convergence in the distribution of provincial income in the 80s. However, the data shows that the provincial income start to diverge from the beginning of the 90s. From the non-linear regression, we found that , while agricultural reform represented by the household responsibility system was the main force of inter-provincial income convergence in the early period of economic reform(78-85), open-door policy which was strongly implemented from the mid-80s was adverse to the inter-regional convergence. However, another important rural reform, the TVEs, have had a different impact on the convergence in different stage of reform. Because the establishment of TVEs was not geographically distributed evenly across China in the early period of reform, concentrated at the more industrialized coastal provinces, formation of TVEs was adverse to the convergence of provincial income. However, it is not clear what kind of distributional consequences they had later years. The expansion of non-state sector promoted per capita GDP convergence within regions(coastal and interior) rather than between regions. The direction and magnitude of inter-provincial migration after reform were proven to be a market-driven and the new patterns of Chinese internal migration functioned as an equalizing force to reduce the regional income disparity especially in the 90s as expected by the Neoclassical thesis.

There is one major reform which I didn't discuss in this paper. That is decentralization reforms in planning and fiscal systems with a sequence fiscal policy of contract responsibility sys-

¹⁶ Another possible explanations for stronger and positive relationship between migration rate and convergence espe-

tem in 80s and tax-sharing system in 90s, which resulted in the decline of government's (central and provincial) share in the economy and decline of central government's share in total government resources (a decrease in redistributive planning and fiscal power of the central government). [Hofman(1993), West and Wong(1995) and Zhao and Zhang(1997)] The reform is very closely related with the uneven development policy I discussed in introduction and should have a significant impact on the regional income disparity. However, so far I could not find a good enough measure representing the changes in fiscal policy.

Also the future studies on the regional income disparity with the model I used in this paper can be extended to the spatial analysis of the growth diffusion between provinces. As I discussed in early sections, while Chinese central government hopes that the growth in the coastal region will diffuse into the rest of the country, the interior has registered a lower income growth rate relative to the coastal region after economic reform. But this should not obscure the fact that the interior provinces have also experienced rapid economic growth in the post-Mao period compared to the pre-reform period and world standard. Can we say that inter-provincial growth diffusion, which the Chinese central government hoped, has been occurred during reform period or not? And, the Chinese central government has encouraged inter-provincial cooperation through direct physical investment from the coast to the interior in order to speed up the interregional or inter-provincial transmission of economic development; inter-provincial diffusion of growth. Will the center succeed in this regard? Is there existing any sources of growth diffusion other than direct transfer of physical capital forced by the government, technology diffusion or transfer resulted from externality? Then, how the growth of neighboring provinces has affected growth of a province and what is channels of the inter-dependence if any?

To answer above questions, we need to develop a new model to test for the existence and nature of spatial correlation of provincial growth in China, which would give us possible evidence of growth diffusion between neighboring provinces and, if the spatial correlation exist, to find the channels of the spillovers between provinces.

Appendix I

Data Definitions and Sources

Variable	Series used
y_i (real GDP per capita)	Gross Domestic Product, <i>Guonei shengchan zongzhi</i> ; Overall Price Index (GDP deflator), Total population, Renkoushu
n (employment growth rate)	Total Employed Labor Force, <i>Shehui laodongzhe zongshu</i>
s_k (investment/GDP)	Total Accumulation of Fixed Assets, <i>Gu ding zi chan jilei zong'e</i> ; GDP, <i>Guonei shengchan zongzhi</i>
CD (Coastal Dummy)	$CD = 1$ if the province is in the coastal region or $= 0$ if not The coastal provinces in this paper are Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan
FDI (Foreign Direct Investment/GDP)	Total value of foreign capital utilized; Shiji liyong waizhe
$TRADE$ (Trade Volume/GDP)	Export plus Import
$PINV$ (Non-State Investment Share)	$PINV = (S_k - SOE_k) / S_k$ where S_k is Total Accumulation of Fixed Assets, SOE_k is Total Accumulations of Fixed Assets by State-owned Enterprises
m (Net-migration Rate)	1990-95: <i>The 1990 1% Population Survey of China</i> , State Statistical Bureau, Peking: China Statistical Publishing House, 1996 1985-90: <i>10% Sampling Tabulation on the 1990 Population Census of the People's Republic of China</i> , State Statistical Bureau, Peking: China Statistical Publishing House, 1991 1978-85: Annual implied net-migration rate is generate from regular vital statistics by comparing the actual provincial population totals and the expected ones based on the reported natural increase rates. $M_j = G_j - N_j$, where M_j is the size of net migration from all other provinces to province j , G_j is the total population increase in the province j and N_j is the natural population increase in the province j .

Appendix II

5. About Data

[1] Economic Data (GDP, Population, Price Index, Sectoral Output, Sectoral Labor Force, and Vital Statistics) of 3 Municipality and 27 Provinces and Independent Provinces

1978-89: *Chuan kuo ko sheng, tzu chih chu, chih hsia shih li shih tung chi tzu liao hui pien, 1949-1989 (Chinese Province, Independence Province, Municipality: Historical Statistics, 1949-1989)*/ Kuo chia tung chi chu tsung ho ssu pien.[Peking] : Chung-kuo tung chi chu pan she(China Statistical Publishing House), 1990.

1978-89: *Hsueh Tien-tung, Li Quing and Liu Shucheng, China's Provincial Statistics, 1949-1989*, Westview Press, Inc. (1993)

1990-95: *Chung-kuo tung chi nien chien(Statistical yearbook of China)*, Peking : Chung-kuo tung chi chu pan she(China Statistical Publishing House), various edition.

2. GDP deflator

1978-95: *Gaige Fang Shiqinian de Zhongguo Diqu Jingji [China Regional Economy: A Profile of 17 years of Reform and Opening-up]*. State Statistical Bureau, Beijing, Zhongguo Tongji (1996)

3. Migration Data

1990-95: *The 1990 1% Population Survey of China*, State Statistical Bureau, Peking: China Statistical Publishing House, 1996

1985-90: *10% Sampling Tabulation on the 1990 Population Census of the People's Republic of China*, State Statistical Bureau, Peking: China Statistical Publishing House, 1991

1978-85: Annual implied net-migration rate is generate from regular vital statistics by comparing the actual provincial population totals and the expected ones based on the reported natural increase rates. $M_j = G_j - N_j$, where M_j is the size of net migration from all other provinces to province j , G_j is the total population increase in the province j and N_j is the natural population increase in the province j .

Table 1. Convergence Estimation

Independent Variables	78-85	85-90	90-95
<u>Estimation 1 (Absolute Convergence)</u>			
Constant	0.217 (6.10)	0.178 (4.95)	0.084 (0.77)
Initial GDP	0.026 (3.57)	0.025 (4.04)	-0.003 (0.17)
R squared	0.36	0.41	0.001
<u>Estimation 2 (Coastal Effect)</u>			
Constant	0.259 (7.01)	0.218 (5.28)	0.376 (3.74)
Initial GDP	0.036 (4.31)	0.034 (4.29)	0.052 (2.53)
Coastal Dummy	0.018 (2.44)	0.012 (1.80)	0.068 (4.85)
R squared	0.48	0.47	0.48
<u>Estimation 3 (Coastal and Structural Effect)</u>			
Constant	0.213 (2.06)	0.213 (3.33)	0.369 (3.61)
Initial GDP	0.029 (1.91)	0.033 (4.00)	0.040 (1.40)
Coastal Dummy	0.017 (2.25)	0.012 (1.74)	0.066 (4.58)
Structural Variable	0.956 (0.48)	0.517 (0.14)	-1.715 (0.51)
R squared	0.49	0.47	0.48
<u>Estimation 4 (Foreign Capital Effect)</u>			
Constant		0.196 (3.18)	0.159 (1.55)
Initial GDP		0.031 (3.95)	0.024 (0.70)
Foreign Capital		0.308 (1.49)	0.441 (2.50)
Structural Variable		-1.666 (0.39)	2.429 (0.49)
R squared		0.46	0.24
<u>Estimation 5 (Foreign Trade Effect)</u>			
Constant		0.196 (2.79)	0.209 (1.77)
Initial GDP		0.031 (3.13)	0.004 (0.15)
Trade Index		0.001 (0.88)	0.001 (2.05)
Structural Variable		0.828 (0.21)	-3.081 (0.73)
R squared		0.43	0.18

Table 2. Real income per worker in each sector (in '78 Yuan)

	Primary ¹⁷	Secondary	Tertiary
1978	359	2470	1750
1985	634	2858	2020
1990	691	2975	2587
1995	875	5170	3157

Table 3. Growth of per worker real income in each sector¹⁸

	Primary	Secondary	Tertiary
Y(85/78)	1.77	1.16	1.15
Y(90/85)	1.09	1.04	1.28
Y(95/90)	1.27	1.74	1.22

Table 4. Composition of workforce (%)

	Primary	Secondary	Tertiary
1978	70.7	17.6	11.7
1985	62.5	21.1	16.4
1990	60.0	21.4	18.6
1995	52.9	22.9	24.1

Table 5. Composition of GDP by sector(%)

	Primary	Secondary	Tertiary
1978	28.4	48.6	23.0
1985	29.8	45.3	24.9
1990	27.0	41.6	31.3
1995	19.2	49.2	31.6

¹⁷ According to the Statistical Yearbook of China, industry in China comprises,
 Primary: agriculture(including farming, forestry, husbandry, sideline production and fishing)
 Secondary: industry(mining, manufacturing, water supply, electricity generation and supply, steam, hot water, gas)
 Tertiary: all other industries not included in primary or second industry.

¹⁸ $Y(t/t-T) = y_{j,t} / y_{j,t-T}$, where y_{jt} is income per worker in sector j at time t .

Table 6. Coefficients of Regressions for Non-agriculture sector growth across Chinese provinces

Period	Agriculture Share	Coastal Dummies	Adjusted R-squared
78-85	0.20 (1.92)	-----	0.14
	0.21 (2.77)	0.020 (1.03)	0.17
	0.22 (2.05)	0.019 (0.97)	0.14
85-90	0.24 (2.75)		0.21
	0.24 (3.86)	0.034 (2.43)	0.33
	0.28 (3.40)	0.033 (2.31)	0.32
90-95	0.54 (5.62)		0.55
	0.46 (5.05)	0.012 (0.65)	0.49
	0.56 (5.38)	0.007 (0.42)	0.53

Table 7. Rural GOV and TVE GOV by zone (yuan/per capita)

	Rural GOV (1)	TVE GOV (2)	Ratio (2)/(1)
1986			
Western ¹⁹	549	184	0.335
Central	776	309	0.398
Eastern	1216	661	0.544
China	902	479	0.469
1992			
Western	833	413	0.496
Central	1172	734	0.626
Eastern	2529	1798	0.711
China	1639	1068	0.663

Sources: Yao(1997) for 1986 and 1992, originally from Ministry of Agriculture, *Chinese Agricultural Statistical Materials*, 1987 and 1993.

(a) Due to the lack of continuous data, Tibet is excluded.

(b) All the values are measured at current prices.

(c) Rural GOV = rural gross output value, including the output values of agriculture and TVEs in the rural areas.
TVE GOV = TVE gross output value, including all the rural GOV except agricultural output value.

Table 8. Employment structure by economic zone in rural China (million people)

	Total Labor	TVEs Labor	TVEs/Total (Share)	1992/1986 (Ratio)
1986				
Western	93.76	11.70	0.125	--
Central	125.43	25.56	0.204	--
Eastern	159.77	42.07	0.263	--
China	378.96	79.33	0.209	--
1992				
Western	111.19	16.59	0.149	1.418
Central	146.35	34.78	0.238	1.361
Eastern	179.55	54.44	0.303	1.294
China	437.10	105.81	0.242	1.334

The ratio in column 5 measures the ratio of TVE employment in 1992 over 1986.

Source: Yao(1997)

¹⁹ The regional division of China follows the official definition of the economic development zones in the Seventh Five-Year Plan (1985-90), by classifying the provinces, regions and cities into three different zones: East, Central and West. The eastern zone includes the provinces and cities along east coast: Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Hainan and Guangxi. The central zone covers the provinces and autonomous regions of Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan. The western zone includes Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang.

Table 9. Non-State Capital Investment Effect

Independent Variables	85-90	90-95	85-95
<u>Estimation for Unconditional Convergence</u>			
Constant	0.178 (4.95)	0.084 (0.77)	0.145 (2.58)
Initial GDP	0.025 (4.04)	-0.003 (0.17)	0.014 (1.37)
R squared	0.41	0.001	0.07
<u>Coastal Effect</u>			
Constant	0.213 (3.33)	0.369 (3.61)	0.308 (5.79)
Initial GDP	0.033 (4.00)	0.040 (1.40)	0.026 (1.41)
Coastal Dummy	0.012 (1.74)	0.066 (4.58)	0.037 (4.57)
Structural Variable	0.517 (0.14)	-1.715 (0.51)	-5.447 (1.15)
R squared	0.47	0.48	0.56
<u>Coastal and Private Capital Effect</u>			
Constant	0.236 (2.82)	0.090 (0.88)	0.208 (3.34)
Initial GDP	0.036 (3.36)	-0.011 (0.53)	0.015 (0.94)
Coastal Dummy	0.013 (1.72)	0.022 (1.49)	0.025 (2.93)
Structural Variable	-0.007 (0.00)	-4.230 (1.60)	-4.360 (1.02)
Private Capital	-0.011 (0.44)	0.184 (4.29)	0.071 (2.59)
R squared	0.48	0.71	0.65
<u>Foreign Capital and Private Capital Effect</u>			
Constant	0.210 (2.62)	0.015 (0.21)	0.094 (1.77)
Initial GDP	0.030 (3.40)	-0.011 (0.58)	0.010 (0.57)
Foreign Capital	0.303 (1.42)	0.199(1.70)	0.259 (2.28)
Structural Variable	-1.417 (0.31)	-2.064 (0.65)	-1.003 (0.20)
Private Capital	0.005 (0.22)	0.209 (6.32)	0.112 (4.52)
R squared	0.46	0.71	0.61
<u>Foreign Trade and Private Capital Effect</u>			
Constant	0.189 (2.21)	0.028 (0.36)	0.165 (2.92)
Initial GDP	0.030 (2.63)	-0.020 (1.22)	0.007 (0.53)
Trade Index	0.001 (0.80)	0.001 (1.29)	0.001 (2.67)
Structural Variable	1.009 (0.24)	-4.645 (1.78)	-4.962 (1.14)
Private Capital	0.004 (0.17)	0.214 (6.42)	0.100 (4.07)
R squared	0.43	0.70	0.64

Table 10. Coefficients of Regressions for Net-migration Rate

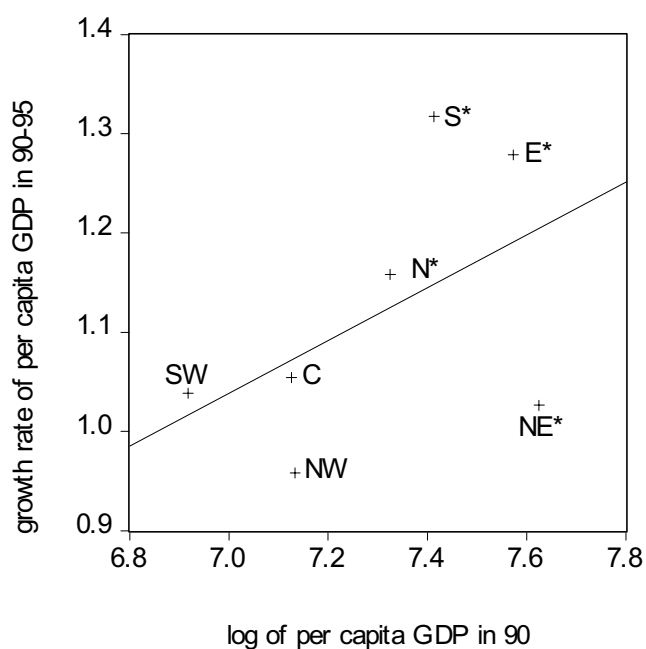
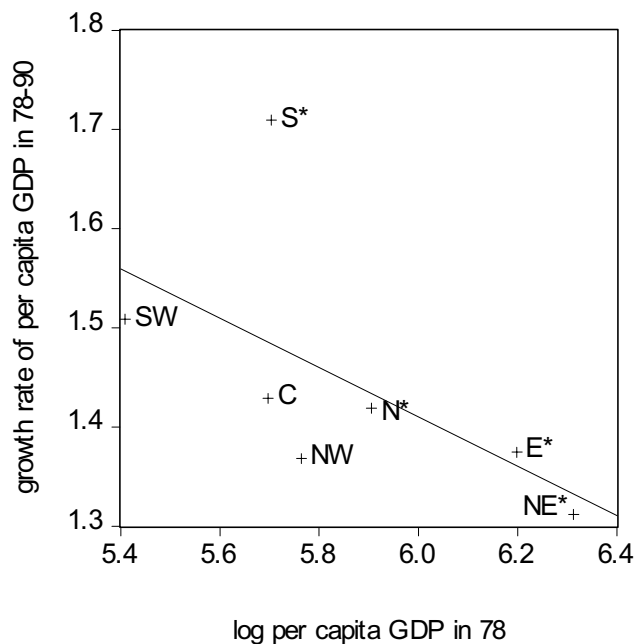
Period	Log of Initial Per Capita Real GDP	Growth of non-agriculture share	Coastal Dummy	Adjusted R-squared
78-85	0.003 (8.05)			0.62
	0.003 (6.41)	-0.006 (-1.20)		0.63
	0.003 (6.41)	-0.006 (-1.15)	-0.00006 (-0.11)	0.63
85-90	0.005 (8.05)			0.70
	0.005 (7.61)	0.001 (0.13)		0.68
	0.006 (6.96)	-0.006 (0.70)	-0.001 (-1.46)	0.63
90-95	0.0059 (7.55)			0.70
	0.006 (7.85)	0.006 (1.20)		0.70
	0.007 (7.57)	-0.006 (1.27)	-0.001 (-1.64)	0.72

Note: t-value in parentheses

Table 11. Migration and Convergence

Independent Variables	78-85	85-90	90-95
<u>Estimation 1</u>			
Constant	0.213 (2.06)	0.213 (3.33)	0.369 (3.61)
Initial GDP	0.029 (1.91)	0.033 (4.00)	0.040 (1.40)
Coastal Dummy	0.017 (2.25)	0.012 (1.74)	0.066 (4.58)
Structural Variable	0.956 (0.48)	0.517 (0.14)	-1.715 (0.51)
R squared	0.49	0.47	0.48
<u>Estimation 2 (Migration Effect)</u>			
Constant	0.216 (2.01)	0.203 (1.80)	0.214 (1.31)
Initial GDP	0.031 (1.79)	0.032 (2.05)	0.003 (0.07)
Coastal Dummy	0.017 (2.15)	0.011 (1.71)	0.066 (4.64)
Structural Variable	1.029 (0.50)	0.761 (0.17)	-3.796 (1.02)
Migration	0.453 (0.18)	-0.214 (0.11)	-4.074 (1.21)
R squared	0.49	0.47	0.51

Figure 1. Regional per capita Income and Growth Rate



The regional division in this figure are from Lardy(1980). Northeast(NE): Liaoning, Jilin, and Heilongjiang. North(N): Hebei, Shandong, Hunan, Shanxi, Inner Mongolia, Beijing and Tianjin. East(E): Jiangsu, Anhui, Zhejiang and Shanghai. Central(C): Hubei, Hunan and Jiangxi. South(S): Guangdong, Guangxi, Fujian and Hainan. Southwest(SW): Sichuan, Guizhou and Yunnan. Northwest(NW): Shanxi, Gansu, Qinghai, and Xinjiang

* indicates coastal regions: S, N, NE and E

Figure 2. Agricultural Share and Growth Rate

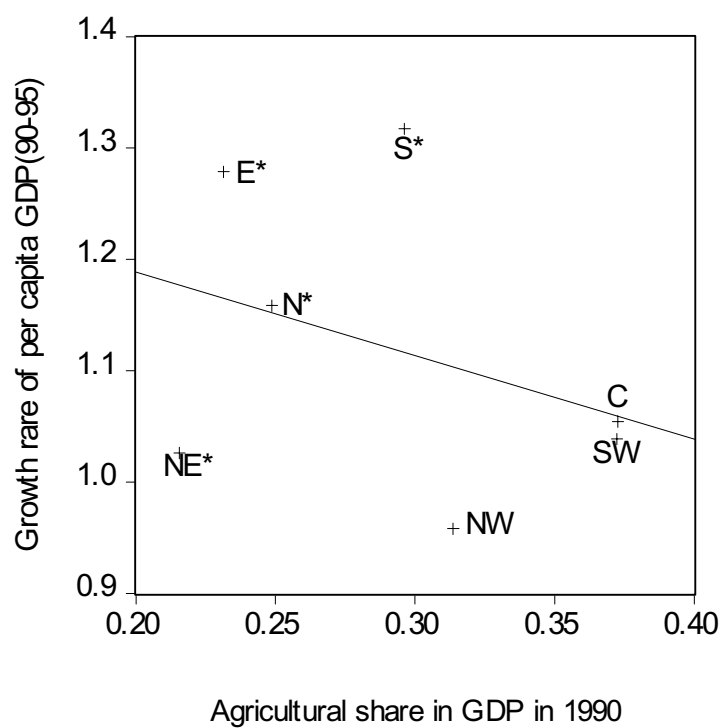
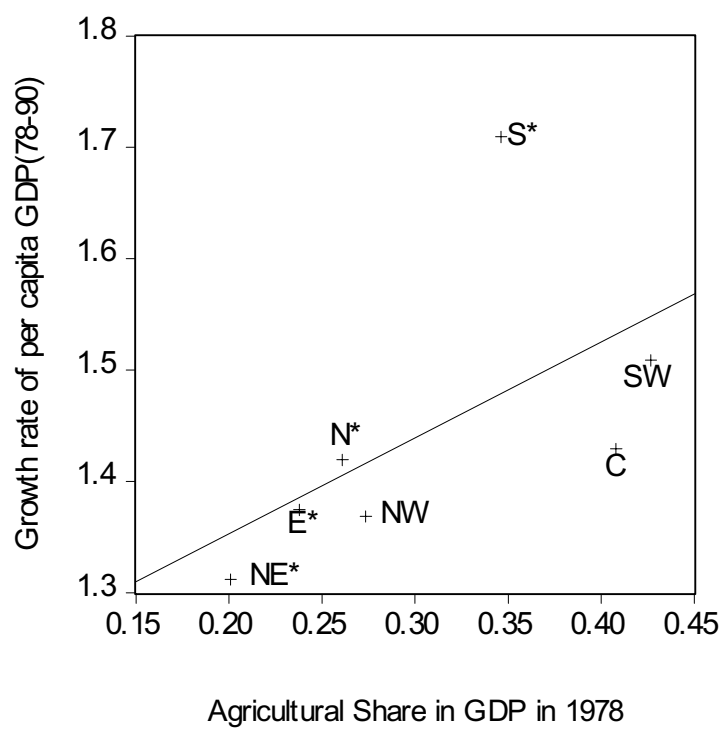
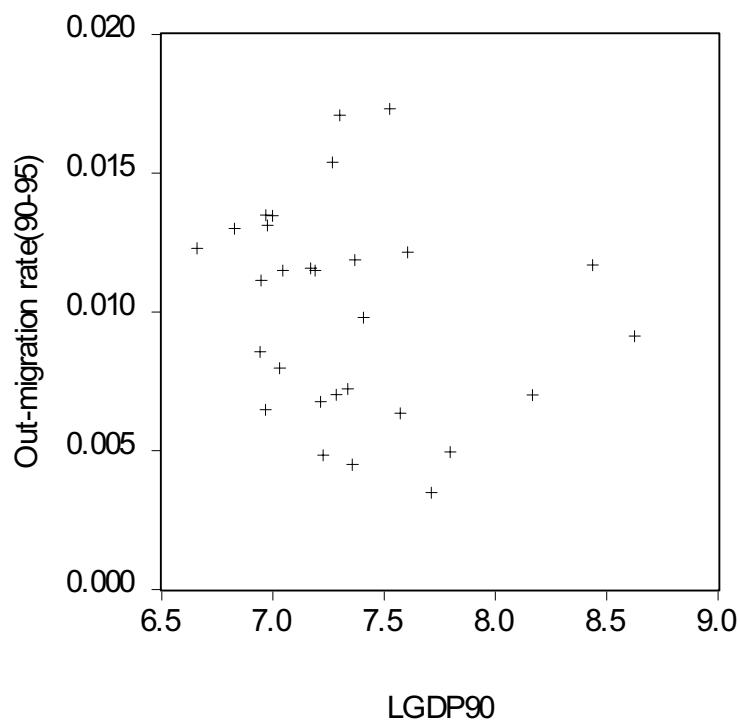
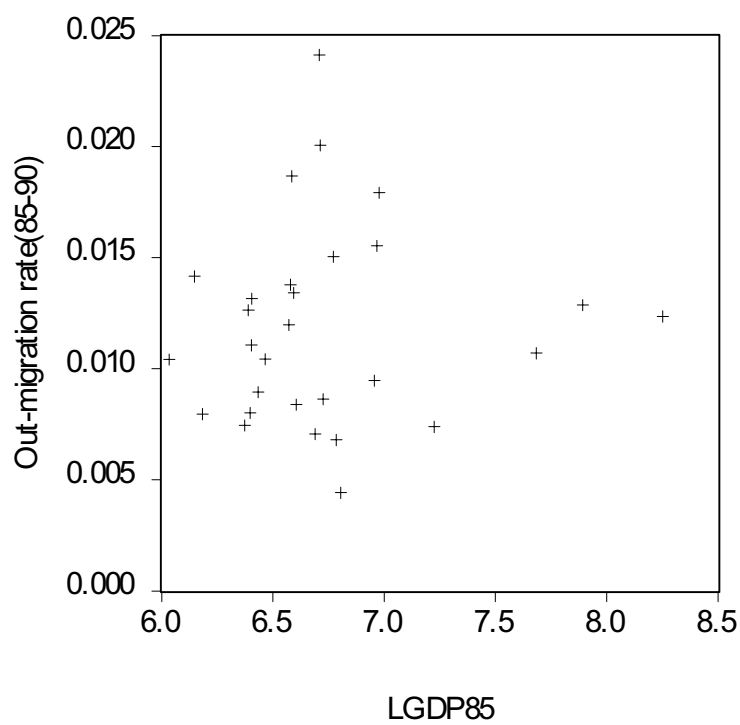


Figure 3. Out-migration Rate and Initial log per capita GDP



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