

7. EVOLUTION OF INTER-PROVINCIAL INEQUALITY IN CHINA, 1952-1996

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1. Introduction

The dramatic acceleration since 1978 of the annual per capita growth rate from 4.1% in 1953-78 to 8.4% in 1979-97 has gone together with large changes in the distribution of provincial per capita incomes. For example, in the descending order of GDP per capita, the southern province of Fujian and the Northern Province of Shandong rose from respectively rank 22 and 17 in 1980 to rank 11 and 9 in 1995. In contrast, the three north-eastern provinces, all relatively prosperous, slipped in ranking, as did all but one of five north-western provinces covering one of the two poorest regions of China (SSB 1996). The income gap between regions has also widened. While, relative to the national mean, the average per capita income of coastal provinces has risen from 131% in 1978 to 142% in 1996, that of interior provinces has dropped from 78% in 1978 to 71% in 1996.

These observations bring into relief the topical issue of the evolution of regional inequality and the aim of this paper is to chart this evolution and to analyse its proximate causes. The inter-provincial pattern of inequality in China has been studied by a number of authors (Donnithorne 1972, Lardy 1978, Lardy 1980, Lyons 1991, Tsui 1991, Tsui 1993, Sloan 1994, Chen and Fleisher 1996, Jian, Sachs and Warner 1996). Findings of these studies are mixed and do not present a coherent picture. Using fragmentary data available then, Lardy (1978 and 1980) found little or no evidence for a rise in inter-provincial income inequality between the late 1940s and mid-1970s. Lyons (1991) and Tsui (1991) find a moderate

decline in inequality during the reform period but a rise in inequality between the 1950s and the early 1980s. Sloan (1994) finds that rapid growth during the 1980s was not associated with rising inter-provincial inequality. Most of the recent studies find a moderate or to sharp decline in inter-provincial inequality over the reform period. At first sight, this seems to be inconsistent with common observation of a widening gap between the coastal and interior provinces. As we point out later both these observations are valid.

This paper goes beyond existing studies in two respects: one concerns data and the other method of analysis. First, all existing studies rely on incomplete and piecemeal data. Second, they confine themselves to analysing inequality amongst all provinces taken as one group, neglecting a likely possibility of differences in the pattern of evolution between groups of provinces, as casual observations and change in the ranking of provinces by per capita income strongly suggest. Moreover, most studies rely either on one inequality index or on growth regression, even though it is well established that conclusions concerning changes in inequality may vary with the index (Atkinson 1983) and that growth regressions may provide a misleading picture of changes in regional inequality (Quah 1996). Unlike most studies, this paper covers the evolution of inequality over the whole period from 1952 to the present. This enables us to identify the persistence and breaks in the pattern of regional evolution and how it has been affected by market-oriented reforms. This paper uses provincial time series published by the State Statistical Bureau of China in two volumes: *Historical Statistics by Provinces, Autonomous Regions and Cities under Jurisdiction of the Central Government (1949-1989)* and *China Regional Economy (1978-1995)*. The data in these two volumes cover 28 out of 30 provinces (increased to 31 in 1997); the two missing provinces are Tibet, for which data are often not reported, and Hainan, which became a province only in 1988. Other than a few, most of the existing studies have not exploited the data provided by these two volumes; and those which do confine themselves to either a sub-sample of 28 provinces or only a sub-period.

The regional pattern of growth and inequality in Chinese economy is of interest for two reasons. One is the two major transitions that the Chinese economy has undergone over the last four plus decades, first, to a socialist economy from the

1953 and then, from 1979, to a market economy. These transitions raise the issue of their implications for regional inequality. Second, the evolution of regional inequality in China is also of interest from the perspective of empirical studies of growth. This paper may also be regarded as a contribution to the large literature on regional evolution in various economies, such as the US, Japan and France to name a few (see Sala-i-Martin 1996). This specific issue we are concerned with can be stated in the form of the following three questions:

- What has been the pattern of evolution of inter-regional inequality amongst Chinese provinces from 1952 to 1996?
- Does the evolution pattern differ between the pre-reform period up to 1978 and the period since? Further, do provincial sub-groups exhibit different evolution patterns?
- Is there a link between provincial growth rates and provincial per capita incomes in the base period? Does the link vary over time and with regional groups?

This paper aims to answer the above three questions in terms of both inequality indexes and growth regressions which we treat as complements rather than as substitutes. While the former is concerned with the evolution of the distribution of provincial per capita income, the latter focuses on the relation between provincial per capita incomes in the base period and provincial growth rate. These are different issues and there is no definite link between them. Growth convergence, as identified by regressions, is compatible with varied patterns of evolution in inequality, a reduction in dispersion of a unimodal distribution or its transformation into a bimodal distribution with a polarisation between rich and poor provinces (Quah 1996).

Our units of analysis are provinces, the highest level of territorial government in China. Much of policy detail is decided at the provincial level or below and many of the principal reforms since 1979, such as the decollectivisation of agricultural land and the re-structuring of state enterprises, were first initiated by provinces (Naughton 1995). In terms of their populations, although not income,

many of Chinese provinces would be substantial size economies on their own. For example, the largest province Sichuan has a population of 114 million and 15 provinces have a population of over 40 million each (1996 figures). They also differ widely in the levels of development and economic structure. Four of them are cities with a small rural hinterland and a number of interior provinces are mainly rural with comparatively little industry. There is enough regional variation in China to make analysis of inter-provincial inequality comparable to that of national economies. Definition of regions in terms of provinces is just one possibility, other possible divisions include counties and cities (sub-provincial units) or supra-provincial groups such as coastal or interior provinces or 6 regions into which China is conventionally divided.

This paper is structured as follows. Section 2 presents a schematic outline of China's political and economic history since 1952 focusing on features directly relevant to structuring the analysis and the interpretation of results. Section 3 presents an overview of the pattern of regional income inequality from 1952 to 1996 in terms of five inequality indexes. Section 4 examines the pattern of evolution of inequality among sub-groups of provinces and then goes on to present a decomposition of inequality into within- and between group components to test the common impression of growing polarisation between the coastal and the interior provinces. Section 5 complements the analyses in terms of inequality indexes with regressions of provincial growth rates on provincial per capita incomes at an initial date. Section 6 concludes.

2. Background

Since its foundation in 1949, the People's Republic of China has gone through a series of cataclysmic political and economic changes. Though now regarded as an exemplar of cautious reforms, China has had a long and varied experience of shock therapy. Our account begins from 1952 and the period since then may be divided as shown in Table 1, which presents a schematic history divided into sub-periods which, by their very nature, have an element of arbitrariness, and simplify the complex historical process involving both change and continuity.

1953-57	Introduction of 1st 5-year plan on the Soviet model; push towards industrialisation with emphasis on heavy industry and large units; completion of land reform and the formation of rural cooperatives (precursors to the rural commune).
1958-62	The “Great Leap” consisting of the collectivisation of agriculture and rural industrialisation through heroic endeavour, devolution of economic decision making to lower government. From 1959 the Great Leap turned into the greatest famine ever, claiming tens of million lives.
1963-65	Period of stabilisation: rolling back excessive collectivism and the restoration of economic incentives in rural areas and a re-centralisation of economic administration.
1966-76	The period the Cultural Revolution alternating between revolutionary campaigns and relative calm, the replacement of economic incentives with moral incentives, emphasis on equality and another round of decentralisation.
1977-78	Changes in the political leadership and the second come-back of Deng Xiaoping.
1979-	The period of reforms: decollectivisation of farming and take-off of rural industry; opening of the economy to international trade and foreign direct investment; progressive erosion of output planning; proliferation of non-state enterprises; steady downward trend in the ratio of taxes to GNP and a rise in the share of provinces in government revenue.

Table 7.1: Schematic History

Two features stand out from this historical schema: first, abrupt changes in policy and attempts at a revolutionary transformation of economic organisation, and, second, it was the rural rather than the urban economy that was the focus of revolutionary transformations. Since 1952, China has seen only two relatively long periods of stability: the short period from 1953 to 1957 and the long period since 1978. The two decades of 1958-78 spanning the Great Leap Forward and the end of the Cultural Revolution were punctuated by abrupt changes in policy and in the top leadership. Thus from the perspective of long-term growth we are dealing with an economy which has been subject to massive “shocks” rather than one that has experienced a stable regime of institutions and policies.

The analysis here is conducted in terms of provincial income per head. Until recently, national income in China has been computed according to the “Net

Material Production Accounts” (NMPA) used in ex-communist economies rather than the usual Standard National Accounts (SNA). The main difference between the two is the exclusion of “non-material production” (services destined towards final consumption) from NMPA. Chinese national income series released after 1980 are scaled to take account of excluded activities. China has gradually shifted to SNA and the changeover was completed in 1993. GDP and GNP figures are only available for the period since 1978. To ensure consistency, we use national income rather than GDP figures. For years from 1993 to 1996 for which provincial income figures are not available, we have re-scaled available provincial GDP figures using the regression relationship between the two measures for earlier years. Provincial incomes are deflated by respective province-specific consumer price indexes.

3. Pattern of Inter-Provincial Income Inequality - 1952-96

This section presents a historical overview of the evolution of inter-provincial income inequality from 1952 to 1996. As Chinese provinces vary widely by population, provincial per capita incomes are weighted by the respective provincial share of the national population for the year in question. In all we have 28 provinces, omitting Tibet because of lack of data and subsuming Hainan island under Guangdong of which it was a part until 1988. The elevation of Chongqing city in Sichuan as a separate province in 1997 does not affect the analysis here as it extends up to 1996 only.

3.1. Measurement of Inequality

To chart the evolution of inequality we use several indexes because inferences concerning changes in inequality may depend crucially on the index that is used (Atkinson 1983). Moreover, a comparison of results yielded by different indexes provides additional information about the location of changes in the distribution of provincial per capita incomes. Our choice of inequality indexes is based on three axioms standard in literature on inequality (Cowell 1995), which adapted to the present context are:

- invariance to equiproportionate growth in provincial per capita income (scale invariance);
- invariance to equiproportionate growth in provincial population (population size invariance);
- normalised by the national mean, a rise in per capita income of a poor province and an equivalent decrease in that of a rich province without a reversal in their ranking should imply a reduction in inter-provincial inequality (the weak principle of transfers).

The two invariance axioms are the conditions for analysing inequality over time in a non-stationary environment. The third is the elementary property of an inequality index, and it rules out some of the widely used measures (Cowell 1998). One amongst them is the variance of log per capita incomes, which may fail to satisfy the condition at the right tail of the distribution (Atkinson 1983 and Sen 1997). This casts doubt on the findings of some of the recent studies of regional inequality in China that use variance of log provincial per capita income. Amongst the admissible inequality indexes, we use the Gini coefficient and the “generalised entropy class of measures” (GE class), the first because of its wide currency and the second because of their two useful features. First, for almost all admissible inequality indexes, one can find a member of the GE class that ranks distributions as being more or less equal in the same order as does the chosen inequality index (referred to as the replication property). The Gini coefficient is not amongst such indexes, but the Atkinson and the Theil indexes and the coefficient of variation are. Second, the indexes of the generalised entropy class lend themselves to a simple decomposition, which we need in Section 4 when analysing inequality within and between provincial groups. The generalised entropy class is defined as follows:

$$GE(\theta) = \frac{1}{\theta(1-\theta)} \sum_i \pi_{it} \left[1 - \left(\frac{x_{it}}{\mu_t} \right)^\theta \right] \quad (7.1)$$

with $i = (1, \dots, 28)$ and $t = (1952, \dots, 1996)$.

$\theta = 2$	$\frac{1}{2\mu^2} \sum_i \pi_i (x_i - \mu)^2$	The same as the Coefficient of Variation squared, except for the scale factor 1/2
$\theta = 1$	$\sum_i \pi_i \frac{x_i}{\mu} \ln \frac{x_i}{\mu}$	The Theil 1 index and equivalent to the Atkinson index with no inequality aversion
$\theta = 0$	$\sum_i \pi_i \ln \frac{\mu}{x_i}$	The Theil 2 index and equivalent to the Atkinson index with a moderate inequality aversion parameter of 1
$\theta = -1$	$\frac{1}{2} \sum_i \pi_i (1 - \frac{\mu}{x_i})$	Equivalent to the Atkinson index with a high inequality aversion parameter of 2
The GE indexes for $\theta = 0$ and $\theta = -1$ are obtained by taking the limit.		

Table 7.2: Replication of Inequality Measures by the GE Indexes

i indicates provinces and t the year, π denotes provincial population share, x provincial per capita income and μ the mean of provincial per capita incomes weighted by population shares (hereafter national per capita income). The problem that θ lacks an intuitive interpretation (Sen 1997) can be addressed by means of the replication property of GE indexes: that is, by selecting values of θ with reference to indexes which lend themselves to such an interpretation. Here, we select values of θ with reference to the coefficient of variation squared (σ^2/μ^2) and the Atkinson class of indexes for three values of the risk aversion parameter. The former is a common measure of dispersion that satisfies the above three conditions and its properties are well understood and θ in GE indexes is linked to the risk aversion parameter ε in the Atkinson indexes by the equation, $\varepsilon = 1 - \theta$, for $\varepsilon \geq 1$. The higher is ε the more sensitive is the Atkinson index, or its equivalent GE index, to a rise in the relative income of poorer provinces. The four GE indexes used here are (Anand 1983, Cowell 1998, Sen 1997).

3.2. Evolution of Inter-provincial Inequality

Figure 1 presents the time series of the above four GE indexes and the Gini coefficient, expressed as percentages. The notable feature is that all indexes show similar patterns of evolution of inter-provincial inequality between 1952

and 1996. But, they differ in the amplitude of fluctuations and the sharpness of trends, which suggest that movements in inequality may vary between provincial groups, a possibility that we discuss below. Up to 1978, fluctuations in all indexes mirror the cataclysms of politics and economics in the pre-reform period. Inter-provincial inequality surged upwards with the Great Leap Forward (1958-60) and the Cultural Revolution (1966-78). Both ended with a higher inequality than they began with. In a stark contrast, the reform period since 1979 exhibits no abrupt jumps in inequality, which is explicable in terms of the gradual nature of economic reforms. On the scale of dislocations and the speed of transformation, economic reforms have been far removed from the Great Leap Forward or the Cultural Revolution. Further, economic reforms have been cumulative and there has been no concerted attempt to call a halt to them and even less to reverse them. The salient features of the pattern in the two sub-periods may be summarised by two observations.

- *Observation 1:* The pre-reform period (1952-78) is dominated by abrupt fluctuations, which are particularly pronounced in the two revolutionary decades from 1958 to 1978. Except for four years between 1963 and 1967, downturns in inter-provincial inequality are short-lived and only partially reverse the previous upturn. As a result, inequality rises over the Cultural Revolutionary period (1968-78).
- *Observation 2:* Two features distinguish the period of economic reforms beginning from 1979: first, the complete disappearance of abrupt and pronounced fluctuations. The second is a steady downward trend in inter-provincial inequality that lasts for 12 years to 1991. Inequality has since risen but generally remains below the level in the 1970s.

These findings are surprising. The Cultural Revolutionary decade (1968-78) when interpersonal equality was emphasised above all witnessed a widening of inter-provincial inequality. In contrast, the reform period that has been characterised by rising inter-personal inequality both in rural and urban areas has, for the most part, seen a steady narrowing of inter-provincial inequality (on interpersonal inequality in the reform period see, Griffin and Zhao 1992). These

emphasise the absence of a logical connection between movements in interpersonal and in inter-provincial inequality and caution against generalisation from one to the other.

In explaining fluctuations and trends in inter-provincial inequality, the relevant factors are those that impinge not on individual households but on sizeable localities and differentially. Factors affecting the rural economy are of particular importance because over the period 1952 to 1996 the rural population constituted between 85 to 68% of the total (see SSB 1997b: 69). Two features of China's rural economy, which hold for the whole period 1952-96, are of special relevance. The first is a low per capita income in rural than in urban areas. The gap in favour of urban incomes, although variable across provinces and over time, has always been present. The second is a wide variation in the share of rural population across provinces. Taken together these two factors suggest a negative correlation between the share of rural population and provincial per capita incomes. As shown by a scatter plot of provincial per capita incomes and shares of rural population in Figure 2 for 1996, such a negative correlation is broadly present despite a large number of other intervening factors. Thus policies or events that uniformly increase rural relative to urban per capita incomes are akin to a transfer from richer to poorer province and should by the Dalton-Pigou principle reduce inter-provincial inequality. The reason is that these raise the per capita incomes (normalised by the national mean per capita income) of poorer provinces, with higher shares of rural population, relative to that of richer provinces with lower shares of rural population. The actual picture is complicated a differential impact of policies and events on rural per capita incomes.

The causal link between the revolutionary upheavals and the surges in inter-provincial inequality up to 1978, for the most part, runs through the rural economy. The urban-industrial economy was firmly set in its mould before the Great Leap and did not undergo a major change until the mid 1980s. The surge in inter-provincial inequality from 1958 that reached its peak in 1960 is explicable in terms of the joint impact on the rural economy of the upheavals of the Great Leap and the natural disasters in 1959-60, both of which varied in intensity across provinces (Yang 1996). The fall in inequality between 1962 and 1967 and the sub-

sequent rise in inequality, although opposed in direction, share the same causes in that the former was associated with the restoration of economic incentives and the latter with their attenuation, as we point out below. The parcelling out of collective-owned land to rural families that would be the centrepiece of the rural reforms from 1979 was first tried in 1961 and 1962.

The above reasoning applies in reverse to the upturn in inter-provincial inequality in 1968 which, bar short-term fluctuations, persists until 1978 (Figure 1). The sharp rise in 1968-69 is explicable in terms of the upheavals of the acute phase of the Cultural Revolution that varied across provinces. The interesting feature is that, following the restoration of calm in 1970, inequality falls but only to a level still substantially higher than that in 1967, prior to the upturn. Broadly, the explanation of rising inequality in the 1970s consists in the debilitating impact on rural incomes of the shift away from economic to moral incentives and from households to collective organisations over the period. Turning to the discrepancy between widening inter-provincial inequality and the emphasis on equality in the Cultural Revolution period, the remit of egalitarianism was confined to two fields that bore no direct relation to inter-provincial inequality. The first was the government pay and wage scale, which applied only to the urban population constituting no more than 24% of the labour force over the period (see SSB 1997b: 9). And the second was the pattern of distribution of the net income of the lowest of the three tiers of the rural communes, usually consisting of 30 or 40 households (Putterman 1993). The aversion to inequality, while high at the lowest tier, diminished progressively at the next two tiers and non-existent beyond that. There was no mechanism for reducing inequality across rural communes. As a result, while inequalities in and between cities were low, they could be large between rural communes even in close vicinity. The perception of the 1970s China as an egalitarian economy rested on observations confined to cities and communes and suffered from blindness to glaring and as it turns out widening inter-provincial inequalities.

In the period since 1979, all five indexes in Figure 1 show a fairly steady downward trend between 1978 and 1991, but the sharpness of the downward trend varies with the index. Despite the rise since 1991, inequality in the 1990s

is substantially lower than in the 1970s according to three out of five indexes (Figure 1). The exceptions are the Gini coefficient and the GE(-1) indexes, which show a higher inequality between 1994 and 1996 than in the years around the start of the reform process. The fact that inequality began falling coinciding with the first instalment of reforms suggests a causal link. Two components of the first instalment would seem to be important as causal factors: first, the decollectivisation of farming and second, impetus they provided to the growth of rural industry, which dated back to the pre-reform period. The first was a stronger version of the reforms in 1961-62, which too were associated with a falling inter-provincial inequality. The causal link between the two operated through a narrowing of the gap between the urban and rural per capita income. But the decollectivisation of farming alone cannot explain the persistence of trend beyond the mid 1980s because by then it was fully implemented and its impact on the acceleration of agricultural growth seems to have petered out (see SSB 1997c). Here the growth of rural industry that accelerated sharply from the mid 1980s becomes relevant, and its two features are of particular importance. First, involving a transfer of labour from agriculture with lower incomes to non-farming activities with higher incomes, it implies a rise in per capita income in rural areas. Second, which sheds light on movements in inter-provincial inequality, the growth of rural industry rather than being widely spread has been heavily skewed towards some of the coastal provinces (Naughton 1995). In particular, these include Hebei, Shandong, Jiangsu, Zhejiang and Guangdong, provinces with large rural populations and which in 1996 accounted for around 53% of value added by rural industry (SSB 1997a).

Turning finally to the rise in inter-provincial inequality since 1990, the most important development over the period is the massive growth in foreign direct investment, as well as continued growth of rural industry. Around 81% of the cumulative FDI inflow between 1979 and 1995 was in last 6 years. Of the total flow between 1990 and 1995, 42% flowed to just two southern provinces of Fujian and Guangdong and a further 31% to 4 coastal provinces in East China (Hussain 1998). Most of these have also been in the forefront of the growth of rural industry. An idea of the joint impact of growth of rural industries and of FDI on inter-provincial inequality is provided by two coastal provinces. One is Shandong,

with the current population of 90 million and in the forefront of the development of rural industry. It rose from Rank 17 in the descending order of per capita GDP in 1980 to Rank 9 in 1996 (see SSB 1996, SSB 1997a). Fujian, with a population of 33 million and a favoured destination for FDI, is the other, which over the same period rose from Rank 22 to Rank 7. What these polar examples suggest is a substantial churning in the distribution of provincial per capita incomes which, in principle, can account for both a narrowing of inter-provincial inequality between 1979 and 1990 and followed by a rise (Figure 1). As we point out later, a major cause of the rise in inequality in the 1990s is the sharpening of polarisation between coastal and interior provinces.

4. Inequality Among Groups of Provinces

Of the number of ways of grouping provinces, one is the binary division between richer and poorer provinces. Such a grouping, although suggestive, suffers from the problem of changing membership, a problem inherent in any division with reference to income. To make a valid comparison over time it is necessary to have a grouping that remains unchanged and also has some significance in terms of possible causes of changes in inter-provincial inequality such as history (initial conditions) and economic policy. Taking the period since 1979 as the focus, we chose a grouping with reference to the differential impact of reforms. One grouping that meets these requirements is the division between coastal and interior provinces. Historically, coastal provinces were the sites of China's economic and social engagement with the international economy. They contained the treaty ports and most of modern industry established before 1949. Over the central planning period (1952-78), much of investment went to industrial centres in coastal provinces. Further, some coastal provinces, such as Jiangsu, took the lead in developing rural industry in the 1970s which in the 1980s would play a central role in reducing the hold of the state industrial sector. Since 1979, coastal provinces have served as test-beds of reforms before their generalisation to the whole country. Examples include the establishment of 4 special economic zones in the Southern provinces of Fujian and Guangdong in the early 1980s, with special concessions to make them attractive to foreign direct investment (FDI). Similar concessions were extended to 14 coastal cities in the mid 1980s. It was not until

the 1990s that the focus of government shifted to interior provinces. The importance of special economic zones and open coastal cities extends beyond FDI and foreign trade in that they also acted as catalysts of reform in the provinces in which they were located. However, coastal provinces were far from homogenous in 1979, when the reforms started. Then the group included both provinces already highly industrialised and those with large populations and heavily dependent on farming.

4.1. *Coastal and Interior Provinces*

Here coastal provinces include the following 10: Beijing, Tianjin, Shanghai, Liaoning, Hebei, Shandong, Shanghai, Jiangsu, Zhejiang, Fujian and Guangdong. The first three are city provinces, and included in the rest are some of most populous province. The category is not completely geographical: Beijing is not on the coast, but, being the capital, it has benefited from preferential treatment similar to those accorded to the coastal provinces. Guangxi in the Southeast is omitted because it was not selected for accelerated reforms. However, its inclusion does not change the results. The above 10 “coastal provinces”, accounting for around 37% of the population and 54% of GDP (1996 figures), have a much higher capita income as a group than do the 18 “interior provinces”. Figure 3 presents the evolution of inequality in coastal and in interior provinces in terms of the four GE indexes only. The Gini coefficient is omitted because its non-decomposability makes it impossible to relate movements in coastal and in interior provinces to movements in the whole sample (Anand 1983; Cowell 1998). The pattern of evolution of inequality as presented by Figure 3 can be summarised by the following observations.

- *Observation 3:* Taking the whole period 1952-96, all four GE indexes present a marked contrast between pronounced movements in inequality among the coastal provinces and subdued changes among the interior provinces. This suggests that it is the changes in relative incomes of the coastal provinces that have been the driving force in the evolution in inter-provincial inequality for the whole sample (Figure 1).

- *Observation 4:* Focusing on the reform period, a comparison of Figures 1 and 2 makes it clear that the decline in inter-provincial income inequality between 1979 and 1990 in the whole sample (Figure 1) is largely driven by falling inequality among the coastal provinces (Figure 3). In contrast, there appears to be little movement in inequality among the interior provinces. As a result, inequality among coastal provinces, which was substantially higher throughout the pre-reform period (1952-78), by the 1990s converges to the level among interior provinces.
- *Observation 5:* The rise in inter-provincial income inequality since 1990 is much more pronounced for the whole sample (Figure 1) than for the sub-samples of coastal and interior provinces (Figure 3). This suggests the hypothesis that the rise in inequality in the whole sample is driven more by inter-group than by intra-group inequality, an issue which we discuss below.

On balance, economic reforms have spurred growth amongst the comparatively low-income coastal provinces but not among their counterparts in the interior. The coastal provinces with an above-average growth rate in the group happen to be populous and those which in 1978 had a comparatively high share of agriculture in GDP and, being less industrialised, had comparatively little state-owned industry. These include Guangdong, Fujian, Zhejiang, Jiangsu and Shandong, provinces where non-state enterprises, particular rural enterprises, have grown very rapidly. The first two have also attracted the lion's share of FDI, which in the 1990s grew rapidly. In contrast, the coastal provinces with below-average growth rate in the group include the three city provinces (Beijing, Tianjin and Shanghai) and Liaoning in the Northeast. The last has been the centre of heavy industry dominated by state enterprises, which has slipped from Rank 4 in 1980 to Rank 8 in 1996 in GDP per capita (SSB 1996; SSB 1997a).

4.2. *In- and Inter-Group Inequality*

Turning now to a decomposition of inter-provincial inequality into 'within-' and 'between-group' components, the first refers to the value of chosen inequality indexes when groups are treated as unrelated units, which is what Figure 3 presents.

The latter is defined as the value of inequality index when all within group differences are suppressed, that is, coastal and interior provinces are each treated as a giant province. Though all GE indexes are decomposable, we restrict ourselves to GE(0) or the Theil 2 inequality index which is sensitive to changes at low incomes and lends itself to a simple decomposition. Its “within group” component is the average of GE(0) indexes for the coastal and provinces weighted by their respective population shares. Its “between group” component is the GE (0) index of the two-member group consisting of the coastal and the interior provinces each taken as one unit and weighted by their respective population share. Of all the GE indexes, GE(0) is the only one for which weights are equal to population shares and sum to 1 (Anand 1983, Sen 1997).

$$GE(0) = \pi_c(GE(0),c) + \pi_i(GE(0),i) + (GE(0),c\&i) \quad (7.2)$$

π , as before denotes population share, letters c and i coastal and interior provinces respectively. The first two terms are the GE(0) indexes for the two groups weighted by their respective population shares and the last is the “between-groups” component. Figure 4 presents the percentage decomposition of the total inter-provincial inequality into the three components. The pattern can be described by following observations.

- *Observation 6:* The pattern of composition of inequality by sources has undergone a complete reversal over time. The share of “in-group inequality” among coastal provinces has turned from being the larger by a wide margin to being the smaller. Conversely, the share of the “between-group” component has risen steadily to well over 50%. In contrast, the share of the “in-group” inequality among interior provinces shows little change other than fluctuations within a narrow band.
- *Observation 7:* There is evidence of growing polarisation between the coastal and interior provinces in the sense that the between-group component has come to dominate the in-group components.

These observations corroborate the common perception of the geographical

	GE(1)	Gini Coefficient
China	8.19	21.54
US	1.23	8.52
Japan	1.98	10.12
India	5.39	18.51

Data for the US and Japan are from Barro and Sala-i-Martin (1995) and that for India are from *Economic Survey of India* 1993.

Table 7.3: Regional Income Inequality, 1990

polarisation of China into the rich coast and the poor hinterland. But two qualifications are necessary. First, the trend towards polarisation in the sense of a steady rise in the between-group component predates economic reforms by 10 years, though it seems to have accelerated in the 1990s. Second, the polarisation has proceeded in tandem with a steep fall in the share of in-group inequality among coastal provinces, and does not necessarily imply a rise in inter-provincial inequality (Figure 1). On the contrary, the GE(0) index over the reform period from 1979, including the 1990s, has generally been lower than the level in the 1970s.

4.3. *Inter-provincial Inequality in an International Perspective*

Finally, how does inter-provincial inequality in China compare with inter-regional inequality in developed and developing economies? Table 3 presents as percentages the Gini coefficient and GE(1) (the Theil 1 index) for Chinese provinces, US states, Japanese prefectures Indian states for 1990. Income in the first three cases is real per capita regional income, but nominal per capita income in the case of Indian states. In all cases regional incomes are weighted by regional population share. Broadly, both indexes present the same picture. Regional inequality in China is not only far greater than that in the US and Japan but also higher than that in India.

Higher regional inequality in China than in Japan and the US fits in with the general pattern of higher regional inequality in developing than in developed economies. The pattern lends itself an explanation in terms of greater factor mobility, trade (both internal and international) and fiscal transfers in the latter than in the former. Due to administrative control on migration, labour mobility

in China has generally been lower than in not only developed but also in many developing economies, though this has began to change in recent years. Given the dominant role of sub-central governments in investment decisions, the same broadly holds for capital mobility. Fiscal transfers geared to reducing regional inequalities, not just to relieving extreme poverty, have had a limited purchase in China.

5. Regression Analysis of Regional Growth

The regression analysis of provincial growth in this section is a supplement to the analysis of inter-provincial inequality in terms of inequality indexes. To that end it seeks to answer two questions. First, depending on the time period and provincial grouping, whether or not poorer provinces grew faster than richer provinces? The second is, in case they did, what was the speed of convergence? In view of the discussion in Sections 3 and 4, the answer to the first question is likely to depend on the time period and the grouping of provinces. The second question is intended to provide a basis for assessing whether the reduction in inter-provincial inequality witnessed in the reform period is fast or slow relative to that in other economies. Our starting point is the recent literature on empirical analyses of growth and convergence reviewed in Barro (1997) and Barro and Sala-i-Martin (1995). Derived from the fundamental equation of the neoclassical growth model, a typical cross-country study of economic growth is based on an equation nested in the following general specification:

$$\frac{(\ln Y_{iT} - \ln Y_{i0})}{T} = \alpha_i + \beta \ln Y_{i0} + \lambda Z_i + \varepsilon_i \quad (7.3)$$

Y denotes provincial per capita income, i provinces (1,...,28), t years (1952,.. 1996), 0 and T the end and the beginning of the period and α_i the province-specific effects depending on the subscript. The term on the left hand of the equation is simply the average annual growth rate over period T. Z is a column vector of determinants of provincial economic growth, such as the investment ratio, and ε_{it} is the error term.

The interpretation of Equation 3 depends on the coefficient β on Y_{i0} . A significant negative β is taken to be the evidence in favour of convergence, the meaning of which depends on the specification of the equation. Literature distinguishes between two types of convergence: absolute and conditional. Absolute convergence rests on the assumption that units of analysis (here provinces) are identical in their intrinsic characteristics except in their capital intensities. Given the assumption of diminishing return to capital and also a constant savings rate, this implies that poorer units tend to grow faster than rich provinces, and thus inter-unit inequality is a transient state, which may, nevertheless, persist for a long time. In tests for absolute convergence the coefficients vector λ is set to 0 and the country-specific effect α_i is omitted. Conditional convergence starts with the observation that units vary in respects that may have an effect on their steady state per capita incomes, such as the propensity to save, human capital, access to technology and government policy. Thus per capita incomes tend to converge only to their respective state levels, not to each other. In empirical analyses of growth, differences in steady-state level are indirectly specified by variables Z_i which usually include investment in physical and human capital, indicators of the quality and size of government and indicators of external openness (Barro 1997). Variables that can be included in Z_{it} are potentially large but all are susceptible to the endogeneity bias. As pointed out by Quah (1996), convergence in a conditional sense has no definite implications about the future evolution of between-unit inequality. It is, in principle, compatible with even an increasing inequality. Given the focus on inter-provincial inequality, the discussion here is restricted to absolute convergence: that is, the relation between the provincial growth rates over various periods and their relation to provincial per capita incomes in the initial period. However, we do not assume that Chinese provinces are the same except for capital intensity. They are, as indicated in the previous sections, very different in their economic structure. We fit the following equation and regard it as no more than a device for a summary presentation of provincial data on per capita incomes and growth rates:

$$\frac{(\ln Y_{iT} - \ln Y_{i0})}{T} = \alpha_i + \beta \ln Y_{i0} + \varepsilon_i \quad (7.4)$$

	1952-96	1952-78	1978-96
Constant	0.0132 (0.872)	0.0388 (2.152)	0.0012 (0.055)
Initial income	-0.0080 (-2.393)	0.0001 (0.036)	-0.0185 (-3.014)
Adjusted R ²	0.1490	-0.0384	0.2304
Implied speed of convergence (%)	0.98		2.22
Half-life (year)	62.5		27.0

Table 7.4: Regression on the Initial Income Level (All Provinces)

Given the estimate of b the speed of convergence b is given by the formula:

$$\beta = \frac{(1 - e^{-bT})}{T} \quad (7.5)$$

T is the length of the period (1952-96 or its sub-period) for which the equation is estimated. The half-life, the number of years (t) needed to close half of the gap between current per income and the steady state per capita income, here characterised by an absence of inter-provincial inequality, is given by $e^{-bt} = \frac{1}{2}$. Equation 5 is open to the objection that as Y_{it} appears with a negative sign on the left hand side and with a positive sign on the right hand side of the equation, a measurement error is likely to yield a negative β regardless of the actual relation between Y_{i0} and the growth rate. The objection can be handled through the use of instruments but at the cost of a loss in the efficiency of estimate. Further, it does not carry much force in the present context because we cross check the results of the regression analysis against the pattern of evolution of inequality as revealed by inequality indexes and density distributions.

Table 4 reports three sets of results for the regression of average annual growth rate on the initial income level: first for the whole period from 1952 to 1996, and then separately for the pre-reform (1952-78) and the reform (1978-96) sub-periods.

For the whole period from 1952 to 1996, the coefficient on the initial income level is negative (albeit very small) and significant at the 1% level, suggesting that poorer provinces grew faster than richer provinces. At the implied speed of convergence it would take 62.5 years to close half of the gap between the current and the steady-state per capita income, by assumption the same for all

	1952-96	1952-78	1978-96
Constant	-0.0102 (-0.866)	0.0615 (4.335)	-0.0510 (-2.883)
Initial income	-0.0155 (-5.606)	0.0044 (1.303)	-0.0402 (-7.179)
Adjusted R2	0.7717	0.0720	0.8488
Implied speed of convergence (%)	2.55		6.77
Half-life (year)	32.3		12.4

Table 7.5: Regression on the Initial Income Level (Coastal Provinces)

provinces. The comparable figure are 37 years ($b=0.019$) for 47 prefectures of Japan; 33 years ($b=0.021$) for 48 states of the US and 43 years ($b=0.016$) for 21 departments of France (see Sala-i-Martin 1996). The regression results for the two sub-periods tell a different story: there was convergence only in the reform period but not in the pre-reform period. This fits in with the findings in Sections 3 and 4, which shows no perceptible trend towards a reduction in inter-provincial inequality except for a brief period in the 1960s (see Figure 1). The speed of convergence gives the half-life of 27 years. This is significantly shorter than the half lives for Japanese prefectures, US states and the French departments cited above. Thus the reduction of inequality observed in the reform period is extraordinarily fast by international standards.

5.1. Coastal and Interior Provinces

Given that the pattern of evolution inequality has been different between coastal and interior provinces, we repeat the regression exercise for these groups separately. The results are reported in Tables 5 and 7. Table 5 shows that there was no convergence among the coastal provinces in the pre-reform period, a result which fits in with Figure 3. In fact, the coastal provinces were significantly more unequal on the eve of the pre-reform period in the 1970s than they were in the 1950s (Figure 3). In contrast, the reform period since 1979 has seen a strong convergence with a half-life of only 12.4 years, which is far shorter than any of the estimates of half-life for various economies reported in literature (Sala-i-Martin 1996).

The above results raise the question of how far these are being driven by two southern provinces of Fujian and Guangdong (including Hainan Island) that over

	1952-96	1952-78	1978-96
Constant	-0.0102 (-0.849)	0.0575 (4.790)	-0.0517 (-2.366)
Initial income	-0.0160 (-4.675)	0.0032 (1.084)	-0.0406 (-5.570)
Adjusted R2	0.7487	0.0244	0.8109
Implied speed of convergence (%)	2.71		6.89
Half-life (year)	31.3		12.3

Table 7.6: Regression on the Initial Income Level (Coastal Provinces Excluding Fujian and Guangdong)

	1952-95	1952-78	1978-95
Constant	-0.0141 (-0.699)	-0.0443 (-1.431)	0.0016 (0.043)
Initial income	-0.0129 (-2.992)	-0.0170 (-2.580)	-0.0162 (-1.679)
Adjusted R2	0.3187	0.2496	0.0967
Implied speed of convergence(%)	1.88	2.24	1.89
Half-life (year)	38.8	29.4	30.9

Table 7.7: Regression on the Initial Income Level (Interior Provinces)

the reform period have grown particularly rapidly, thanks to special privileges by the central government. Amongst others, these include the establishment of five Special Economic Zones that have enabled the two provinces to attract over half of inward foreign direct investment since 1979. To ascertain the impact of these two provinces, Table 6 reports the results for the coastal provinces excluding Guangdong and Fujian.

The results in Table 6 are almost identical to those in Table 5, except that the exclusion of Fujian and Guangdong marginally reduces the half-life both in the pre-reform and the reform periods.

Turning now to the interior provinces, there is convergence in both the reform and the pre-reform (Table 7). The half-life for the two periods respectively comes to 29.4 and of 30.9 years. The latter is considerably longer than just over 12 years for the coastal provinces and the interesting finding is the slow-down in the speed of convergence in the reform period.

These results broadly accord with those in Figure 3 that shows that the downward trend in inequality in the reform period is significantly shallower for the inte-

rior provinces than for the coastal provinces. The convergence in the pre-reform period in Table 7 does not lend itself to corroboration by Figure 3 because of fluctuations.

6. Summary of Main Findings

- In the pre-reform period, there were substantial fluctuations in inter-provincial inequality but there no clear trend towards decrease or increase in inequality. The fluctuations in the pre-reform period broadly follow the twists and turns of economic policy and the political climate.
- Over the period of the Cultural Revolution, inter-provincial inequality rather than falling actually rose. In general, the Great Leap (1958-61) and the Cultural Revolution (1966-78), which were highly egalitarian in rhetoric, were associated with a rise in inter-provincial inequality.
- The process of reform has accentuated the differences in the pattern of evolution of inequality among the coastal provinces and interior provinces. The period since 1978 has seen a rapid convergence among coastal provinces, but no perceptible trend either towards or away from convergence among interior provinces.
- There has in the reform period been a dramatic rise in the inequality between coastal and interior provinces. Unlike in the pre-reform period, the between-group inequality outweighs the within-group inequality by a large margin.
- Over the reform period, the speed of convergence among coastal provinces has been much faster than that for 48 states of US and 47 prefectures of Japan.

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Figure 7.1: Evolution of Inter-Provincial Inequality, 1952-96

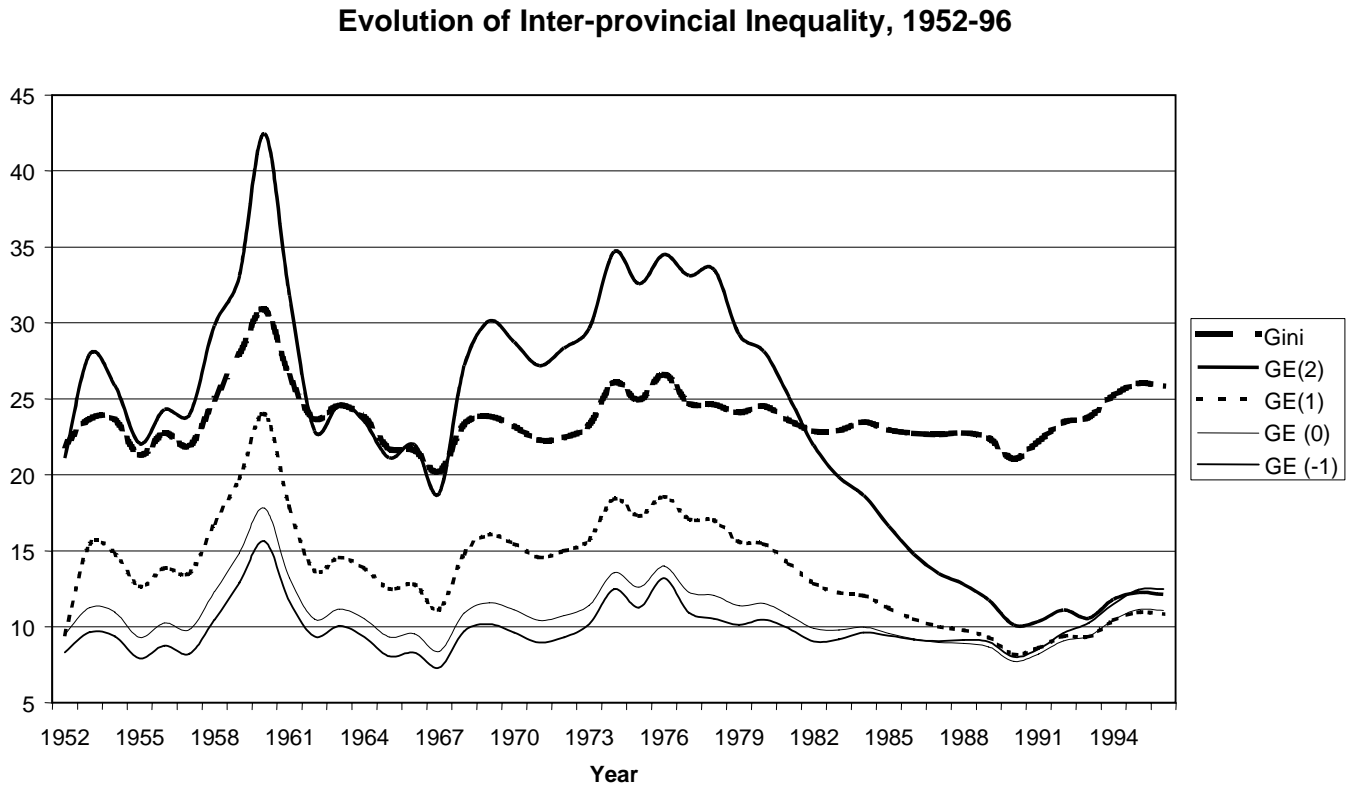
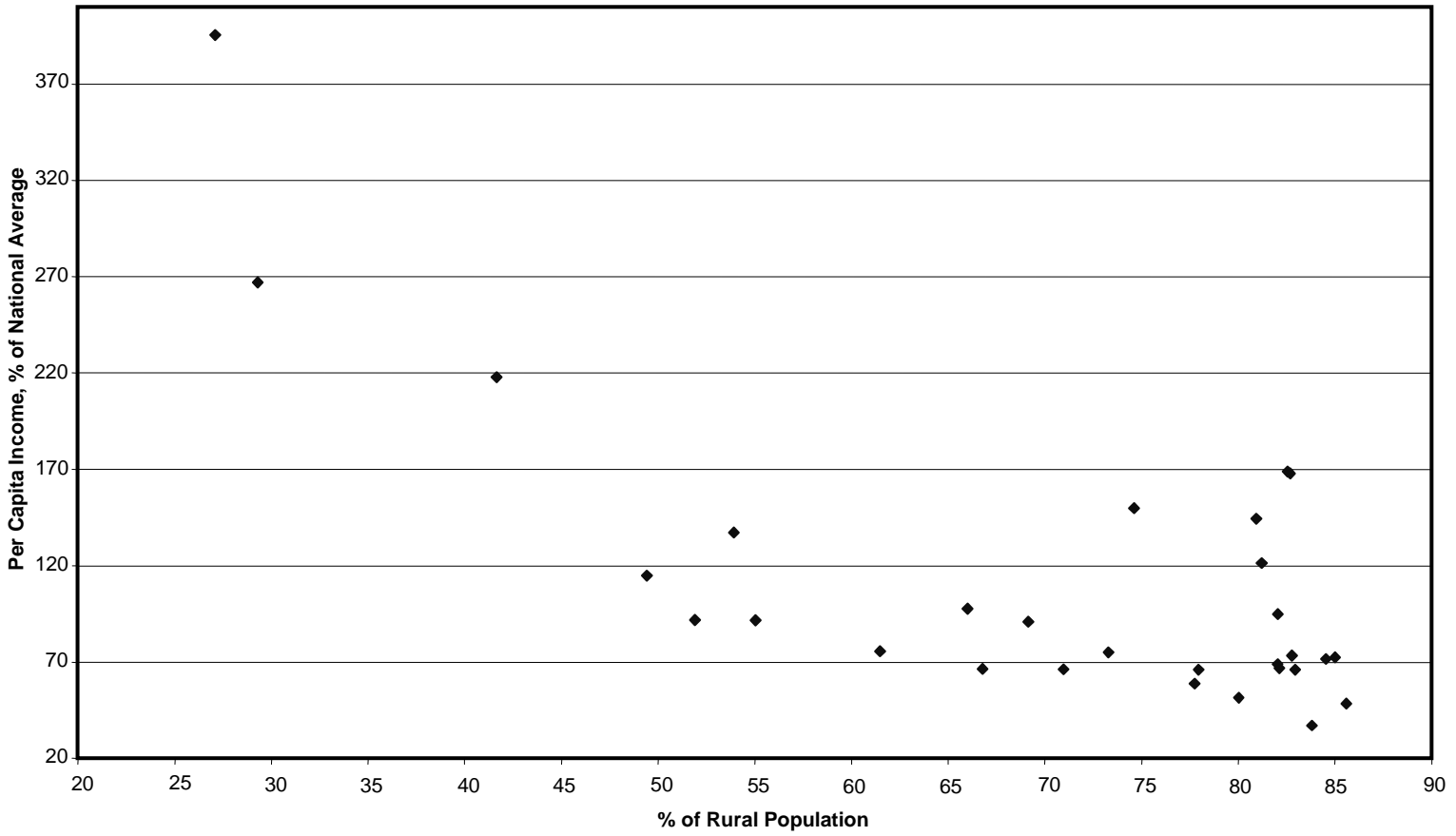


Figure 7.2: Per Capita Income and Percentage of Rural Population, 1996
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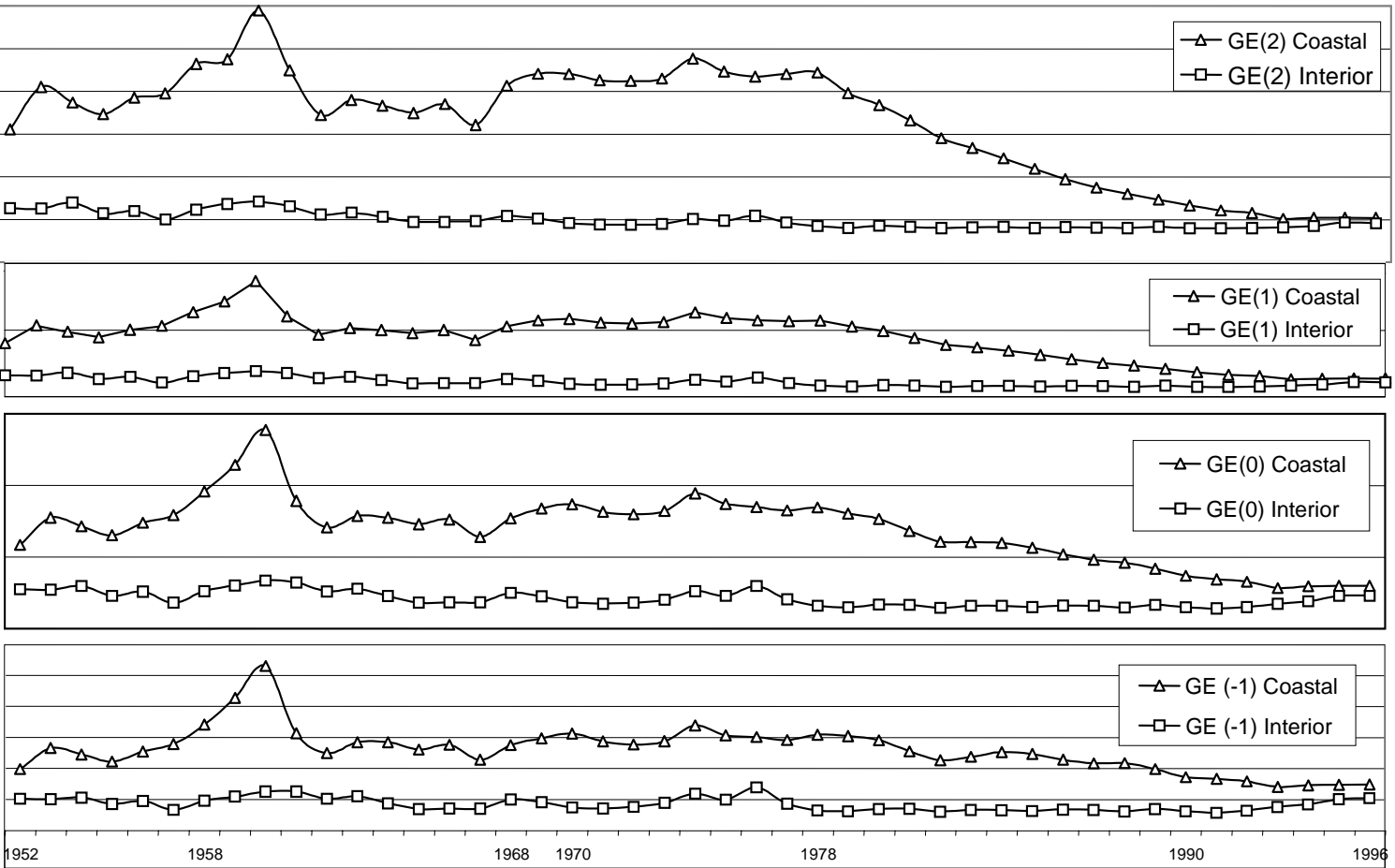


Figure 7.3: Pairwise Comparison of Inequality Indexes for Coastal and Interior Provinces

Figure 7.4: Decomposition of Inequality
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