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Fifty Years of Regional Inequality in China: a Journey Through Central Planning, Reform, and Openness

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Abstract

The paper constructs and analyzes a long-run time series for regional inequality in China from the Communist Revolution to the present. There have been three peaks of inequality in the last fifty years, coinciding with the Great Famine of the late 1950s, the Cultural Revolution of the late 1960s and 1970s, and finally the period of openness and global integration in the late 1990s. Econometric analysis establishes that regional inequality is explained in the different phases by three key policy variables—the ratio of heavy industry to gross output value, the degree of decentralization, and the degree of openness.

1. Introduction

The second half of the twentieth century saw a tumultuous history unfold in China—the early years of communist rule in the 1950s culminating in the Great Famine, the Cultural Revolution and its aftermath in the late 1960s and the 70s, the reform of agriculture in the late 1970s and the 80s, and an explosion of trade and foreign direct investment in the late 1980s and the 90s. All these events have affected the course of economic growth and income distribution. However, while a large literature has studied growth through these different phases of Chinese history (e.g. McMillan et al., 1989; Lin, 1992; Fan et al., 2003), few studies have matched the evolution of inequality over the long run with these different periods in Communist Chinese history over its entire course.

This paper presents and analyzes the evolution of Chinese regional inequality since the Communist Revolution right up to the present. Most studies on China's inequality (e.g. Hussain et al., 1994; Khan and Riskin, 2001; Chen and Ravallion, 1996; Aaberge and Li, 1997; Tsui, 1998) have focused on relatively short periods, mostly during the post-reform years, making use of the new household surveys that became available during this period. Of the studies which come closest to the spirit of our interest in Chinese inequality over the long run, Tsui (1991) stopped in 1985 and Lyons (1991) stopped in 1987, just as the increase in trade and foreign direct investment was beginning; Yang and Fang (2000) went up to 1996, but focused only on the rural–urban gap at the national level; and Kanbur and Zhang (1999) disaggregated down to the rural–urban level within provinces to calculate a regional inequality index, and present a decomposition of regional inequality by its rural–urban and inland–coastal components, but their study is only for the post-reform years of 1983–1995.

Using a dataset of provincial and national data covering the second half of the twentieth century, we are able to construct a comprehensive time series of regional

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inequality in China, including its decompositions into rural–urban and inland–coastal components, from 1952 to 2000. We find that changes in regional inequality match the phases of Chinese history remarkably well, as do its rural–urban and inland–coastal components. The peaks of inequality in China have been associated with the Great Famine, the Cultural Revolution, and the current phase of openness and decentralization. We further use econometric analysis to establish that regional inequality is explained to different degrees in different phases by three key policy variables: the share of heavy industry in gross output value, the degree of decentralization, and the degree of openness.

2. Constructing a Long-run Time Series for Regional Inequality in China

Ideally, for an analysis of the evolution of inequality over Communist Chinese history we would have available representative national household surveys over the entire period. Unfortunately, while such surveys have been conducted throughout the last 50 years, they are available to researchers only for the post-reform period, and in any case sporadically, for restricted years with varying but limited coverage. Thus, for example, Chen and Ravallion (1996) had access to official household survey data but only for four provinces between 1986 and 1990. Aaberge and Li (1997) analyzed urban household surveys for Liaoning and Sichuan provinces for the same period, while Tsui (1998) analyzed rural surveys for 1985, 1988, and 1990, but only for Guangdong and Sichuan. Yang (1999) analyzed both rural and urban parts of the household survey for four years between 1986 and 1994, and for Guangdong and Sichuan. This different coverage across studies reflects the differential access to official data. Researchers have also conducted and analyzed independent surveys—for example, Hussain et al. (1994) did one for 1986, Rozelle (1994) for township and village enterprises between 1984 to 1989 in Jiangsu province, and Khan et al. (1993) conducted a household survey for 1988.

The inequality analysis that has been done on household surveys for the late 1980s and 90s has been extremely valuable in illuminating specific aspects of the distributional dimensions of Chinese development. In general these analyses decompose inequality by income sources but few have aligned the patterns of inequality with national development policies. The bottom line is that researchers simply do not have access to comprehensive household surveys which are national and which cover the entire, or even a substantial part of, the half-century sweep of Chinese history that is of interest to us in this paper.

In the face of this data restriction, we are forced to look for data availability at higher levels of aggregation than at the household level. As it turns out, certain types of data are indeed available at the province level, disaggregated by rural and urban areas, stretching back to 1952. This paper constructs a time series of inequality by building up information on real per capita consumption in the rural and urban areas of 28 of China's 30 provinces (unfortunately, data availability is not complete for Tibet and Hainan provinces).[1]

With these sub-provincial rural and urban per capita consumption figures, and population weights for these areas, a national distribution of real per capita consumption can be constructed, and its inequality calculated, for each year between 1952 and 2000, thus covering the vast bulk of the period from 1949 to the present. Of course what this means is that overall household-level inequality is being understated, since inequality within the rural and urban areas of each province is being suppressed. Moreover, we cannot say anything about the evolution of household-level inequality *within* these areas. Our measures do provide a lower bound on inequality over this entire period.

But the fact remains that our study of inequality is essentially a study of regional inequality.

A detailed discussion of our basic data is provided in the Appendix. A number of studies have used province-level data to study regional inequality in the past. Many of them used Soviet-type statistics, largely because long-term data series existed for these (Lyons, 1991; Tsui, 1991), and they did not in general disaggregate by rural and urban areas within provinces. With the availability of rural–urban disaggregations on consumption per capita stretching back to the 1950s, these studies can be substantially improved and extended in terms of time and space coverage. In the recent literature, Yang and Fang (2000) used the same data sources as we have used, but focused solely on the average rural–urban gap at the national level, and did not go into inequalities across provinces.

Using the information available, we calculate the Gini coefficient of inequality using the standard formula. But the bulk of our analysis is done with a second inequality index, a member of the decomposable generalized entropy (GE) class of inequality measures as developed by Shorrocks (1980, 1984):

$$I(y) = \begin{cases} \sum_{i=1}^{n} f(y_i)\left\{\left(\frac{y_i}{\mu}\right)^c - 1\right\} & \text{for } c \neq 0, 1, \\ \sum_{i=1}^{n} f(y_i)\left(\frac{y_i}{\mu}\right)\log\left(\frac{y_i}{\mu}\right) & \text{for } c = 1, \\ \sum_{i=1}^{n} f(y_i)\log\left(\frac{\mu}{y_i}\right) & \text{for } c = 0. \end{cases} \tag{1}$$

In the above equation, y_i is the ith income measured as Chinese yuan, μ is the total sample mean, $f(y_i)$ is the population share of y_i in the total population, and n is total population. For c less than 2, the measure is transfer-sensitive, in the sense that it is more sensitive to transfers at the bottom end of the distribution than those at the top. The key feature of the GE measure is that it is additively decomposable. For K exogenously given, mutually exclusive and exhaustive groups indexed by g:

$$I(y) = \sum_{g}^{K} w_g I_g + I(\mu_1 e_1, \ldots, \mu_K e_K), \tag{2}$$

where

$$w_g = \begin{cases} f_g\left(\frac{\mu_g}{\mu}\right)^c & \text{for } c \neq 0, 1, \\ f_g\left(\frac{\mu_g}{\mu}\right) & \text{for } c = 1, \\ f_g & \text{for } c = 0. \end{cases}$$

In equation (2), I_g is inequality in the gth group, μ_g is the mean of the gth group, and e_g is a vector of 1s of length n_g, where n_g is the population of the gth group. If n is the total population of all groups, then $f_g = n_g/n$ represents the share of the gth group's population in the total population. The first term on the right-hand side of (2) represents the within-group inequality. The second term is the between-group, or intergroup, component of total inequality. For simplicity, we present results in this paper only for

$c = 0$.[2] The within-group inequality part in (2) represents the spread of the distributions in the subgroups; the between-group inequality indicates the distance between the group means. With our time series of inequality in China over the long term, we are now in a position to investigate dimensions of inequality in the different phases of Chinese development over the past half century.

3. Inequality Change through the Phases of Chinese History: a Narrative

Following standard discussions, Communist Chinese history can be divided into several phases: 1949–56 (revolution and land reform), 1957–61 (the Great Leap Forward and the Great Famine), 1962–65 (post-famine recovery), 1966–78 (Cultural Revolution and transition to reform), 1979–84 (rural reform), and 1985–present (post-rural reform, decentralization, and opening up to trade and foreign direct investment).

Table 1 presents economic indicators for China from 1952 to 2000. It includes three key indicators of economic policy—the share of heavy industry in gross value of total output (a measure of the bias against agriculture and China's comparative advantage), the ratio of trade volume to total GDP (a measure of the degree of openness), and the ratio of local government expenditure to total government expenditure (a measure of decentralization).[3] Figure 1 shows the evolution of real per capita GDP through the different phases identified above. Table 2 presents long-run inequality series, and Figure 2 graphs the evolution of Chinese regional inequality, as measured by the Gini and the GE indices, through the six phases of development identified above. The two indices move in close relation to each other, and match the different phases of Chinese development remarkably well.

Inequality was relatively low and steady in the early first years of communist rule when land reform was introduced. However, it rose precipitously during the Great Leap Forward and the Great Famine, reaching a peak in 1960. It fell during the recovery from the Great Famine, reaching a trough in 1967. But the effects of the Cultural Revolution, which began in late 1966, started an increase in inequality which peaked in 1976. The transition from the Cultural Revolution to the period of rural reform saw a decline in inequality which gathered pace in the early 1980s and reached its trough in 1984. In the post-rural reform period after 1984, when China decentralized, opened up, and experienced an explosion of trade and foreign direct investment, inequality rose steadily and sharply right through to the end of our data series, in 2000.

Thus over the past 50 years inequality has peaked three times—during the Great Famine, at the end of the Cultural Revolution, and in the current period of global integration. In fact, the Gini coefficient of regional inequality in China in 2000 exceeds the peaks of inequality reached at the end of the Cultural Revolution in 1976, and at the Great Famine in 1960. Using the Gini coefficient, inequality in 2000 is about 16% higher than that in 1960.

Similarly, there are three major troughs in the overall evolution of inequality—in 1952, right at the beginning of the data series; in 1967, at the end of the recovery from the Great Famine and before the effects of the Cultural Revolution set in; and in 1984, at the end of the rural reform period and the start of the expansion based on global integration. Overall, inequality seems to have been low when policy was encouraging to agriculture and the rural sector generally, and high when this sector was relatively neglected. These effects can be further investigated by decomposing overall inequality into subcomponents and examining the evolution of these.

As discussed in the previous section, the GE index is subgrouped additively decomposable, allowing us to look deeper into the make-up of inequality. The 56 data points

Table 1. Economic Indicators, 1952–2000

Year	GDP (billion)	Imports (billion)	Total expenditure (billion)	GOV (billion)	Tariff rate (%)	Trade ratio (%)	Decentralization (%)	Industrialization (%)
1952	67.9	3.8	17.2	81.0	12.8	9.5	25.9	15.3
1953	82.4	4.6	21.9	96.0	11.0	9.8	26.1	17.5
1954	85.9	4.5	24.4	105.0	9.2	9.9	24.7	18.9
1955	91.0	6.1	26.3	110.9	7.6	12.1	23.5	19.7
1956	102.8	5.3	29.9	125.2	10.2	10.6	29.6	21.7
1957	106.8	5.0	29.6	124.1	9.6	9.8	29.0	25.5
1958	130.7	6.2	40.0	164.9	10.4	9.8	55.7	35.2
1959	143.9	7.1	54.3	198.0	9.9	10.4	54.1	43.8
1960	145.7	6.5	64.4	209.4	9.2	8.8	56.7	52.1
1961	122.0	4.3	35.6	162.1	14.5	7.4	55.0	37.7
1962	114.9	3.4	29.5	150.4	14.3	7.0	38.4	32.3
1963	123.3	3.6	33.2	163.5	11.6	6.9	42.1	33.5
1964	145.4	4.2	39.4	188.4	10.4	6.7	42.9	34.4
1965	171.6	5.5	46.0	223.5	10.3	6.9	38.2	30.4
1966	186.8	6.1	53.8	253.4	10.6	6.8	36.9	32.7
1967	177.4	5.3	44.0	230.6	7.3	6.3	38.7	28.1
1968	172.3	5.1	35.8	221.3	12.4	6.3	38.7	26.9
1969	193.8	4.7	52.6	261.3	13.5	5.5	39.3	31.7
1970	225.3	5.6	64.9	313.8	12.5	5.0	41.1	36.4
1971	242.6	5.2	73.2	348.2	9.5	5.0	40.5	39.5
1972	251.8	6.4	76.6	364.0	7.8	5.8	43.7	40.2
1973	272.1	10.4	80.9	396.7	8.7	8.1	44.4	39.9
1974	279.0	15.3	79.0	400.7	9.2	10.5	49.7	38.7
1975	299.7	14.7	82.1	446.7	10.2	9.7	50.1	40.2
1976	274.4	12.9	80.6	453.6	11.6	9.6	53.2	40.3
1977	320.2	13.3	84.4	497.8	19.8	8.5	53.3	41.9
1978	362.4	18.7	112.2	563.4	15.3	9.8	52.6	42.8
1979	403.8	24.3	128.2	637.9	10.7	11.3	48.9	41.3
1980	451.8	29.9	122.9	707.7	11.2	12.6	45.7	38.5
1981	486.0	36.8	113.8	758.1	14.7	15.1	45.0	34.5
1982	530.2	35.8	123.0	829.4	13.3	14.5	47.0	34.9
1983	595.7	42.2	141.0	921.1	12.8	14.4	46.1	36.1
1984	720.7	62.1	170.1	1083.1	16.6	16.7	47.5	37.0
1985	898.9	125.8	200.4	1333.5	16.3	23.0	60.3	38.6
1986	1020.1	149.8	220.5	1520.7	10.1	25.3	62.1	38.6
1987	1195.5	161.4	226.2	1848.9	8.8	25.8	62.6	38.7
1988	1492.2	205.5	249.1	2408.9	7.5	25.6	66.1	38.4
1989	1691.8	220.0	282.4	2855.2	8.3	24.6	68.5	39.4
1990	1859.8	257.4	308.4	3158.6	6.2	29.9	67.4	38.3
1991	2166.3	339.9	338.7	3478.2	5.5	33.4	67.8	41.5
1992	2665.2	444.3	374.2	4368.4	4.8	34.2	68.7	44.8
1993	3456.1	598.6	464.2	5939.8	4.3	32.6	71.7	49.7
1994	4667.0	996.0	579.3	8592.7	2.7	43.7	69.7	35.5
1995	5749.5	1104.8	682.4	11223.5	2.6	40.9	70.8	33.1
1996	6685.1	1155.7	793.8	12195.3	2.6	36.1	72.9	30.0
1997	7314.3	1180.7	923.4	13749.7	2.7	36.9	72.6	29.2
1998	7801.8	1162.2	1079.8	14320.5	2.7	34.4	71.1	27.0
1999	8206.8	1373.7	1318.8	15063.0	4.1	36.4	68.5	23.6
2000	8940.4	1863.9	1588.7	n.a	4.0	43.9	65.3	n.a.

in each year from which the overall distribution is constructed, a rural and an urban observation for each of 28 provinces, can be divided into rural and urban observations across the provinces and, using equation (2), the GE can be decomposed into "within rural–urban" and "between rural–urban" components (we will call it rural–urban inequality hereafter). The overall GE and the between rural–urban component are

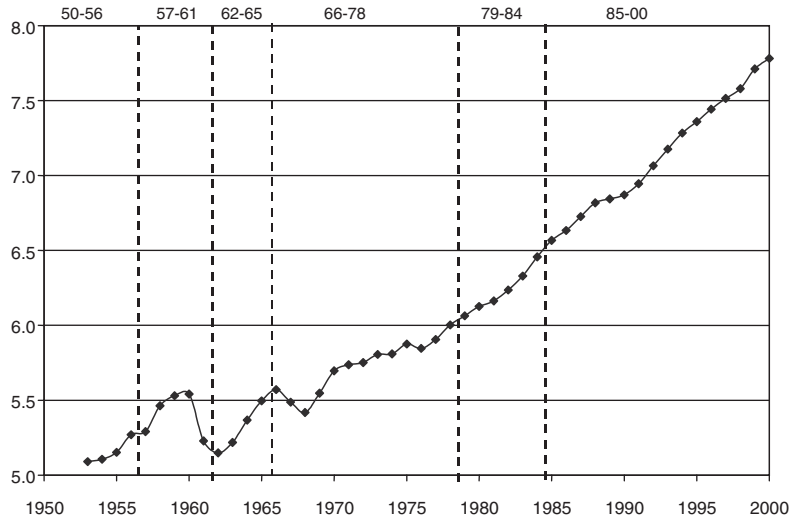

Figure 1. Per Capita GDP (in logs) in Constant 1980 Prices

shown in Table 2. The within rural–urban component is the difference of the above two.

A key dimension of inequality in China, especially in the post-reform period, is that between inland and coastal provinces (Tsui, 1993; Chen and Fleisher, 1996; Yao 1997; Zhang and Kanbur, 2001). We follow the practice of classifying the provinces of Beijing, Liaoning, Tianjin, Hebei, Shandong, Jiangsu, Shanghai, Zhejang, Fujian, Guangdong, and Guangxi as coastal and the other provinces as inland. We therefore divide our 56 observations into 22 coastal and 34 inland observations and decompose the GE measure accordingly. The "between inland–coastal" component (we will call it inland–coastal inequality hereafter) is reported in Table 2.

Figures 3–5 go a long way in translating the above narrative into impacts on overall inequality and the rural–urban and inland–coastal inequalities, and provide some initial hypotheses for econometric testing in the next section. Under the central planning system, the central government had large powers to allocate and utilize financial revenues to achieve the goal of equity, albeit at the expense of efficiency. With economic reforms, the central government has granted local governments more autonomy in allocating their resources and bearing more responsibilities (Ma, 1997; Lin et al., 1997; Qian and Roland, 1998). Figure 3 shows that in general the share of local government expenditure increased in the reform period, although there were some blips as the government reassessed its priorities periodically. With the new fiscal structure, local governments have more incentive to promote economic growth. However, because of differences in historical development level and geographical locations, the rate of growth may differ across regions. Under fiscal decentralization, regions with agriculture as the major means of production must rely more on the extraction of levies and compulsory apportionment, which hinder local economic growth. Regions with more diverse economic structure and larger revenue base have a larger degree of freedom to finance their economic development (Zhang et al., 2004). Not surprisingly, as shown in Figure 3, inequality moved closely in tandem with decentralization.

Table 2. Inequalities and Decompositions, 1952–2000

Year	*Gini* (%)	*GE* (%)	*Rural–Urban*	*Inland–Coastal*
1952	22.4	9.0	6.9	0.6
1953	24.7	10.7	8.6	0.7
1954	23.2	9.4	7.9	0.6
1955	22.0	8.6	7.3	0.3
1956	22.9	9.4	8.2	0.2
1957	23.8	9.8	8.5	0.1
1958	24.4	10.2	8.8	0.2
1959	29.7	14.3	11.6	0.2
1960	32.2	16.6	13.5	0.3
1961	30.3	14.5	11.2	0.2
1962	28.5	13.1	10.7	0.2
1963	27.6	12.4	9.6	0.2
1964	28.2	12.8	9.5	0.2
1965	26.7	11.8	8.7	0.2
1966	26.6	11.7	9.1	0.2
1967	25.5	10.8	8.5	0.2
1968	26.3	11.3	8.7	0.3
1969	27.1	12.2	9.9	0.3
1970	27.0	12.1	9.8	0.3
1971	26.9	12.1	9.8	0.3
1972	28.1	12.8	9.8	0.3
1973	27.9	12.7	9.9	0.3
1974	28.8	13.5	10.3	0.3
1975	29.5	14.2	11.2	0.5
1976	30.9	15.5	12.1	0.5
1977	30.8	15.4	12.1	0.5
1978	29.3	14.0	11.0	0.4
1979	28.6	13.3	10.1	0.4
1980	28.2	13.1	9.9	0.5
1981	27.0	12.0	9.1	0.6
1982	25.6	10.6	7.2	0.5
1983	25.9	11.1	6.8	0.4
1984	25.6	10.9	6.3	0.4
1985	25.8	11.1	6.6	0.5
1986	26.8	11.9	6.9	0.5
1987	27.0	12.0	6.8	0.6
1988	28.2	13.1	7.7	0.8
1989	29.7	14.4	9.3	1.0
1990	30.1	14.9	9.5	1.0
1991	30.3	14.9	9.9	1.2
1992	31.4	16.0	10.2	1.5
1993	32.2	16.8	10.9	1.7
1994	32.6	17.2	10.8	2.0
1995	33.0	17.7	11.5	2.3
1996	33.4	18.2	11.7	2.6
1997	33.9	18.9	11.7	2.7
1998	34.4	19.6	12.2	2.9
1999	36.3	23.4	12.8	3.2
2000	37.2	24.8	13.9	3.8

Notes: Calculated by the authors. GE refers to the generalized entropy index with $c = 0$.

GE with $c = 1$ was also calculated but the results are similar and not reported here.

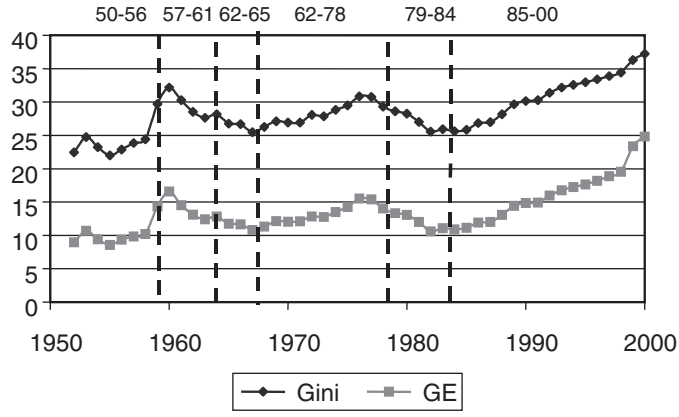

Figure 2. Trends of Regional Inequality (from Table 2)

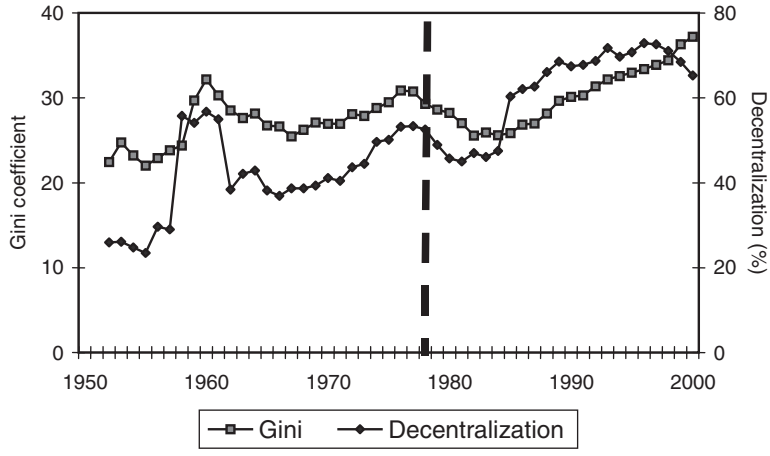

Figure 3. Decentralization and Overall Inequality (Gini coefficient)

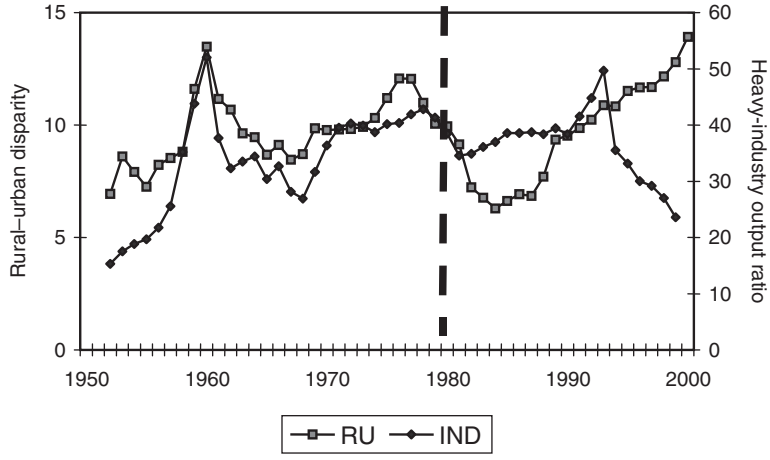

Figure 4. Heavy-industry Development Strategy and Rural–Urban Divides

While Lin et al. (1997) and Zhang and Zou (1998) have in particular analyzed the relationship between fiscal decentralization and economic growth for China, few studies except Tsui (1991) have investigated the effect of decentralization on regional inequality. Tsui (1991) detected a positive relationship between decentralization and worsening regional inequality using a graph analysis based on data series up to 1985. Based on lessons drawn from other countries, Prud'homme (1995) has cautioned on the possible detrimental effects of decentralization on inequality. This leads to the following hypothesis.

HYPOTHESIS 1. *Decentralization affects regional inequality during the economic transition from a planned economy to a market economy*.

In order to accelerate the pace of industrialization after the initial period of land reform, the state extracted massive resources from agriculture, mainly through the suppression of agricultural prices and restrictions on labor mobility (Lin et al., 1996). Almost all the scarce investment funds were allocated to heavy industry in preference to light industry and agriculture. As shown in Figure 4, the share of heavy industry in gross output value rose from 0.22 in 1956 to 0.52 in 1960. Because this policy greatly violated China's comparative advantage, it could not be implemented unless administrative distortions were imposed. The main enforcement mechanisms were a trinity of institutions, including the household registration system, the unified procurement and sale of agricultural commodities, and the people's communes.

In particular, the government established the *Hukou* system of household registration in this period, confining people to the village or city of their birth, in order to ensure there was enough agricultural labor to produce sufficient grain for urban workers (Solinger, 1993). Although, to some extent, the urban wage was also suppressed, employment was guaranteed and the urban residents enjoyed many exclusive subsidies, such as free housing and numerous in-kind transfers from the government. Consequently, the large rural–urban divide became a major feature of China's inequality (Yang, 1999; Yang and Fang, 2000), and the policies eventually led to the Great Famine. During the famine, however, most urban residents were protected from starvation at the expense of about 30 million deaths in the rural areas (Lin and Yang, 2000). These developments are reflected in the sharp increases, up to 1960, in the rural–urban inequality in Table 2 and in Figure 4.

In reaction to the Great Famine, agriculture was once again given priority. The slogan "Yi Liang Wei Gang, Gang Ju Mu Zhang" [Grain must be taken to be the core; once it is grasped, everything falls into place] reflects the spirit of this policy. In the years between 1961 and 1964, 20 million state workers and 17 million urban high school students were sent to the countryside for "re-education" by participating in agricultural production (Selden, 1992). Meanwhile, central planning was loosened a little, boosting agricultural productivity (Fan and Zhang, 2002). Not surprisingly, the share of heavy industry fell and the rural–urban divide narrowed. This is reflected in the declining rural–urban disparity during this period, which pulled down overall inequality to its next trough, just before the start of the Cultural Revolution.

With the start of the Cultural Revolution in 1966, pro-Mao leftists came into the ascendancy. The combination of a lack of incentives in the agricultural sector and investment in military and heavy industry during the Cold War atmosphere of the time, as reflected in the rise in the share of heavy industry in Figure 4, led to the rural–urban divide increasing to its peak at the end of the Cultural Revolution, on the eve of the 1979 reforms.

With the end of the Cultural Revolution, the Chinese economy was on the verge of collapse. In response to the agricultural crisis, the government started to give greater incentives to household producers. The "household responsibility" system spread from its origins in Anhui province to cover 98% of all villages in China by 1983 (Lin, 1992). These and other market-oriented strategies led to a remarkable growth in agricultural output, and the share of heavy industry dropped. The first five years of the post-1979 reforms saw a sharp decline in the rural–urban divide. Overall inequality fell as well, as shown in Figure 3.

In general, the heavy-industry development strategy in the pre-reform period violated China's comparative advantage at the time that capital was scarce and labor was abundant. To ensure low food cost for urban workers and to extract funds from the agricultural sector, agricultural product prices had to be suppressed as well, and the mobility of rural residents was severely restricted. This leads to our second hypothesis.

HYPOTHESIS 2. *The heavy-industry development strategy, particularly in the pre-reform period, was a major contributing factor to the large rural–urban divide and to overall inequality.*

The latest phase in Chinese history began in the mid-1980s. As is well known, this has been a period of accelerating integration into the global economy through greater openness in trade and especially in foreign direct investment. As seen in Figure 5, the trade ratio, after showing no trend for 35 years, began a steady increase from the mid-1980s both because of reductions in nominal tariffs and because of increases in import volumes. Between 1984 and 2000, the value of exports grew 11% per year. Changes in FDI flows are even more astonishing. We do not of course have long-run time series for these; but from an almost isolated economy in the late 1970s, China has become the largest recipient of FDI among developing countries. In order to speed up integration with world markets, China has implemented a coastal-biased policy, such as establishing special economic zones in coastal cities and providing favorable tax breaks to coastal provinces. Obviously, the policy is biased against inland regions and may

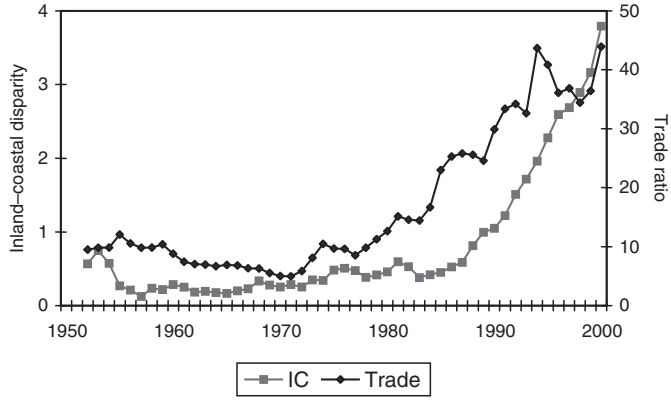

Figure 5. Openness and Inland–Coastal Disparity

have enlarged inland–coastal disparity. In other words, the opening process has been intertwined with the regional-biased development policy.

As is well appreciated, and as shown in Figure 1, there has been spectacular growth largely due to the reforms and open-door policy. But the gains have not been evenly distributed across regions. Coastal provinces have attracted far more foreign direct investment and generated more trade volume than inland provinces during the liberalization process. In 2000, the three coastal provinces, Guangdong, Jiangsu, and Shanghai, were the top three, while the three inland provinces, Guizhou, Inner Mongolia, and Jilin, were the bottom three in terms of attracting FDI. The above three coastal provinces alone contributed more than 60% of total foreign trade in 2000. The difference in the growth rates between the coastal and inland regions has been as high as three percentage points during the past two decades (Zhang and Zhang, 2003).

We can use Guangdong and Sichuan provinces to illustrate how internal geography affects the response to openness. In 1978, the coastal Guangdong province ranked 14th in labor productivity, which was almost the same as the 15th rank of inland Sichuan province. In a closed economy, Guangdong did not enjoy any obviously better resource endowments than inland provinces. However, since China opened its door to the world, Guangdong has become one of the most favored places for foreign direct investment and international trade, in large part due to its proximity to Hong Kong. Meanwhile, the ranking of labor productivity in Sichuan has declined from 15th in 1978 to 23rd in 2000. Clearly, the relative comparative advantages between the two provinces have changed significantly and are associated with the opening up to the outside and the decentralization which facilitated this response.

The above story of Guangdong and Sichuan is reflected nationwide in the behavior of the inland–coastal component of inequality. The major change in the behavior of these components over the entire 50-year period comes in the mid-1980s. After relative stability up to this point, inland–coastal inequality began to increase sharply. Although still quite small as a contributor to overall inequality, its contributions to *changes* in inequality increased dramatically. As shown in Figure 5, inland–coastal disparity has closely followed the path of the trade ratio.

When an economy opens up to world markets, theory suggests that there could well be affects on regional inequality, as argued recently by Fujita et al. (1999). External trade liberalization can change internal comparative advantage and hence location patterns. Coupled with decentralization, opening up to world markets provides local governments with an opportunity to better exploit a comparative advantage. Trade liberalization could also lead to specialization and industry clustering. Empirical evidence for the impact of globalization on income distribution in developing countries has been limited, and the findings of existing studies are at best mixed. The existing work for developing countries has been limited to the effects of trade liberalization on wage inequality (e.g. Wood, 1997; Hanson and Harrison, 1999), shedding little light on the effect on regional inequality. Jian et al. (1996) have argued that China's regional inequality is associated with internal geography. China's rapid change from a closed economy to open economy provides a good testing ground for our third hypothesis.

HYPOTHESIS 3. *Greater openness is associated with greater regional inequality in a spatially large country such as China.*

Our narrative of the phases of Chinese development, and of the evolution of inequality and its components, is suggestive of the forces behind the changes in inequality over this half century. We now turn to an econometric analysis of the correlates of inequality, to see whether these hypotheses can be confirmed statistically.

4. Correlates of Regional Inequality: an Econometric Analysis

Our task is to test the association between inequality and its components on the one hand, and heavy industrialization, decentralization, and openness, on the other. Following several analyses on Chinese data (e.g. Lin, 1992), we use one-period lagged values of the independent variables as regressors to reduce potential endogeneity problems.[4] In the regressions, all the variables are in logarithms. We have compared regressions in levels and log levels and the latter gives a better fit based on R^2 and RESET misspecification test. In addition, the heteroskedasticity problem is greatly reduced after taking logarithms.

A central issue in this long-run time series is that of structural breaks. It is common in the econometric literature on China (e.g. Lin 1992; Li, 2000) to locate the break at the start of the reforms in the late 1970s. As shown in regression R1 in Tables 3 and 4 on overall inequality and rural–urban inequality, the Chow tests indicate a significant break in 1979. The Chow-test *p*-value is 0.105 in the regression on inland–coastal inequality (R1 in Table 5), indicating a marginally significant structural break.

Table 3. Regression Results: Total Inequality

	R1	*R2*	
Variables	*Whole period (1952–2000)*	*Before reform (1952–1978)*	*Reform (1979–2000)*
Decentralization	0.279**	0.011	0.267**
	(0.072)	(0.068)	(0.056)
Trade ratio	0.295**	0.151**	0.455**
	(0.060)	(0.071)	(0.056)
Heavy-industry ratio	0.003	0.488**	–0.161
	(0.111)	(0.113)	(0.128)
Chow-test *p*-value	0.000	0.997	
F-test for coefficients (*p*-value)		0.001	
Phillips–Ouliaris test	–3.350	–5.012	
KPSS statistic	0.116	0.054	
Adjusted R^2	0.675	0.817	

Notes: All the variables are in logarithmic form and independent variables have one-year lag. Figures in parentheses are robust standard errors. * and ** indicate statistical significance at 10% and 5%, respectively. The null hypothesis of the Chow test is that there is no structural break in 1979. The *F*-test is for testing whether the coefficients are the same across the two periods. The Phillips–Ouliaris Z_t test is for testing the null hypothesis of no cointegration. Phillips and Ouliaris (1990) report the critical values for regressions with independent variables only up to 5. The critical values to reject this null hypothesis with three and five independent variables at the 10% significant level are –3.833 and –4.431, respectively. The KPSS statistic is for testing the null hypothesis of cointegration. If the statistic is larger than 0.347, the null will be rejected at the 10% significance level.

Table 4. Regression Results: Rural–Urban Inequality

	R1	*R2*	
Variables	*Whole period (1952–2000)*	*Before reform (1952–1978)*	*Reform (1979–2000)*
Decentralization	0.256**	–0.018	0.369**
	(0.078)	(0.060)	(0.079)
Trade ratio	0.128**	0.208**	0.406**
	(0.036)	(0.087)	(0.067)
Heavy-industry ratio	–0.080	0.458**	0.121
	(0.108)	(0.102)	(0.159)
Chow-test *p*-value	0.000	0.993	
F-test for coefficients		0.001	
Phillips–Ouliaris test	–2.596	–4.529	
KPSS statistic	0.153	0.036	
Adjusted R^2	0.302	0.669	

Notes: All the variables are in logarithmic form and independent variables have one-year lag. Figures in parentheses are robust standard errors. * and ** indicate statistical significance at 10% and 5%, respectively. The null hypothesis of the Chow test is that there is no structural break in 1979. The *F*-test is for testing whether the coefficients are the same across the two periods. The Phillips–Ouliaris Z_t test is for testing the null hypothesis of no cointegration. Phillips and Ouliaris (1990) report the critical values for regressions with independent variables only up to 5. The critical values to reject this null hypothesis with three and five independent variables at the 10% significant level are –3.833 and –4.431, respectively. The KPSS statistic is for testing the null hypothesis of cointegration. If the statistic is larger than 0.347, the null will be rejected at the 10% significance level.

There are two ways to handle a structural break. One way is to estimate the equations separately for the pre-reform period (1952–78) and the post-reform period (1979–99). However, in so doing, some degrees of freedom will be lost. Here, we adopt the second way by estimating the equations for the whole period but allowing coefficients to vary across the two periods. Regression R2 in Tables 3–5 provide the estimation results under the varying-coefficient specifications. The Chow-test *p*-values indicate that a structural break has been correctly captured in the new specification.

Because the three inequality series are not stationary, it is important to check whether regressing one on other policy variables produces stationary residuals, which means cointegration among variables. If the residuals are not stationary, the regressions with nonstationary data may give spurious results. Here we adopt two cointegration tests. The first one is the Phillips–Ouliaris test (1990, PO for short). The PO test is designed to detect the presence of a unit root in the residuals of regressions among the levels of time series. The null hypothesis is that the residuals have unit roots (no cointegration). The critical values for the PO test can be found in the appendix of Phillips and Ouliaris (1990). In addition to the Phillips–Ouliaris test, we also perform the KPSS test (Kwiatkowski et al., 1992) to check the cointegrated relationship. In contrast to the PO test, the KPSS tests the null hypothesis that the regression residuals are stationary (the variables are cointegrated).

Consider Table 3 first and start with the results for overall inequality. Regression R2 has better specification than R1 as it does not have structural breaks and passes both

cointegration tests. The *F*-test indicates that the coefficients in the two periods are statistically different. In the pre-reform period, the heavy-industry coefficient is significant and has the highest value (0.488), suggesting that the heavy-industry development strategy implemented in the central planning era was a dominant force behind the overall inequality. Turning to the post-reform period, the coefficients for decentralization and trade ratio are significantly positive. In particular, trade ratio has the largest impact on overall inequality in this period. The coefficient for decentralization has changed from insignificant to significant, confirming the observation in Figure 3 that decentralization has a closer relationship with the overall inequality in the reform period. Despite the importance of the heavy-industry ratio in the pre-reform period, it faded into insignificance in the reform period as China changed its development strategies.

As in Table 3, regression R2 with varying coefficients in Table 4 has a better specification than regression R1 with constant coefficients. The *F*-test shows a systematic difference in coefficients across the two periods. The results are similar to Table 3. In the pre-reform period, a greater favoring of heavy industry increases rural–urban spread. The impact of openness on the rural–urban divide almost doubled as China transformed from a closed economy to a more open economy. In the reform period, greater decentralization widened the rural–urban disparity.

In Table 5 the two specifications on inland–coastal inequality produce similar results. The PO test and KPSS test indicate that the first regression R1 is cointegrated in levels.

Table 5. Regression Results: Inland–Coastal Inequality

	R1	*R2*	
Variables	*Whole period (1952–2000)*	*Before reform (1952–1978)*	*Reform (1979–2000)*
Decentralization	0.564**	0.341*	0.440**
	(0.119)	(0.203)	(0.163)
Trade ratio	1.409**	1.070**	1.412**
	(0.072)	(0.280)	(0.133)
Heavy-industry ratio	–0.611**	–0.260	–1.100**
	(0.293)	(0.421)	(0.363)
Chow-test *p*-value	0.105	0.242	
F-test for coefficients		0.566	
Phillips–Ouliaris test	–3.908	–3.895	
KPSS statistic	0.152	0.137	
R^2	0.828	0.825	

Notes: All the variables are in logarithmic form and independent variables have one-year lag. Figures in parentheses are robust standard errors. * and ** indicate statistical significance at 10% and 5%, respectively. The null hypothesis of the Chow test is that there is no structural break in 1979. The *F*-test is for testing whether the coefficients are the same across the two periods. The Phillips–Ouliaris Z_t test is for testing the null hypothesis of no cointegration. Phillips and Ouliaris (1990) report the critical values for regressions with independent variables only up to 5. The critical values to reject this null hypothesis with three and five independent variables at the 10% significant level are –3.833 and –4.431, respectively. The KPSS statistic is for testing the null hypothesis of cointegration. If the statistic is larger than 0.347, the null will be rejected at the 10% significance level.

The coefficients for all the three policy variables are significant with signs consistent with our hypotheses. In particular, the trade ratio has the largest impact on inland–coastal inequality, reflecting the dramatic changes in regional comparative advantage as a result of coastal-biased policy as well as the opening up to the world market. The negative coefficient for the heavy-industry ratio tells the same story. In the planned era, most heavy industries were established in the interior regions, thereby reducing the inland–coastal disparity. When China opened up, the coastal region found itself with a pronounced comparative advantage in labor-intensive exporting sectors (usually light industries) in world markets. The faster growth in the coastal region widened the inland–coastal gap. In the second regression R2, the coefficient for decentralization has increased by nearly 30% from the pre-reform period to the reform period, indicating that greater decentralization played a larger detrimental effect on inland–coastal inequality.

Overall, these results represent broad support for the hypotheses advanced earlier on heavy industry, decentralization, and openness. Heavy industry increased inequality, especially its rural–urban component, and particularly in the pre-1979 period. Decentralization, when it is significant, increased overall inequality, rural–urban inequality, and inland–coastal inequality. The trade ratio was associated with greater overall inequality and, in particular, inland–coastal disparity in the reform period.

5. Conclusions

The tremendous growth in per capita GDP since the reform period, and its impact on poverty in China, has been much discussed and celebrated (Piazza and Liang, 1998; Fan et al., 2002). But this has not stopped a concern with growing inequality, for at least two reasons. First, as is well known, the poverty-reducing effects of a given growth rate on poverty are lower at higher levels of inequality (e.g. Ravallion, 2001). Second, rising inequality may itself lead to tensions within a country and impede the prospects for future growth through a variety of social, political, and economic mechanisms (Kanbur, 2000; Kanbur and Lustig, 2000). In the case of China, such concerns have been expressed widely (Wang et al., 2002).

This study tries to comprehend the driving forces behind the changes in China's regional inequality over half a century. We find that the evolution of inequality matches different political–economic periods in Chinese history. In particular, we find that the heavy-industry development strategy played a key role in forming the enormous rural–urban gap in the pre-reform period, while openness and decentralization contributed to the rapid increase in inland–coastal disparity in the reform period of the 1980s and 90s.

The empirical finding also has relevance to the ongoing debate on how globalization affects regional inequality in developing countries. Convergence or divergence of a nation's economy is dependent not only on its domestic polices but also on its openness. With China joining the WTO, the economy will become more liberalized, and open, likely resulting in more dramatic shifts in regional comparative advantages. If the government continues to favor the coastal region in its investment strategy, then regional disparity may widen even more. Further liberalizing and investing in the economy in the inland region is thus an important development strategy for the government to both promote economic growth and reduce regional inequality.

Data Appendix

GDP

The nominal gross domestic product is from *China Statistical Yearbook* (2001, p. 49). The constant GDP (1980 prices) used in Figure 1 is calculated based on the nominal GDP value in 1980 as well as the annual real growth rate of GDP in *China Statistical Yearbook* (2001, p. 49).

Per Capita Consumption

Following Kanbur and Zhang (1999) and Yang and Zhou (1999), this study uses rural and urban per capita consumption data at the provincial level, but covering a longer period, 1952 to 2000. Prior to 1990, the data are from *Regional Historical Statistical Materials Compilation (1949–1989)*. Alongside the nominal per capita consumption, the accumulative growth rates of real per capita consumption for rural and urban residents at a provincial level with 1952 as a basis are also published. By assuming the prices were the same across provinces in 1952, we can derive real per capita consumption by province with a rural–urban divide since 1952. For the period 1990–2000, the annual real growth rates are available from various issues of *China Statistical Yearbook*. Using the calculated per capita consumption in 1989 and the annual real growth rates since 1989, we can obtain the real capita consumption for this period. However, the published real growth rates are identical to nominal growth rates for the years of 1999 and 2000.[5] So for these two years, we further adjust the real growth rates with rural and urban consumer price indexes by province.

There do exist differences between this dataset and another dataset (per capita living expenditure) in the section of People's Livelihood in *China Statistical Yearbook*. Yang and Zhou (1999) provide discussions on the differences between the two sets of measures. The consumption dataset may be more consistently compiled over time for three reasons. First, the data includes information on real growth rates while the other dataset lacks this information. Second, per capita expenditure data were estimated based on survey data, which carry different imputation at different times. Third, the consumption data include consumption in-kind, such as the value of housing, food subsidies from the government to urban households, according the explanatory notes in the yearbook. As a result, the consumption estimate is significantly higher than the living expenditure estimate.

We should be aware that there exists some incomparability between rural and urban resident consumptions. For instance, urban residents enjoy some housing and medical care subsidies while rural residents do not. In addition, the calculation of price index may have not reflected the improvement in quality of consumer goods, which is more evident in cities. The relatively higher increase in urban price may be partly due to quality improvement. In addition, price support in cities has been gradually phased out over the past decades while the procurement price for major grains in rural areas has long been very low, which may also lead to differences in price levels between rural areas and cities. In spite of these shortcomings of the consumption measure, it is the only summary measure at a provincial level that is readily available, consistently compiled, and covering both rural and urban populations in all the provinces for nearly half a century.

Population

When calculating inequality measures, we also need to use population by province as weights. There are two sets of population data. One is agricultural and nonagricultural population and the other is rural and urban population. In general, these two sets of population are rather close except for several provinces, such as Heilongjiang and Xinjiang, where state farming is a large sector. In this paper, we use rural and urban population with per capital consumption data that have a rural and urban divide as well.

The population data prior to 1978 are from *Regional Historical Statistical Materials Compilation (1949–1989)*. For several provinces without the rural and urban population, we use the agricultural and nonagricultural population data instead. The total population data from 1978 to 2000 are from *Comprehensive Statistical Data and Materials on 50 Years of New China,* while the rural population for the same period are available from *Comprehensive Agricultural Statistical Data and Materials on 50 Years of New China.* The total population and rural population in 1999 and 2000 are from *China Statistical Yearbook* (2001 and 2001) and *China Rural Statistical Yearbook* (2000 and 2001). The difference between the total and rural population is urban population.

Urban and rural residencies refer to the status registered in the household register system. Principally speaking, rural and urban residents are supposed to specialize in farm work and nonfarm work in their registration areas, respectively. The strict household registry system used to prevent population from moving freely to a large extent. However, with the success of rural reform, many workers are freed up from agriculture activities and move to urban areas, especially to big cities, to seek opportunities without any entitlement to subsidies like urban residents. These floating migrants are not covered in the SSB sample that includes only the registered resident households. Hence, possible biases result from using the official registered numbers of rural and urban population. However, more than 80% of these floating migrants are laborers who work outside during the off-harvest season (*China Development Report 1998*). These migrants usually send money back home (Tsui, 1998), to some extent reducing the bias resulting from migration that is not captured by the official population statistics.

Decentralization

We use the share of local governments' expenditure in total government expenditure as a proxy for fiscal decentralization. Although, in the literature, some other measures are also used as a proxy for decentralization, they are not long enough for our time-series analysis. For example, Lin et al. (1997) create a fiscal decentralization index based on the revenue-sharing formula, but their index dates back to only 1985. The total, central, and local governments' expenditure data from 1953 to 2000 are available from *China Statistical Yearbook* (2001, p. 258). The data for 1952 are obtained from *Comprehensive Statistical Data and Materials on 50 Years of New China* (p. 19).

Openness

There are two ways to measure openness. One is the effective tariff rate, which is defined as the ratio of tariff revenue to total imports. The other commonly used measure is the trade ratio—the share of trade (imports plus exports) in total GDP. The

data on imports and exports prior to 1999 are from *Comprehensive Statistical Data and Materials on 50 Years of New China* (p. 60). Information on the two last years is from *China Statistical Yearbook* (2001, p. 586). The tariff data are from *China Statistical Yearbook* (2001, p. 248).

Heavy-Industry Ratio

This is defined as the ratio of the gross heavy-industrial output value relative to the gross agricultural and industrial output value. From 1949 to 1998, the gross agricultural output value, the gross industrial output value, and the gross heavy-industrial output value are available from *Comprehensive Statistical Data and Materials on 50 Years of New China* (p. 30 and 38). For 1999, the gross agricultural output value and the gross industrial output value are from *China Statistical Yearbook* (2000, p. 374 and 409). The gross output value of heavy industry is from the same source (p. 412). For the year 2000, the *China Statistical Yearbook* publishes gross output values of enterprises with only revenue of over five million Chinese yuan. Therefore the data are incompatible with previous years. Because we take a one-year lag for this variable and other policy variables in regressions, the omission of data in 2000 does not affect the results.

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Notes

1. Data for Hainan province since 1988 are incorporated into Guangdong province, while data for Chongqing province since 1997 are included in Sichuan province.
2. Results for $c = 1$ are similar and not reported here.
3. We note here criticisms of Rodrik (2000) on various standard measures of "openness." Since our measure is based partly on trade volume it does not fully isolate the pure effects of a policy of openness.
4. Given data restrictions it is impossible to find suitable alternative instruments covering the entire 50-year period under consideration.
5. We thank Professor D. Gale Johnson for pointing this out. In fact, the inflation (deflation) rates in the two years were rather low.