Available online at www.sciencedirect.com
SCIENCE DIRECT®
NORTH-HOLLAND
China Economic Review 16 (2005) 189–204
China Economic Review

Spatial inequality in education and health care in China

Xiaobo ZHANG[a,c,*], Ravi KANBUR[b]

[a]International Food Policy Research Institute, 2033 K Street, N.W., Washington, DC 20006, USA
[b]Cornell University, USA
[c]Wang Yanan Institute for Studies in Economics, Xiamen University, China

Received 3 February 2004; accepted 22 February 2005

Abstract

While increasing income inequality in China has been commented on and studied extensively, relatively little analysis is available on inequality in other dimensions of human development. Using data from different sources, this paper presents some basic facts on the evolution of spatial inequalities in education and healthcare in China over the long run. In the era of economic reforms, as the foundations of education and healthcare provision have changed, so has the distribution of illiteracy and infant mortality. Across provinces and within provinces, between rural and urban areas and within rural and urban areas, social inequalities have increased substantially since the reforms began.

JEL classification: D63; O15; O18
Keywords: Illiteracy; Infant mortality rate; Spatial inequality in China; Polarization

1. Introduction

Since the start of the reforms in 1978, China has experienced unprecedented economic growth, which has led to spectacular reductions in income poverty (Fan, Zhang, & Zhang, 2002; World Bank, 2000). However, this growth has been accompanied by dramatic increases in inequality, especially in the 1990s. In recent years, the policy dabate in China

* Corresponding author. Tel.: +1 202 862 8149; fax: +1 202 467 4439.
E-mail addresses: x.zhang@cgiar.org (X. Zhang), sk145@cornell.edu (R. Kanbur).

1043-951X/$ - see front matter © 2005 Elsevier Inc. All rights reserved.
doi:10.1016/j.chieco.2005.02.002

has begun to reflect strong concern with this increasing inequality (CASS, 2005; UNDP, 2000). Growing disparities along different dimensions (rural–urban, inland–coastal, etc.) are cited as reasons for growing social unrest, not to mention the fact the poverty reduction would have been even more spectacular has the growth not been accompanied by sharp increase in inequality. Most of the literature on inequality in China is about income inequality (Aaberge & Li, 1997; Chen & Martin, 1996; Démurger et al., 2002; Hussain, Lanjouw, & Stern, 1994; Kanbur & Zhang, 1999, 2005; Khan, Riskin, & Zhao, 1993; Lyons, 1991; Tsui, 1991; Yang, 1999). Relatively little analysis is available on inequality in other dimensions of human development. For example, West and Wong (1995) discuss fiscal decentralization and increasing regional disparities in education and health status. However, their study focuses on only rural areas in two provinces, Shandong and Guangdong. The China Human Development Report, 1999 (UNDP, 2000) highlights the negative impact of fiscal decentralization on education and health. Although it presents a human development index at the province level in 1997, it does not quantify the change in social inequality over time. This paper is a contribution to the attempts at filling this gap in our knowledge. Using data from different sources, it presents a picture of the long-term evolution of spatial inequalities in education and healthcare in China.

There are several reasons to worry about high social inequality. First, people live in a social setting and do care about their relative positions in a society. High social inequality is often in relation to low happiness. Second, large social inequality often leads to more crimes and social instability, which in turn contribute negatively to investment environment and economic growth. Third, the increasing gap of social development will reduce the trickle-down effect of economic growth on poverty reduction. For example, it is hard for an illiterate person to share the boat of rapid economic development. All in all, social inequality is equally important as income inequality.

The paper is arranged as follows. Section 2 provides an institutional and historical review of social welfare provision in rural areas and cities. Section 3 describes the spatial distribution of education and health development, respectively, using national level data that go back to the pre-reform period. Section 4 concludes, and an Appendix provides a description of the data used in the analysis.

2. Institutional changes in education and healthcare provision

Until the 1980s, China's distributional policies manifested a strong urban bias (Lin, Cai, & Li, 1996).[1] The rationing system introduced in the 1950s enabled urban residents to have access to food, housing, education, and healthcare at much lower prices. Almost all urban residents in the working age group had guaranteed jobs in the state or collectively owned firms. Because these jobs were permanent, the so-called "iron rice bowl", urban unemployment was virtually nonexistent. These jobs also provided urban residents with

[1] This bias still exists today, but in different forms (for example, government invests more in urban than in rural areas; universities post higher admission scores for rural students; and there are still visible and invisible restrictions on migration from rural to urban areas).

many benefits such as free or subsidized education and healthcare. Basically, enterprises and government agencies were responsible for providing social welfare to urban residents.

Compared to the level of social expenditure in cities, rural areas received far less. Nevertheless, the government adopted an alternative strategy in rural areas to promote basic education and healthcare. For healthcare, the focus was on preventive rather than curative healthcare measures. The communes, production brigades, and production teams had authority to mobilize the masses to engage in public health and infrastructure works. With large manpower input, the government could implement various public health campaigns, such as fighting against the four pests (rats, flies, mosquitoes, and bed bugs), expanding nationwide immunization, and training indigenous rural health workers (so-called "bare-foot doctors"). By the late 1970s, "bare-foot doctors" and clinics were set up in almost all the villages. As shown in Table 1, the numbers of hospital beds and healthcare personnel per thousand in rural areas rose dramatically from 0.08 and 0.95 to

Table 1
Education and healthcare in China, 1952–1998

Year	Primary school enrollment rate (%)	Primary school graduates entering secondary schools (%)	Student/ teacher ratio in primary school	Student/ teacher ratio in secondary school	Hospital beds per 1000 people (city)	Hospital beds per 1000 people (rural)	Healthcare personnel per 1000 people (city)	Healthcare personnel per 1000 people (rural)
1952	49.2	96.0	35.6	27.4	1.46	0.08	2.71	0.95
1957	61.7	44.2	34.1	27	2.08	0.14	3.60	1.22
1962	56.1	45.3	27.6	24.8	3.88	0.45	5.07	1.50
1965	84.7	82.5	30.1	21.2	3.78	0.51	5.38	1.46
1970	n.a.	71.2	29.1	22.4	4.03	0.85	4.71	1.22
1975	96.8	90.6	29.0	21.1	4.46	1.23	6.70	1.41
1978	95.5	87.7	28.0	20.5	4.70	1.41	7.50	1.63
1979	93.0	82.8	27.2	19.1	n.a.	n.a.	n.a.	n.a.
1980	93.9	75.9	26.6	18.5	4.57	1.48	7.82	1.81
1981	93.0	68.3	25.7	17.6	n.a.	n.a.	n.a.	n.a.
1982	93.2	66.2	25.4	17.6	n.a.	n.a.	n.a.	n.a.
1983	94.0	67.3	25.0	17.6	4.62	1.47	8.37	1.99
1984	95.3	66.2	25.2	18.4	n.a.	n.a.	n.a.	n.a.
1985	96.0	68.4	24.9	18.4	4.48	1.50	7.81	2.06
1986	96.4	69.5	24.3	18.4	4.87	1.46	8.36	2.01
1987	97.2	69.1	23.6	17.9	5.22	1.46	8.72	1.97
1988	97.2	70.4	22.8	16.7	5.56	1.41	8.98	1.92
1989	97.4	71.5	22.3	15.8	5.71	1.38	9.08	1.89
1990	97.8	74.6	21.9	15.7	5.81	1.37	9.15	1.89
1991	97.8	75.7	22.0	15.7	5.86	1.36	9.17	1.89
1992	97.2	79.7	22.1	15.9	6.02	1.33	9.34	1.86
1993	97.7	81.8	22.4	15.7	6.06	1.30	9.24	1.83
1994	98.4	86.6	22.9	16.1	6.18	1.22	9.37	1.75
1995	98.5	90.8	23.3	16.7	6.09	1.19	9.31	1.73
1996	98.8	92.6	23.7	17.2	6.08	1.16	9.24	1.71
1997	98.9	93.7	24.2	17.3	6.10	1.14	9.25	1.72
1998	98.9	94.3	24.0	17.6	6.08	1.11	9.16	1.71

Source: *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000).

1.48 and 1.81 from 1952 to 1980, respectively. In general, these public health measures were rather successful in controlling infectious and parasitic diseases. Mortality rates specific to infectious diseases declined noticeably in the pre-reform period (Yu, 1992).

Basic education relied largely on the communes. Agricultural collectivization created a large number of "commune schools," making access to basic education much easier. As shown in Table 1, the student–teacher ratio in primary school declined from 35.6 in 1952 to 25.7 in 1980 while the ratio in secondary school decreased from 27.4 to 17.6. By 1980 the enrollment rate among rural children reached was almost 90% (Fan et al., 2002).

Overall, in the planned era, although health care and school conditions for rural residents were much worse than their urban cohorts due to an urban-biased policy, basic education and preventive healthcare were widely available. By the late 1970s, China's life expectancy and infant mortality rate were much higher than most developing countries, even many middle-income countries (World Bank, 2003). Despite the remarkable achievement in social equity, the collective system had well known economic drawbacks. Since the late 1970s, China has implemented a series of rural and urban reforms to introduce market incentives in order to enhance economic efficiency and dynamism. In addition, the center granted local governments more fiscal responsibility to improve their incentives to develop the local economy. Consequently, the redistributive power of central government has declined. With limited help from the center and tight budget constraints, many local governments in poor regions cut spending on social development and let individuals share more healthcare and education expenses (West & Wong, 1995). As shown in Table 2, the shares of both government and social spending in total health expenditure have declined dramatically.

Table 2
Recurrent health expenditures by source of finance

Year	Per capita expenditure (1980 yuan)	Government budget (%)	Social expenditure (%)	Personal expenditure (%)
1965	4.7	28	56	16
1970	5.1	27	57	15
1975	8.6	28	55	16
1980	10.9	28	56	16
1981	12.1	27	55	18
1982	13.9	26	53	20
1983	15.8	25	51	23
1984	17.3	25	50	25
1985	19.4	23	47	29
1986	22.0	22	45	32
1987	23.4	19	46	35
1988	26.3	18	44	38
1991	37.7	23	38	39
1995	51.7	17	33	50
2000	95.5	15	24	61
2001	101.7	16	23	61

Source: The data from 1965 to 1988 are from *China: Long-Term Issues and Options in the Health Transition* (World Bank, 1992), Annex Table 9.1. Information for later years are from the website of the Ministry of Health, http://www.moh.gov.cn/statistics/digest03/t28.htm. The health expenditure data from 1991 to 2001 are converted to 1980 yuan using the national consumer price index.

Table 3
China's healthcare coverage in 1998 (yuan per capita)

	Cities	Countryside	Total
Totally public paid	16.0	1.2	5.0
Labor related	22.9	0.5	6.2
Semi-labor related	5.8	0.2	1.6
Insurance	3.3	1.4	1.9
Cooperative	4.2	6.6	5.9
Self-paid	44.1	87.4	76.4
Other	3.7	2.7	2.9

Source: *China Health Yearbook 1999* (Ministry of Health, 1999), p. 410.

In addition to the general fiscal reforms, rural and urban areas have undergone their own reforms. Following the rural economic reform, the communes were dissolved and households became the unit of decision-making, reducing the power of villages and directly affecting the provisions of education and healthcare. Not surprisingly, many rural health clinics have disappeared since the rural reform in the 1970s. The number of hospital beds per thousand has declined from 1.50 to 1.11 from 1985 to 1998 (Table 1). To fill the vacuum, in 1984, the government authorized private medical practices in rural areas. Because private medical practitioners provide their services according to patients' ability to pay, an increasing number of people have had to bear the full cost of medical care. The share of out-of-pocket expense in medical care for China as a whole increased from 16% in 1980 to 38% in 1988 to 61% in 2001 (Table 2). Table 3 shows that in 1998 the self-paid share in total health expenses was much greater for rural than for urban areas. After the reforms, most rural residents have been left out of healthcare coverage of any kind and paying for a health visit has become the norm. A special report in Economist (2004) points out that even immunization is not free in many parts of China.

Table 4 compares some key indicators among several Asian countries. China's performance on literacy and infant mortality rate is more like a middle income country than many developing countries, and better than India. However, there are huge disparities

Table 4
International comparisons on key indicators

Country	GDP per capita (current PPP dollars)	Infant mortality rate (deaths per 1000)	Illiteracy rate (%)	Ranking based on health expenditure per capita in international dollars	Ranking of overall health systems performance
China	3740	32	15	139	144
India	2730	68	43	133	112
Indonesia	2970	35	13	154	92
Korea, Rep.	14,720	5	2	31	58
Malaysia	9100	8	13	93	49
Philippines	3790	30	5	124	60
Singapore	23,700	3	8	38	6
Thailand	6230	25	5	64	47

Data in the second to fourth columns are for 2000 and from the World Development Indicators (World Bank, 2003). The last two columns are from Annex Table 1 of the World Health Report (WHO, 2000).

in the distribution of access to health care. In rich areas, such as Shanghai, health indicators are on par with many western countries. In western China, such as Guizhou, they are those of African countries. According to the World Health Organization (WHO), health expenditure per capita in international dollars ranks only at 139th, comparing to 133rd in India although China has a higher GDP per capita measured in PPP. The ranking of overall health system performance, which takes into account the fairness of access to health care and individual contribution cost, puts China at the 144th place, behind India's 112th place and far behind other Asian countries listed in Table 4. In a word, although China's health indicators are comparable to countries at the similar development level, the trend and distribution are more worrisome.

Although contested elections have been introduced over the past two decades partly in attempt to improve the efficiency of public goods provision, the gains are not significant for at least two reasons (Zhang, Fan, Zhang, & Huang, 2004). First, privatization has made taxation or levies on rural enterprises more difficult. Second, in many villages, the power is not shared between the party secretary and the elected village head, limiting the impact of elections. It is likely that the increasing rural income inequality would translate into increasing health inequality, as villages do not have much fiscal power to provide public goods and service in poor areas under the current fiscal arrangement.

In cities, many people's livelihood is wrapped up with the fate of state-sector jobs. Unlike the simple objective of profit maximization in private enterprises, state owned enterprises (SOEs) have to bear multiple responsibilities of efficient production and social welfare provision (Bai, Li, Tao, & Wang, 2001). With greater integration of China into the world market, it becomes increasingly difficult for SOEs to compete with multinationals and private enterprises because of their full range of social obligations. In the initial stage, the government could afford to subsidize the SOEs through low-interest loans. But with the increasing burden of loss, government's support to SOEs has declined. Therefore, since the mid-1990s, the government has carried out ambitious reforms to reduce the noneconomic burden of SOEs by allowing bankruptcy and more open unemployment. Since then, many SOEs have laid off workers and cut health and other benefits. To provide new impetus to the SOEs, the government has launched a series of urban reforms since the late 1980s. The central theme is to transfer welfare-provision obligations such as healthcare and housing from enterprises to social insurance agencies and individuals (China Development Report, China State Statistical Bureau, 1997). Although China has made progress in reforming the healthcare and pension system, a well-functioning social safety net is still far from being in place (Liu, Wu, Peng, & Wu, 2001). Therefore, the liberalization of the urban welfare system may have made some disadvantaged groups more vulnerable to sudden shocks such as catastrophic illness.

Similar to healthcare, both rural and urban residents are increasingly relying on themselves to pay for education. Table 5 lists the sources for education expenditure, showing that the out-of-pocket education expenses have increased significantly. The government's share in total education expenditure declined from 64.6% in 1990, when the data were first available, to 53.1% in 1998, while the share of tuitions and incidental fees rose from 2.3% to 12.5% in the 9-year period. With the increasing out-of-pocket expenses on education, children in the poor families may have difficulties in finishing the basic 9-year schooling, likely leading to more uneven access to education.

Table 5
Sources of education expenditure

Year	Total education expenditure (100 million yuan)	Government budget (%)	Social expenditure (%)	Tuitions and incidentals (%)
1990	659.4	64.6	33.1	2.3
1991	731.5	62.8	34.6	2.5
1992	867.1	62.1	35.0	2.9
1993	1059.9	60.8	36.2	3.0
1994	1488.8	59.4	36.7	4.0
1995	1878.0	54.8	40.9	4.4
1996	2262.3	53.6	41.3	5.1
1997	2531.7	53.6	40.8	5.6
1998	2949.1	53.1	34.4	12.5

Source: Calculated by authors based on Table A-14 in *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000), p 14.

This completes our discussion of the institutional changes in education and health care provision in China since the start of the reform process. Sen (1992, 2000) expresses concerns about the social inequality consequences of these policy changes for two reasons. First, social development is the end of economic development and therefore a highly uneven distributional outcome of social development is not desirable in itself. Second, considering that the rather equal distribution of human capital was regarded as a key to China's success in economic reform, the uneven social development may have a long-term negative impact on economic growth. We now turn to the evolution of inequality in health and education indicators, viewing them through the lens of spatial inequality.

3. Spatial inequality in education and health over the long run

We are interested in the evolution of social inequality in China over the long run, comparing the planned era with the more recent era of market reforms. As noted in Kanbur and Zhang (2005), although the ideal requirement for this exercise is household level survey data stretching back over 50 years, such data is simply not available for China. Analysts focusing on interpersonal inequality as revealed by household survey data have had to analyze much shorter periods or with severely restricted regional coverage—a few years for a few provinces, and mainly in the recent period. An alternative approach, as in Kanbur and Zhang (2005), is to view inequality through the lens of spatial inequality, meaning by this variations across provinces, sub-divided by rural and urban areas. Apart from the fact that such regional inequality is interesting in its own right, the advantage of taking this perspective is that data is more readily available at the national level for much longer periods. As shown in Kanbur and Zhang (2005) and in Table 6, regional income inequality calculated at the provincial level with a rural–urban divide has increased. The Gini coefficient rose from 29.3% in 1978 to 25.6% in 1984 and then to 37.2% in 2000. The question for this paper, however, is:

Table 6
Regional inequality

Year	Gini
1978	29.3
1979	28.6
1980	28.2
1981	27.0
1982	25.6
1983	25.9
1984	25.6
1985	25.8
1986	26.8
1987	27.0
1988	28.2
1989	29.7
1990	30.1
1991	30.3
1992	31.4
1993	32.2
1994	32.6
1995	33.0
1996	33.4
1997	33.9
1998	34.4
1999	36.3
2000	37.2

The figures for Gini coefficients are calculated based on population weighted per capita expenditure at the provincial level with a rural–urban divide. The data sources for 1978–1998 and 1999–2000 are *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000) and *China Statistical Yearbook* (China State Statistical Bureau, 2000 and 2001), respectively. See Kanbur and Zhang (2005) for details of the calculation.

what has happened to social inequality? We look at the spatial inequality of education and health outcomes in turn.

3.1. Education inequality

Focusing on the years for which census data is publicly available at the national level, we initially arrive at illiteracy rates for rural and urban areas and for females and males for the years 1981, 1990 and 2000. The illiteracy rate for 1981 is defined as the number of illiterate per hundred people who are 12 years old and above. The definition changes to 15 years old and above in the censuses of 1990 and 2000. Because the censuses do not report the aggregate illiteracy rate in coastal and inland areas, we compute it using data at the provincial level with population as weights. The upper panel of Table 7 presents the levels of illiteracy for overall, rural, urban, inland, coastal, females, and males in China. Several striking features stand out from the table. First, the illiteracy rate has declined steadily over the years, reflecting the success of 9-year compulsory education and the high primary-school enrollment rate. Second, there exist large rural–urban and gender-gaps. In 2000, the rural illiteracy rate was more than double of the urban illiteracy rate. The illiteracy rate

Table 7
The levels of illiteracy rate and infant mortality rate (IMR)

Year	National	Rural			Urban			Rural/urban	Inland	Coast	Inland/coast	Female	Male	Female/male
		Total	Female	Male	Total	Female	Male							
Illiteracy rate														
1981	31.9	34.8	49.1	21.1	16.4	24.6	8.9	2.1	33.7	29.1	1.2	45.3	19.2	2.4
1990	22.2	26.2	37.1	15.7	12.0	18.4	6.1	2.2	23.8	19.6	1.2	31.9	13.0	2.5
2000	15.1	19.9	27.9	12.1	8.7	13.2	4.1	2.3	16.0	13.9	1.2	21.6	8.8	2.5
IMR														
1981	36.6	39.1	38.1	40.0	23.6	22.4	24.8	1.7	44.5	24.4	1.8	35.7	37.6	1.0
1990	30.5	32.4	34.9	30.0	19.1	19.5	18.8	1.7	35.8	17.2	2.1	30.6	26.8	1.1
2000	24.1	30.8	36.7	25.8	11.0	13.5	10.3	2.8	26.8	13.6	2.0	28.4	20.5	1.4

For data sources, see Appendix A. The 1981 census defines the illiteracy rate using age 12 as a benchmark, while other two censuses refer to those people 15 years old and above. Therefore, they may not be totally comparable.

among females is more than twice as high as the male illiteracy rate, suggesting a strong gender bias against girls. The illiteracy rate in inland areas is about 15% higher than that in coastal areas.

Table 8 further displays the spread in the illiteracy rate across rural and urban areas, with the Gini and Generalized Entropy (GE) as inequality measures. The GE family of measures is discussed further in Zhang and Kanbur (2001)—the specific member of the family used in this paper is the famous Theil measure of inequality. Inequality is calculated using the population weighted values of illiteracy for spatial units. In the top panel of Table 8, the first two columns show that the Gini and the GE at the national level increased from 1981 to 2000. The same pattern holds true for inequalities across rural, urban, inland, coastal, female, and male population. It seems that the regional variation in health outcome has enlarged over the reform period in all dimensions.

As is well known, the GE family of inequality measures can be decomposed into the sum of a within and a between group component, for any given partitioning of the population into mutually exclusive and exhaustive groups. Table 8 also presents the evolution of the between group components of inequality. The female–male component is larger than the rural–urban and inland–coastal components. Using the overall inequality and between-inequality, we can calculate the polarization index following the method outlined by Zhang and Kanbur (2001).[2] As shown in the last column in Table 8, illiteracy rate is mostly polarized along the gender line although it has decreased from 59.0 in 1981 to 44.6 in 2000. The rural and urban areas became increasingly polarized from 17.8 in 1981 to 25.7 in 2000.

The above inequality analysis offers a snapshot for each of 3 years. To check whether the findings are robust over a long continuous period, we calculate regional inequality in rural illiteracy rate from 1978 to 1998, when the data at provincial level are available in

[2] The polarization index is defined as the ratio of between-inequality to within-inequality.

Table 8
Regional inequality in illiteracy rate and infant mortality rate (IMR)

Year	National Gini	National Theil	Rural	Urban	Rural–urban	Rural–urban/ total	Inland	Coast	Inland–coast	Inland–coast/ total	Female	Male	Female–male	Female–male/ total
Illiteracy rate														
1981	30.3	14.5	11.5	17.3	2.6	17.8	13.0	16.5	0.2	1.7	4.8	8.6	8.6	59.0
1990	33.7	18.1	12.7	17.5	4.7	26.0	17.5	18.0	0.4	2.4	7.0	12.8	9.3	51.4
2000	36.5	21.3	13.8	23.9	5.5	25.7	19.8	23.6	0.2	1.1	9.8	16.7	9.5	44.6
IMR														
1981	27.0	11.9	10.9	7.3	1.3	11.1	9.6	3.7	3.8	31.6	11.3	12.3	0.0	0.3
1990	29.6	14.1	12.6	8.0	2.4	16.7	9.9	4.8	5.4	38.1	14.5	13.6	0.2	1.6
2000	36.7	22.5	17.8	13.7	8.1	35.9	19.5	11.5	4.6	20.6	23.2	18.8	1.2	5.1

For data sources, see Appendix A. The GE measure is parameterized so as to make it the Theil measure of inequality. National inequality in illiteracy and infant mortality rate (IMR) are calculated using population at the provincial level a rural–urban and gender divide. Rural–urban, female–male, inland–coastal polarization indexes are defined as the ratio of between-group GE to within-group GE. For a discussion of polarization measures, see Zhang and Kanbur (2001).

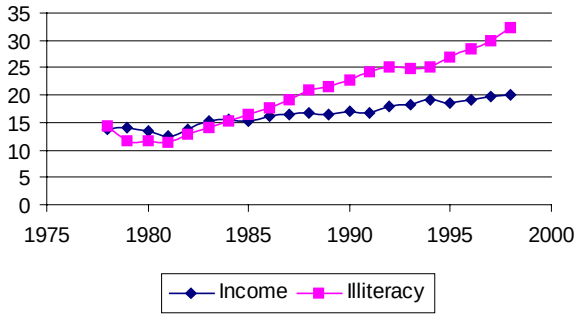

Fig. 1. Twenty years of rural inequality in income and illiteracy rate. The income inequality measure is the Gini coefficient, calculated by authors based on population weighted per capita expenditure at the provincial level in rural areas. The data are from *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000). The illiteracy inequality measure is also the Gini coefficient, calculated from population weighted province level data on rural illiteracy rates. The data source is *China Rural Statistical Yearbook* (China State Statistical Bureau, various issues).

various issues of *China Rural Statistical Yearbook*. Fig. 1 graphs the regional Gini coefficients of per capita income and illiteracy rate. As clearly shown in Fig. 1, the regional inequality in illiteracy across rural areas has increased, consistent with the analysis based on data at the county and district level as shown in Table 7. The rural regional income inequality, measured by the Gini coefficient, increased from 13.7% to 24.1% in the period of 1978–1998, but the Gini coefficient of rural illiteracy worsened even more rapidly, from 14.5% to 32.4%.

Fig. 2 plots the evolution of regional inequality in the provision of primary and secondary education. We calculate the Gini coefficients of student/teacher ratios in the two sectors using provincial data. The inequalities in the two ratios show a similar pattern, except for the Cultural Revolution period (1966–1976) when the middle school education system was disrupted. The regional inequality in the provision of public education has

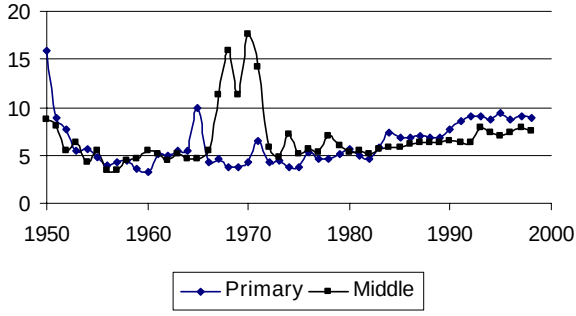

Fig. 2. Regional inequality in student/teacher ratio. The figure reports regional Gini coefficients of student–teacher ratios in primary and secondary schools calculated by authors based on population weighted provincial data from *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000).

increased since the late 1970s, reflecting the fiscal decentralization policy in the reform period.

3.2. Health inequality

Similar to education inequality, we first look at the health outcomes using more disaggregated population census or survey data. The lower panel in Table 6 reports the levels of infant mortality rate (IMR), defined as the number of infant deaths per thousand births. For China as a whole, IMR declined dramatically from the 1960s to 1980s and then leveled off. With careful adjustment, Banister and Hill (2004) even find that the mortality risks of girls at the national level in infancy increased from 1990 to 2000. IMR in rural areas was significantly higher than in cities and the gap widened from 1.5 in 1981 to 2.1 in 2000. The ratio of female to male IMR increased dramatically from 0.9 to 1.3 over the same period. More seriously, female IMR in rural areas rose from 34.9 to 36.7 in the period of 1990–2000. These probably reflect an outcome of family planning policy, as rural residents in general prefer to have boys.

Using the data set, we can further examine the regional distribution of IMR. As shown in the lower panel of Table 7, overall regional inequality increased from 1981 to 2000, so did the within-rural, within-urban, and between rural–urban inequalities. It seems that the regional variation in health outcomes has enlarged over the reform period in both rural and urban areas.

To understand the driving forces behind the observed changes in health outcome, we further investigate the distribution of healthcare provision. Based on the last four columns of Table 1, we graph the urban–rural ratios of healthcare personnel and hospital beds per thousand people in Fig. 3. Fig. 3 shows that the density of healthcare personnel and facilities in cities has been much higher than that in rural areas. For example, in 1980, hospital beds and healthcare personnel per 1000 people in cities were 4.57 and 7.82, respectively, compared to 1.48 and 1.81 in rural areas. Moreover, as shown in Fig. 3, the gap between rural and urban areas has grown. The enlarging difference in access to healthcare appears to be a contributing factor to the widening gap in IMR between rural and urban residents.

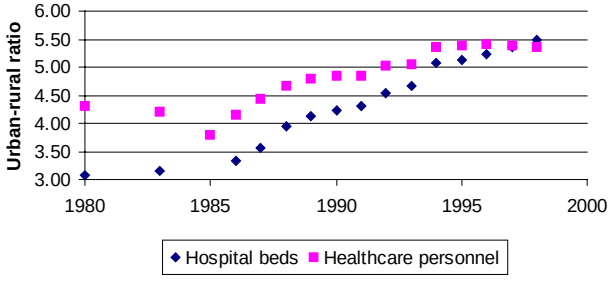

Fig. 3. Urban–rural ratios in hospital beds per thousand people and healthcare personnel per thousand people. The vertical axis measures the urban–rural ratios of hospital beds per thousand people and healthcare personnel per thousand people, based on data at the national level reported in the last four columns of Table 1.

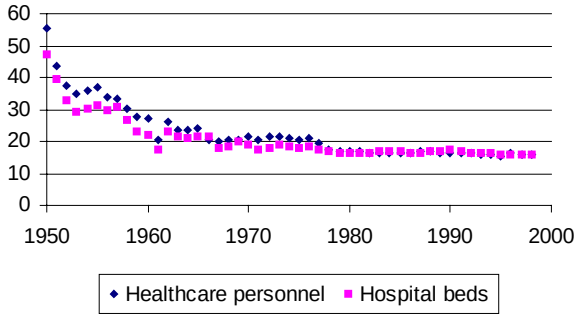

Fig. 4. Regional inequality in healthcare. The vertical axis represents regional Gini coefficients of healthcare personnel and hospital beds per thousand people calculated by authors based on provincial data from *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000).

While Fig. 3 provides a rural–urban comparison at the national level, Fig. 4 graphs the regional distribution of the above two variables using data at the provincial level. Regional inequality declined steadily in the planned era but leveled off since the late 1970s. The picture in Fig. 4 is in contrast to the increasing trend of rural–urban disparity shown in Fig. 3. This is probably due to the fact that the provincial level data used in Fig. 4 does not have a rural–urban divide, masking the large variation in this dimension within a province.

4. Conclusion

In this paper, we have described the institutional and historical background on the public provision of education and healthcare and examined the patterns and evolution of social inequality. In the era of market reforms, the old foundations of education and healthcare provision have eroded. First, the increasing fiscal decentralization has reduced the central government's redistributive power. Many local governments, in particular those in poor regions with insufficient revenues have largely withdrawn from their role in investing in human development. Second, increasing competition has doomed SOEs, as it is difficult to serve well the dual task of profit maximizing and welfare provision. As a result, a large number of SOEs have laid off employees and reduced welfare benefits. Third, weak governance at the village level makes it difficult to finance pubic infrastructure in rural areas. Fourth, governments cannot mobilize vast manpower in public works as they did in the planned era, because labor must be adequately compensated in the market economy.

With this background, we examine the spatial patterns of social development indicators. Not surprisingly, the changing distribution in outcome of education and public health has reflected the evolution of underlying institutions in the process of economic transformation. Social inequalities in rural, urban, inland, and coastal areas all have increased since the economic reforms. In particular, the rural–urban gap in IMR is increasing and the gender gap in literacy is still large.

It has been argued by many observers that to ensure a long-term sustainable development, China should adopt a broad-based development strategy. A healthy and

well-educated labor force is a key asset to ensuring China's success in incorporating the challenges of WTO accession. However, the increasing economic integration will greatly intensify market competition, which will likely further weaken the central government's ability to redistribute wealth among provinces, and it will reduce the role of SOEs as social welfare providers. In addition, the increasing shocks associated with global integration may further worsen social inequality. Moreover, increasing social inequality may increase social instability, which in turn affects economic growth. The facts of social inequality presented in this paper call for more attention to improving the mechanisms of education and healthcare provision and reforming the fiscal arrangement between local and central governments so as to ensure more equitable education and health outcomes. In other words (UNDP, 2000), the state should play a more "substantial and vigorous role" in providing education and health care.

Appendix A

Per capita expenditure, population, hospital beds, healthcare personnel, school enrollment, teacher–student ratios, and education expenditures prior to 1999 are from *Comprehensive Statistical Data and Materials on 50 Years of New China* (China State Statistical Bureau, 2000). The information on per capita expenditure and population for 1999 and 2000 are from *China Statistical Yearbook* (China State Statistical Bureau, 2000 and 2001). The healthcare coverage data in 1998 is from *China Health Yearbook 1999* (Ministry of Health, 1999) and the sources of health expenditures are *China: Long-Term Issues and Options in the Health Transition* (World Bank, 1992) and the website of Ministry of Health, http://www.moh.gov.cn/statistics/digest03/t28.htm.

The illiteracy and IMR are compiled from published provincial and national statistical volumes of the population censuses of 1981, 1990 and 2000. The official data report illiteracy and IMR rate at the provincial level with a rural–urban and gender disaggregation for each province. When calculating regional inequality in illiteracy and IMR, we use the corresponding population as weights. The rural illiteracy data at the provincial level annually from 1978 to 1998 is from *China Rural Statistical Yearbook* (China State Statistical Bureau, various issues).

Banister and Zhang (2005) find that the infant mortality rates reported from the census are lower than those from a large annual survey conducted by the China's Ministry of Health, which is specially designed to get unusually complete death reporting. This survey estimated that China's infant mortality rate was 50.2 infant deaths per thousand live births in 1991 and 32.2 in 2000 (China National Working Committee on Children and Women, 2001, p. 28). The World Development Indicator (World Bank, 2003) reports the higher figure from the second source, as shown in Table 4. Comparing the survey results in 1991 and 2000 with census results in 1990 and 2000, if assuming that the survey infant mortality data are accurate, we can conclude that infant deaths may have been only about 61% reported for 1990 in the 1990 census and over 70% reported in the 2000 census. However, without access to the survey data at the disaggregate level, we cannot make use of them for inequality measures. Considering that the two data series share similar trends, therefore the impact on the accuracy of inequality measures may not be that serious.

References

Aaberge, R., & Li, X. (1997). The trend in urban income inequality in two Chinese provinces, 1986–90. *Review of Income and Wealth*, *43*(3), 335–355.

Bai, C., Li, D. D., Tao, Z., & Wang, Y. (2001). A multi-task theory of state enterprise reform. *The William Davidson Institute Working Paper*, *vol. 367*. Beijing: University of Michigan.

Banister, J., & Zhang, X. (2005). China, economic development and mortality decline. *World Development*, *33*(1), 21–41.

Banister, Judith, & Kenneth, Hill. (2004). Mortality in China. *Population Studies*, *58*(1), 55–75.

Chen, S., & Martin, R. (1996). Data in transition: Assessing rural living standards in southern China. *China Economic Review*, *7*(1), 23–56.

China National Working Committee on Children and Women. (2001). *Report of the People's Republic of China on the development of children in the 1990s*. Beijing: China State Council.

China State Statistical Bureau (SSB). (1997). *China development report*. Beijing: China Statistical Press.

China State Statistical Bureau (SSB). (2000). *Comprehensive statistical data and materials on 50 years of new China*. Beijing: China Statistical Press.

China State Statistical Bureau (SSB). (2000 and 2001). *China statistical yearbook*. Beijing: China Statistical Press.

China State Statistical Bureau (SSB). (various issues). *China rural statistical yearbook*. Beijing: China Statistical Press.

Chinese Academy of Social Sciences (CASS). (2005). *Blue report on social development in China*. Beijing: China Social Science Literature Publishing House.

Démurger, S., Sachs, J., Woo, W., Bao, S., Chang, G., & Millinger, A. (2002). Geography, economic policy and regional development in China. *Asian Economic Papers*, *1*(1), 146–197.

Economist. (2004). *Special report: China's health care*. August 21st.

Fan, S., Zhang, L., Zhang, X. (2002). *Growth, inequality, and poverty in rural China: The role of public investments*. International Food Policy Research Institute (IFPRI) Research Report 125. Washington, DC.

Hussain, A., Lanjouw, P., & Stern, N. (1994). Income inequalities in China: Evidence from household survey data. *World Development*, *22*(12), 1947–1957.

Kanbur, R., & Zhang, X. (1999). Which regional inequality: The evolution of rural–urban and coast–inland inequality in China. *Journal of Comparative Economics*, *27*, 686–701.

Kanbur, R., & Zhang, X. (2005). Fifty years of regional inequality in China: A journey through revolution, reform and openness. *Review of Development Economics*, *9*(1), 87–106.

Khan, A. R., K.G., Riskin, C., & Zhao, R. (1993). Sources of income inequality in post-reform China. *China Economics Review*, *4*(1), 19–35.

Lin, J. Y., Cai, F., & Li, Z. (1996). *The China miracle: Development strategy and economic reform*. Hong Kong: The Chinese University Press.

Liu, G., Wu, X., Peng, C., Wu, A. (2001). *Urbanization and access to health care in China*, paper presented at the International Conference on Urbanization in China: Challenges and Strategies of Growth and Development, June 26–28, Xiamen, China.

Lyons, T. P. (1991). Interprovincial disparities in China: Output and consumption, 1952–1987. *Economic Development and Cultural Change*, *39*(3), 471–506.

Ministry of Health. (1999). *China heath yearbook 1999*. Beijing: People's Health Publishing Press.

Sen, A. (1992). Life and death in China: A reply. *World Development*, *20*(9), 1305–1312.

Sen, A. (2000). *Development as freedom*. New York: Random House Inc.

Tsui, K. (1991). China's regional inequality, 1952–1985. *Journal of Comparative Economics*, *15*(1), 1–21.

United Nations Development Programme (UNDP). (2000). *China human development report 1999: Transition and the state*. Oxford University Press.

West, L. A., & Wong, C. P. W. (1995). Fiscal decentralization and growing regional disparities in rural China: Some evidence in the provision of social services. *Oxford Review of Economic Policy*, *11*(4), 70–84.

World Bank. (1992). *China: Long-term issues and options in the health transition*. Washington, DC: World Bank.

World Bank. (2000). *China: Overcoming rural poverty.* Washington, DC: World Bank.

World Bank. (2003). *World Bank development indicators*. Washington, DC: World Bank.

World Health Organization (WHO). (2000). *World health report*. Geneva: World Health Organization.
Yang, D. T. (1999). Urban-biased policies and rising income inequality in China. *American Economic Review (Paper and Proceedings)*, *89*(2), 306–310.
Yu, D. (1992). Changes in health care financing and health status: The case of China in the 1980s. *Economic Policy Series*, *vol. 34*. Geneva: International Child Development Centre, UNICEF.
Zhang, X., & Kanbur, R. (2001). What difference do polarisation measures make? An application to China. *Journal of Development Studies*, *37*(3), 85–98.
Zhang, X., Fan, S., Zhang, L., & Huang, J. (2004). Local governance and public goods provision in rural China. *Journal of Public Economics*, *88*(12), 2857–2871.