Within-urban inequality and the urban-rural gap in China

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Abstract

This paper investigates the underlying determinants of China's income inequality within the urban areas and the gap between urban and rural areas. Based on a set of Chinese provincial data over the period of 1990-2001 and applying fixed effects, random effects, as well as GMM methods, this paper finds that the reduction in state sector, the flow of foreign capital, and increasing urbanization increased both within-urban inequality and the urban-rural income gap. While the role of education in the urban-rural disparity is not significant, it appears highly significant in the increasing within-urban inequality. Economic growth has positively significant (but not robust) impact on the urban income inequality, whereas it has negative (but not significant) impact on the urban-rural income disparity. The gap between urban and rural areas also increased with higher inflation and the reduction of fiscal expenditure on agriculture. In addition, provinces farther from the coast experienced larger inequality both within-urban and between the urban and rural areas.

Key words: China, income inequality, within-urban, urban-rural gap
JEL classifications: D31, O15, O53, R12

1. Introduction

Ever since China's reform and open door policy started in the late 1970s, the Chinese economy has continuously shown a remarkable economic performance, with an average annual economic growth rate of 9 percent or so. But meanwhile, China shows a trend of rising inequality that is among the fastest growing in the world. According to the data released by National Bureau of Statistics of China (NBSC), China's Gini coefficient of household income was 0.21 in 1978, and it reached 0.465 in 2005, higher than the internationally accepted warning level of 0.4.[1] This positive correlation between growth and inequality seems to support Kuznets's (1955) inverted U-curve hypothesis. China is being transformed from a country with high equality in income distribution to one with high inequality.

Widening gap in China's overall inequality is due to increase in within-urban and within-rural inequalities, and the inequality between urban and rural sectors. Studies on China's inequality using decomposition method show that the urban-rural gap is the main driving force for increased overall inequality (Tsui, 1993; Kanbur and Zhang, 1999; Shi, 2004; Sicular et al., 2007).

This article revisits the issue on income inequality in post-reform China. It investigates the factors underlying inequality within the urban areas and between urban and rural areas using a panel data set of covering 26 provinces over the period of 1990-2001. First, this paper examines the determinants of the within-urban inequality with Gini coefficient as the dependent variable, and compares the result with other results of studies on China's urban income inequality, especially with the result of Xu zand Zou (2000). Second, it analyzes the determinants of the inequality between urban and rural sectors with the urban-rural income ratio as the dependent variable. Third, it compares the factors underlying inequality within the urban areas with ones underlying inequality between urban and rural areas. Fixed effects, random effects, as well as the classic one-step difference GMM (Generalized Method of Moments) techniques are used in this empirical work.

The paper is organized as follows. The next section presents existing literature on China's income inequality. Section 3 provides an overview of income inequality within the urban areas and the inequality between urban and rural areas. Section 4 explains the empirical method and the data. Section 5 presents the results of empirical analysis. Finally, section 6 concludes.

2. Literature review on China's income inequality

A variety of studies have examined China's income inequality either within-urban (Knight and Song, 1991; Khan et al., 1999; Zhou, 2000; Xu and Zou, 2000; Meng, 2004; Okushima and Uchimura, 2005; Démurger et al., 2006) and within-rural (Griffin and Saith, 1982; Knight and Song, 1993; Rozelle, 1996; Yao, 1997; Tsui, 1998; Wan, 2001; Gustafsson and Li, 2002; Morduch and Sicular, 2002; Zhang and Fan, 2004; Wan and Zhou, 2005; Benjamin et al., 2006) or between urban and rural income sectors (Knight and Song, 1999; Kanbur and Zhang, 1999; Yang and Zhou, 1999; Wei and Wu, 2001; Shi, 2004; Wan et al., 2006; Sicular et al., 2007).

First, this paper is related to those on determinants of China's income inequality within the urban sector. In those study, urban income inequality has been analyzed from a variety of

[1] The Gini coefficient standard was set up as a warning system for the study of the wealth inequality by global economists and sociologists. It is a universally accepted gauge to measure whether the gap between the rich and poor is tolerable. The warning level of the system is 0.4.

perspectives such as education (Knight and Song, 1991; Zhou, 2000; Okushima and Uchimura, 2005), inflation (Xu and Zou, 2000), economic growth (Xu and Zou, 2000), and structural changes like privatization (Xu and Zou, 2000; Zhou, 2000) or labor allocation (Meng, 2004).

Using a panel data set about Chinese provincial-urban-level income inequality over the period of 1985-1995, Xu and Zou (2000) find that inequality increased with the reduction of the share of state-owned enterprises in GDP, high inflation, growth, and (less significantly) the increasing exposure to foreign trade. Based on the published results of average incomes of different percentiles for urban residents in each province (World Bank, 1996), they computed the Gini coefficients, the percentage of income of top quintile in total income (Q5), that of bottom quintile (Q1), and that of the third and fourth quintiles (Q34), and the ratio of the percentage of Q5 over that of Q1 (Q5/Q1).

Using panel data of 4,730 urban residents drawn from 20 cities in China, Zhou (2000) examines changes in income determinants between the pre-reform and reform eras, and the findings show significant changes in returns to education and in the rise of private/hybrid firms in the reform era.

Meng (2004) investigates the increase in income inequality in urban China during two phases of economic reform: a moderate reform era (1988-95) and a radical reform era (1995-99). It is found that although income inequality increased considerably during both stages, the nature and causes of the increase are different. In the moderate reform period, the increase in inequality was a result of some parts of society sharing more of the economic gain than others, and the main cause of this inequality is regional income dispersion. During the radical reform period income reduction at the lower end of the distribution is observed, and it is mainly due to the large-scale unemployment generated by labor reallocation.

Okushima and Uchimura (2005) report the results of an analysis of changes in income inequality, and in its determinants, in urban China. Micro data for 1988 and 1995 are used in this analysis. These data based on a large household survey, which was conducted by the Institute of Economics, Chinese Academy of Social Science, in 1989 and in 1996. It first shows that age was the major factor in inequality in 1988, while education became the important factor in 1995. Second, education significantly contributed to increasing inequality during the period. Third, the higher education-level groups had less within-group inequality.

Second, this paper is also related to studies on determinants of China's income inequality between urban and rural sectors. The sources of the urban-rural income gap such as labor allocation (Yang and Zhou, 1999), education (Sicular et al., 2007), globalization (Wei and Wu, 2001), and economic growth (Wan et al., 2006) were found in those literature.

Combining polynomial inverse lag (PIL) framework with simultaneous systems of equations, Wan et al. (2006) analyze the growth-inequality nexus in post reform China, finding that this relationship is nonlinear and is negative irrespective of time horizons. In their work, regional urban-rural income ratio was used to measure inequality.

Wei and Wu (2001) construct a measure of urban-rural income ratio for 100 or so Chinese cities (urban areas and adjacent rural counties) over the period 1988-1993. The central finding is that cities that experience a greater degree of openness in trade also tend to demonstrate a greater decline in urban-rural income inequality. Thus, globalization has help to reduce, rather than increase, the urban-rural income inequality.

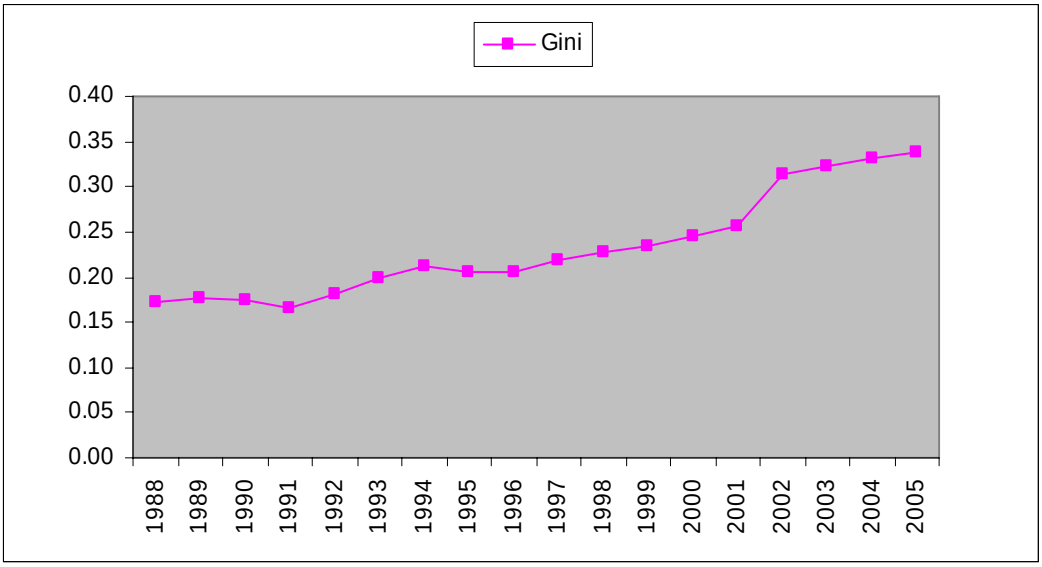
Yang and Zhou (1999) examine China's rural-urban segmentation and its causes, and find this sectoral division is consistent with production function estimates that reveal higher labor productivity in urban/state-owned industries than in rural industries and agriculture. They argue that the precedent of successful rural reforms raised farmer's relative earnings, but the remaining obstacles for an efficient sectoral allocation of labor have prevented China from eliminating dualism. The recent financial policies consisting of urban price subsidies and increased investment credits have also had influential distribution effects biased against the rural sector.

Factors discussed in the above literature, especially in Xu and Zou (2000) such as the share of state-ownership, education, government spending, urbanization, inflation rate, trade globalization and economic growth were included in this empirical work to examine the influencing factors and compare this result with the result of other literature. I also include FDI which was neglected in Xu and Zou (2000).

3. Income inequality in China

China has been achieving an unprecedented and impressive growth over the last three decades. The average per capita GDP growth rate was 9.3 during the period of 1990-2001 (Table 1). But the rapid economic growth has produced income inequality that is among the fastest growing in the world. Between 1990 and 2001, urban income inequality increased by 8.2 points (from 0.175 to 0.257). While the share of income of top quintile in total income rose from 26.6% to 32.6%, bottom quintile's share dropped from 14.4% to 10.8%. The middle class (middle three quintiles) also slightly suffered with the lapse, its claim dropped by 2.3% (from 58.9% to 56.6%). Underlying these figures is an increasing disparity between the rich and the poor. Chart 1 presents the trend of official Gini coefficient for urban china over the last 17 years.

Chart 1
Income inequality in urban China



The urban Gini is calculated by the author based on various volumes of China Statistical Yearbook.

Widening income gap was by no means evenly shared among the provinces. Some provinces, such as Qinghai, Inner Mongolia, Yunnan did not change much. Other provinces, in contrast dramatically raised their Gini: Tianjin (one of the four municipalities) increased its Gini by more than 13 points, Jiangsu by 11.8 points, Liaoning by 10.5 points, Sichuan and Shanghai by 10.3

points (Table 2). It was found that all our sample provinces except Xinjiang raised their Gini during the period of 1990-2001. Xinjiang, located in the northwest corner of China, even improved its Gini by 12.7 points. It is a special case.

Increasing income inequality was not only exhibited at the urban level, but also between the urban and rural sectors, the largest contributor to China's overall income inequality. The urban-rural income ratio increased by 0.6 from 2.3 in 1990 to 2.9 in 2001, and reached 3.2 in 2005. Chart 2 shows the trend of the ratio of urban to rural income. It shows that the urban-rural income differentials decreased between 1994 and 1997, but then have continually increased historically high levels. The provinces exhibited a large difference in their urban-rural income gap. While the ratio of urban to rural income was 1.7 for Shanghai, 1.8 for Jiangsu, 1.9 for Heilongjiang, it was 4.0 for Yunnan, 3.6 for Guizhou, 3.2 for Shaanxi, 3.1 for Xinjiang. The correlation between urban-rural income ration and urban Gini was 0.23 (Table 3).

Chart 2
The urban-rural income ratio

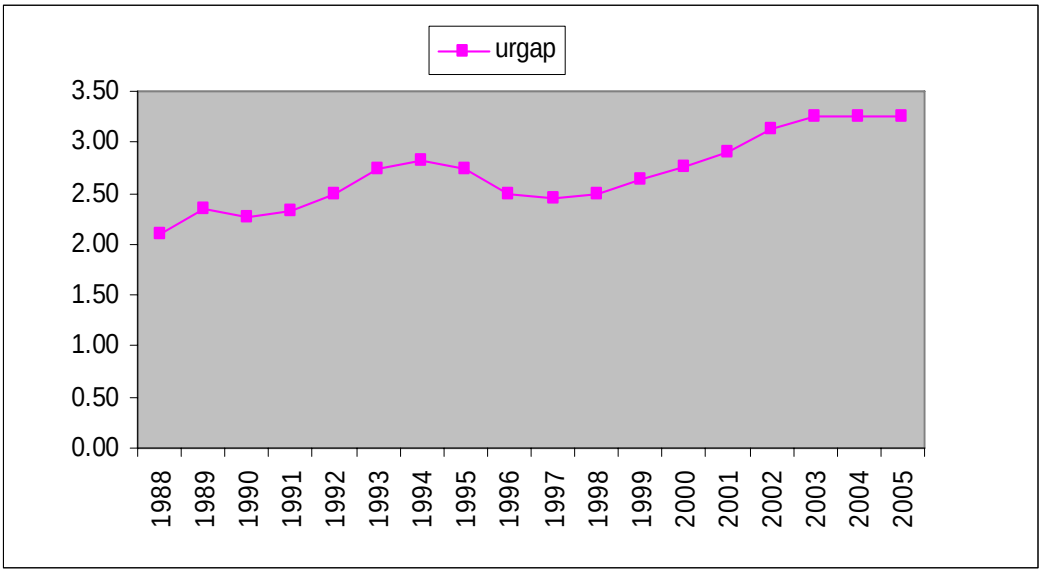


Table 1
Descriptive statistics of used variables

Variable	Obs	Mean	Std. Dev.	Min	Max
GINI	312	0.22	0.04	0.05	0.39
URGAP	312	2.55	0.64	1.14	4.55
COAST	312	0.46	0.50	0.00	1.00
GDPGR	312	9.30	4.93	-6.77	37.75
EDU	312	87.81	9.54	57.60	100.89
INFL	312	7.13	8.10	-3.20	26.90
SOE	312	20.98	11.99	6.40	58.01
TRADE	312	28.07	38.97	3.17	232.71
FDI	312	3.39	4.50	0.00	24.19
GOVEXP	312	11.92	4.70	4.92	33.66
AGREXP	312	8.14	2.78	2.44	15.48
URBAN	312	28.42	15.56	12.26	75.30
URBANGR	312	1.92	1.91	-2.98	11.07

See the appendix for the definitions of the variables.

Table 2
Statistics for used variables by province for the period of 1990 to 2001

	GINI		URGAP		GDPGR		EDU		INFL		SOE	
	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)
Beijing	0.212	0.068	1.95	0.93	7.91	10.51	99.04	0.26	9.58	-2.30	51.21	-19.60
Tianjin	0.223	0.131	1.98	0.74	9.64	9.64	96.37	0.06	7.73	-1.80	37.07	-21.06
Hebei	0.200	0.071	2.34	0.08	10.73	8.41	90.36	17.52	5.75	-0.10	15.17	-4.90
Shanxi	0.229	0.083	2.47	0.61	7.55	8.07	87.82	12.68	7.03	-2.40	23.68	-7.23
Inner Mongolia	0.230	0.044	2.33	0.87	8.54	4.05	84.40	6.20	8.32	-19.70	26.48	-12.15
Liaoning	0.207	0.105	1.98	0.40	8.00	11.35	93.50	3.50	6.80	-3.10	30.41	-14.97
Heilongjiang	0.223	0.093	1.90	0.77	7.54	0.99	89.84	12.77	6.91	-4.90	35.84	-20.40
Shanghai	0.202	0.103	1.66	1.05	9.25	15.52	99.25	-1.10	8.80	-6.30	39.33	-26.79
Jiangsu	0.213	0.118	1.84	0.46	12.09	10.03	92.80	15.90	6.83	-2.40	14.18	-4.46
Zhejiang	0.208	0.084	2.01	0.54	12.87	7.14	95.77	15.06	7.03	-2.30	9.96	-4.60
Anhui	0.206	0.068	2.84	0.33	9.96	3.31	84.41	22.49	6.97	-2.20	10.33	-4.26
Fujian	0.212	0.058	2.25	0.20	12.93	7.28	87.58	31.94	5.98	-0.60	13.10	-6.49
Jiangxi	0.215	0.054	2.08	0.66	9.78	6.26	85.03	28.34	6.57	-2.60	15.12	-5.24
Shandong	0.198	0.072	2.34	0.39	11.63	9.34	90.47	22.40	6.83	-1.60	13.30	-2.58
Henan	0.219	0.052	2.47	0.31	9.42	6.19	83.39	29.47	5.73	0.00	11.61	-4.63
Hunan	0.219	0.102	2.84	0.57	8.96	4.44	88.31	26.51	7.36	-1.30	12.37	-4.17
Guangdong	0.235	0.059	2.59	0.56	11.81	16.03	92.76	8.56	5.78	1.80	14.32	-7.05
Guangxi	0.216	0.084	2.96	0.97	10.54	-2.76	81.26	23.02	6.54	-0.50	11.12	-3.68
Hainan	0.251	0.074	2.68	0.04	10.36	1.05	83.03	19.11	6.54	-3.60	25.89	-13.09
Sichuan	0.227	0.103	3.08	0.47	9.04	2.83	85.12	30.93	7.40	-1.70	10.79	-4.00
Guizhou	0.223	0.088	3.63	0.53	6.73	-0.12	68.60	23.09	7.28	0.00	9.76	-4.02
Yunnan	0.201	0.048	3.95	1.67	7.56	0.24	73.60	20.43	7.33	-3.70	11.59	-4.04
Shaanxi	0.226	0.089	3.18	1.21	7.87	7.99	89.00	6.39	7.14	-0.30	17.66	-5.28
Qinghai	0.232	0.042	3.08	1.24	6.57	9.11	87.98	-0.26	7.63	-2.50	22.84	-12.20
Ningxia	0.231	0.090	2.85	0.53	7.03	9.51	86.88	2.22	7.44	-3.90	23.36	-9.30
Xinjiang	0.293	-0.127	3.12	1.78	7.62	4.70	86.59	10.55	8.07	-1.00	38.96	-13.58

	TRADE		FDI		GOVEXP		AGREXP		URBAN		URBANGR	
	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)	Mean	X(T)-X(0)
Beijing	117.32	129.37	5.99	2.50	13.06	6.37	4.39	-1.32	65.42	7.40	0.97	0.93
Tianjin	61.22	47.74	8.86	9.06	11.11	-0.18	3.22	-2.26	57.11	2.52	0.39	0.07
Hebei	9.94	-3.58	1.41	0.78	7.86	-0.52	6.08	-1.93	17.22	5.98	2.70	6.79
Shanxi	7.08	5.12	0.85	1.05	11.81	3.48	8.22	-0.35	24.52	5.14	1.81	1.93
Inner Mongolia	9.89	3.62	0.59	0.41	15.94	1.58	11.22	-2.23	32.89	5.04	1.30	1.26
Liaoning	31.71	4.14	3.43	3.04	10.53	1.13	6.63	-1.68	44.41	4.26	0.82	0.37
Heilongjiang	10.38	-2.11	1.16	0.63	10.75	0.47	9.16	-1.21	44.47	3.61	0.71	0.27
Shanghai	72.64	54.81	7.13	6.07	11.21	4.31	3.48	-2.81	71.10	7.90	0.98	0.34
Jiangsu	27.45	30.71	5.54	5.60	6.04	0.68	6.69	0.41	25.87	12.60	4.03	4.78
Zhejiang	26.30	25.46	2.20	2.45	6.64	-0.08	8.52	-2.80	19.07	6.69	2.88	4.84
Anhui	7.77	3.75	1.04	0.78	8.92	3.16	8.04	0.30	17.61	4.98	2.35	2.59
Fujian	48.99	4.37	10.44	4.97	9.20	-4.31	7.55	-2.09	18.87	4.42	1.83	4.20
Jiangxi	7.69	-2.21	1.42	1.44	10.69	1.20	8.97	-5.15	20.44	4.74	1.96	2.37
Shandong	19.62	11.82	2.91	2.61	6.78	-0.21	6.42	1.21	24.02	9.16	3.69	0.58
Henan	4.66	-1.06	0.93	0.62	8.24	-0.56	7.88	-4.70	16.04	6.15	3.54	1.49
Hunan	6.87	-0.31	1.52	1.61	9.41	0.08	8.62	-4.28	17.93	5.32	2.60	1.42
Guangdong	147.71	1.03	11.50	4.53	10.33	2.17	4.48	2.29	28.90	7.96	2.49	1.21
Guangxi	11.48	-2.89	2.85	1.12	11.69	1.29	10.03	-6.64	16.14	4.46	2.50	1.19
Hainan	43.94	-17.20	13.64	2.39	13.36	-2.54	8.49	-2.69	23.76	5.31	1.99	0.56
Sichuan	5.95	2.22	1.05	1.06	9.97	1.44	8.66	-2.42	16.74	6.08	3.08	3.44
Guizhou	5.72	0.98	0.42	0.13	17.30	6.69	9.99	-3.73	13.56	2.67	1.66	3.36
Yunnan	9.29	-0.02	0.47	0.23	20.69	3.83	11.99	-5.43	13.90	3.50	2.22	0.82
Shaanxi	11.14	1.86	1.76	1.04	12.76	4.57	11.28	-2.64	20.79	4.68	1.90	1.81
Qinghai	5.72	0.69	0.15	1.00	22.10	9.17	9.67	-3.60	26.91	-1.45	-0.59	2.89
Ningxia	9.37	8.44	0.56	0.45	19.69	9.05	12.58	-5.83	26.63	5.19	1.78	0.06
Xinjiang	9.96	2.70	0.27	0.02	13.71	0.35	9.44	-4.77	34.52	2.30	0.43	2.48

1. See the appendix for the definitions of the variables.
2. Source: various volumes of China statistical yearbook, provincial statistical yearbooks, China population statistical yearbook and China's National Bureau of Statistics.

Table 3
The correlation matrix of used variables

	GINI	URGAP	COAST	GDPGR	EDU	INFL	SOE	TRADE	FDI	GOVEXP	AGREXP	URBAN	URBANGR
GINI	1.00												
URGAP	0.23	1.00											
COAST	-0.17	-0.49	1.00										
GDPGR	-0.06	-0.06	0.25	1.00									
EDU	0.26	-0.44	0.39	0.08	1.00								
INFL	-0.22	0.12	-0.01	0.36	-0.13	1.00							
SOE	-0.02	-0.41	0.15	-0.11	0.27	0.23	1.00						
TRADE	0.06	-0.25	0.56	0.13	0.35	0.06	0.31	1.00					
FDI	0.14	-0.20	0.61	0.32	0.29	0.17	0.15	0.66	1.00				
GOVEXP	0.21	0.48	-0.41	-0.33	-0.33	-0.15	0.11	-0.10	-0.24	1.00			
AGREXP	-0.05	0.44	-0.60	-0.12	-0.57	0.14	-0.23	-0.57	-0.45	0.37	1.00		
URBAN	0.08	-0.51	0.35	-0.08	0.54	0.03	0.82	0.52	0.30	0.02	-0.55	1.00	
URBANGR	-0.02	0.15	0.09	0.40	-0.02	0.27	-0.38	-0.02	0.11	-0.36	-0.03	-0.31	1.00

See the appendix for the definitions of the variables.

4. Estimation methodology and data

4.1 Methodology

First, I estimate income inequality within the urban areas. The urban Gini equation takes the following form:

$$GINI_{it} = \beta_0 + \beta_1 COAST_i + \beta_2 GDPGR_{it} + \beta_3 EDU_{it} + \beta_4 INFL_{it} + \beta_5 SOE_{it} + \beta_6 TRADE_{it} + \beta_7 FDI_{it} + \beta_8 GOVEXP_{it} + \beta_9 URBAN_{it} + \gamma_{10} URBANGR_{it} + \mu_i + \varepsilon_{it} \quad (1)$$

Where $GINI_{it}$ is the logarithm of urban Gini coefficient in province i in year t, $COAST_i$ is the variable relating to geography of province i, this dummy variable takes on a value of 1 for 12 provinces or municipalities located in the coastal areas,[2] and takes on a value of 0 for the rest. $GDPGR_{it}$ is the real per capita GDP growth rate, and EDU_{it} is the secondary school enrollment rate as the measure of human capital. Inflation rate ($INFL_{it}$), the size of state sector (SOE_{it}), openness ($TRADE_{it}$), foreign direct investment (FDI_{it}), and government consumption ($GOVEXP_{it}$) were included in equation (1) to capture policy. Also controlled is urbanization. In this paper, I used two measures of urbanization, the proportion of nonagricultural population in the total ($URBAN_{it}$) and the growth rate of the share of nonagricultural population of total provincial population ($URBANGR_{it}$). More detailed definitions of these variables are provided in the appendix.

The error term in equation (1) is made up of two components: μ_i and ε_{it}. μ_i represents a province-specific effect: it can be viewed as the collection of factors that are specific to the province, but are not included in regressors. Failure to take these attributes into account is likely to cause an omitted variable bias in the estimation of equation (1). When μ_i is correlated with the included explanatory variables (X_{it}), the fixed effects (FE) model is appropriate. When μ_i is not

[2] They include Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan.

correlated with X_{it}, a random effects model is more efficient than a FE model. I test the correlation by the Hausman test. [3] Equation (1) also includes the time-variant component of the measurement error, which is likely to be associated with the regressors. While time-invariant heterogeneity across members of a panel is eliminated when one employs FE estimates, time-varying effects are not controlled and endogeneity may exist in this model. In order to control for unobserved inter-province or inter-household heterogeneity and the associated omitted variable bias, the time-varying component of the measurement error, as well as for the potential endogeneity, the classic one-step Generalized Method of Moments (GMM) methodology, proposed by Arellano and Bond (1991) is used here. To correct for the time-varying component of the measurement error and the endogeneity bias, this paper instruments all explanatory variables except *COAST* and *INFL* which were considered exogenous in this paper. *COAST* is a purely natural endowment, *INFL* is seen exogenous because the monetary policy was set by the central banks, and unlikely to be correlated with the province-specific time-variant ε_{it} (Xu and Zou, 2000). Values of the contemporary explanatory variables lagged at least twice are used as instruments in the equation in differences.

In order to evaluate whether the GMM model is correctly specified (i.e. whether the used instruments are appropriate), two criteria are used: the Sargan test and the AR(2) test. The Sargan test is the Sargan/Hansen test for over-identifying restrictions, which, under the null of instrument validity, is asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the number of parameters. The AR(2) test is asymptotically distributed as a standard normal under the null of no second-order serial correlation of the differenced residuals, and provides a further check on the specification of the model.

For the income gap between urban and rural areas, I have the following regression model:

$$URGAP_{it} = \gamma_0 + \gamma_1 COAST_i + \gamma_2 GDPGR_{it} + \gamma_3 EDU_{it} + \gamma_4 INFL_{it} + \gamma_5 SOE_{it} + \gamma_6 TRADE_{it} + \gamma_7 FDI_{it} + \gamma_8 AGREXP_{it} + \gamma_9 URBAN_{it} + \gamma_{10} URBANGR_{it} + \nu_i + \rho_{it} \quad (2)$$

Where $URGAP_{it}$ is the ratio of urban to rural income in province i in year t. Here, fiscal expenditure on agriculture ($AGREXP_{it}$) is controlled instead of total government consumption ($GOVEXP_{it}$). The definitions of the rest are the same as described above. In estimating equation (2), FE, RE and the one-step difference GMM methods are also employed. In GMM method, values of the contemporary explanatory variables lagged at least five times are used as instruments in the equation in differences.

4.2 Data

A panel data set covering 26 provinces[4] over the period of 1990-2001 is used to estimate the urban Gini and the urban-rural income gap. Data used in this paper are from various years of

[3] Hausman (1978) constructed a test based on the difference between β^{RE} and β^{FE}. The null hypothesis is that difference in coefficients is not systematic. If the difference is large, FE is preferred.

[4] There are totally 31 provinces or municipalities in China. Among the 31 members, 4 provinces, i.e., Jilin, Hubei, Gansu and Tibet were excluded from the analysis because of the lack of related data for some years. Chongqing was included in Sichuan province before 1997, and it became a municipality since then. In this paper, I put Chongqing in Sichuan province for the convenience of analysis.

China Statistical Yearbook, *China Population Statistical Yearbook*, provincial statistical yearbooks and China's National Bureau of Statistics. Note that all of the variables used are provincial-level. Of course, it is ideal if one use the urban–level data when estimate the determinants of urban income inequality. But unfortunately, it is not feasible for many variables to get urban measures. On the other hand, some variables such as $INFL$, SOE , FDI , $URBAN$, $URBANGR$ have less problems. FDI activities are mainly occurred in urban areas, all state-owned enterprises are located in the urban, inflation rates in urban areas should be quite closely related to provincial ones. Finally, urban population growth is the ideal measure, because we want to see how urbanization itself affected income distribution within the urban sector (Xu and Zou, 2000).

The urban Gini coefficient is calculated based on the reported grouped data of urban household income. These survey data are available from provincial statistical yearbooks. While most provinces divided households by 7 groups, some provinces by 8, and Beijing by 5. For those who have 8 groups, I used only the last 7 groups to reduce inter-provincial bias, but still 5 groups for Beijing. The urban-rural income gap is defined as urban-rural per capita income ratio after deflating urban and rural incomes by regional urban and rural CPIs.

5. Empirical results

Table 4 exhibits the regression results of the urban Gini. First, the results of fixed effects are reported. As shown in column 1, education, the size of state sector, foreign direct investment and urbanization, measured by the proportion of nonagricultural population in the total, have significant impact on urban income inequality. These reflect the penetration of the market mechanism into the Chinese economy, which was induced by the reform policy (Okushima and Uchimura, 2005). The emerging labor market encouraged workers' incomes to be determined more on the basis of their working ability and skills than before. Foreign direct investment has played a special role in credit market. It can create or reduce the imperfection of the credit or capital market in China. The powerful and the rich are in a better position to collude with foreign investors in granting licenses for foreign direct investment and joint ventures. In this way, the powerful and the rich can benefit disproportionally from the rents generated by foreign direct investment (Xu and Zou, 2000). Xu and Zou (2000) also give the explanation of privatization in increasing urban income inequality. According to their theory, the initial rich in the urban sector will become richer through their investment in the private sector; the initial poor will remain poor as the employees of the state sector if they lack political clout and access to credit markets; and the powerful, even without sufficient initial resources, may gain as a result of their access to credit and profitable, money-making opportunities. The role of urbanization in urban income distribution has two. If the migrants are not poor, or they have enough funds to set up private businesses in the urban sector, they can become the new middle class or they may even become the new rich, so their migration from the rural to the urban can improve urban income distribution. But if migrants are very poor, these unskilled peasants may become the new unemployment, or may earn a lower wage in the informal sector than employees in the formal sector. As a result, they become the new poor of the urban sector, and worsen urban income distribution. Our regression result indicates that the most of the migrants are unskilled, poor peasants.

Second, column 2 shows the regression results of random effects. In this case, province-specific time invariant factor, i.e., $COAST$ remains. Intriguingly, provinces located in coastal region had smaller inequality. In addition, another measurement of urbanization, the growth rate of the share of nonagricultural population of total province population is also significant at the

10% significance level, deeply confirms the role of urbanization in increasing urban income inequality. The test result of Hausman indicates that it favors fixed effects.

Finally, column 3 in table 4 shows GMM results. The results are similar to the results of fixed effects. But here, GDP growth rate turns out to be positively significant. This result is consistent with the result of Xu and Zou (2000), indicating that provinces experiencing higher economic growth have experienced more unequal income inequality in urban sector. The reported results of Sargan test and AR(2) test suggest that the used instruments are valid, and there is no evidence of second serial correlation.

Overall, factors relating to economic growth, i.e., education, FDI, the size of state sector and urbanization had significant impact on urban income inequality. Also, provinces with high growth had larger inequality (in GMM model). Compare to Xu and Zou (2000), some difference are significant. In their work, inflation rate and government spending also increased urban income inequality significantly, but in our work, both of them lost their significance, and they are replaced by education and urbanization. Actually, inflation rate was very high during the early period, but it has decreased significantly since 1997, so the impact of inflation on the urban poor has also decreased. As a result, inflation did not change urban income distribution much.

Table 4
Determinants of the urban Gini (dependent variable=the logarithm of the urban Gini coefficient)

	Fixed effects	Random Effects	GMM(FD+IV)
COAST		-0.190	
		(0.000)***	
GDPGR	0.001	0.00002	0.003
	(0.487)	(0.990)	(0.054)*
EDU	0.003	0.007	0.005
	(0.051)*	(0.000)***	(0.000)***
INFL	0.001	-0.001	0.001
	(0.302)	(0.346)	(0.442)
SOE	-0.009	-0.010	-0.007
	(0.000)***	(0.000)***	(0.001)***
TRADE	-0.0001	-0.00002	0.0003
	(0.827)	(0.965)	(0.446)
FDI	0.005	0.013	0.005
	(0.084)*	(0.000)***	(0.080)*
GOVEXP	0.003	0.008	0.003
	(0.354)	(0.005)***	(0.354)
URBAN	0.037	0.007	0.038
	(0.000)***	(0.000)***	(0.000)***
URBANGR	0.002	0.008	0.007
	(0.662)	(0.082)*	(0.088)*
Hausman test		0.000	
Sargan test			0.905
AR(2)			0.662
R^2	0.563	0.508	
Observations	312	312	286
Provinces	26	26	26

1. P-values are given in parentheses.
2. Test values reported are p-values.
3. R^2 reported for FE and RE are R^2 within.
4. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.
5. See the appendix for the definitions of the variables.

Table 5
Determinants of the urban-rural income gap (dependent variable=the urban-rural income ratio)

	Fixed effects	Random Effects	GMM(FD+IV)
COAST		-0.785	
		(0.000)***	
GDPGR	-0.002	-0.003	-0.004
	(0.455)	(0.373)	(0.338)
EDU	0.0005	0.0002	0.007
	(0.855)	(0.937)	(0.152)
INFL	0.020	0.019	0.024
	(0.000)***	(0.000)***	(0.000)***
SOE	-0.035	-0.033	-0.041
	(0.000)***	(0.000)***	(0.000)***
TRADE	0.001	0.001	-0.002
	(0.229)	(0.155)	(0.102)
FDI	-0.0002	0.003	0.027
	(0.972)	(0.654)	(0.000)***
AGREXP	-0.055	-0.047	-0.033
	(0.000)***	(0.000)***	(0.007)***
URBAN	0.007	0.004	0.040
	(0.578)	(0.355)	(0.013)**
URBANGR	0.028	0.027	0.018
	(0.002)***	(0.004)***	(0.077)*
Hausman test		0.001	
Sargan test			0.379
AR(2)			0.723
R^2	0.510	0.508	
Observations	312	312	286
Provinces	26	26	26

1. P-values are given in parentheses.
2. Test values reported are p-values.
3. R^2 reported for FE and RE are R^2 within.
4. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.
5. See the appendix for the definitions of the variables.

Table 5 presents determinants of the urban-rural income gap. Column 1 shows fixed effects regression results. The role of the state (the reduction of SOE sector) is also highly significant, implying the above theory again. The initial rich will become richer through their investment in the private sector; the powerful, even without sufficient initial resources, may gain as a result of their access to credit and profitable, money-making opportunities; and the initial poor will remain poor if they lack political clout and access to credit markets (Xu and Zou, 2000). Because the initial rich and the powerful are mainly urban residents, and most of the poor are powerless, poor peasants, this privatization process widened the income gap between urban and rural sectors. Inflation rate also had positively significant impact on the widening urban-rural income gap through its effect on the poor. In reality, the assets of the urban residents are more diversified (stocks, equities, land ownership, private housing, and business ventures), whereas the poor peasants depend mainly on farm products. Decreasing consumer price index reduced farmers' income, and thus increased the urban-rural income gap. Urbanization, measured by the growth rate of the share of nonagricultural population of the total provincial population had positively significant impact at the 1% significance level. Essentially, urbanization is a cure for the income gap between the urban and rural areas, as Chang (2002) argued "…a cure for this problem is to accelerate urbanization in the short run and to promote the growth of the urban sector in the long

run. Yet, these policies in the short run may further widen the measured income gap." However, the urban sector may not be able to absorb the large rural surplus workers. Therefore it is likely that China will maintain a high level of income inequality for an extended period (Wu and Perloff, 2004). Fiscal expenditure on agriculture is also significant as expected, implying that input in agriculture has helped to reduce the income gap between urban and rural sectors.

Next, random effects results are reported in column 2. The results are the same as fixed effects results, and provinces located in the coastal region exhibited smaller urban-rural income gap. Here, Hausman test also favors fixed effects.

Finally, column 3 shows the results of GMM model. The inflation rate, the role of state, and fiscal expenditure on agriculture are robust, and both measure of urbanization are positively significant. In addition, FDI is significant in this model, implying that the flow of foreign capital has mainly benefited the urban residents with high skills. The test results of Sargan and AR(2) suggest that the used instruments are valid, and there is no evidence of second serial correlation.

Overall, the results of Table 5 suggest the following. Income gap between the urban and rural areas increased with the reduction of SOE share and fiscal expenditure on agriculture, higher inflation rate and FDI share, and increasing urbanization. Provinces farther from the coast had larger urban-rural income inequality. Education, trade globalization and economic growth did not play a significant role in the increasing income inequality between the urban and rural areas during this period. Economic growth has negative, but not significant impact on the urban-rural income disparity. This negative sign is consistent with the result of Wan et al. (2006). Thus, the reduction of SOE share, higher FDI share and increasing urbanization not only increased urban income inequality, but also urban-rural income gap. Provinces farther from the coast not only experienced increasing income inequality within the urban areas, but also widening income gap between the urban and rural areas.

6. Conclusion

This paper has examined the underlying factors of China's income inequality within the urban level and between the urban and rural sectors. Using Chinese provincial data covering 26 provinces over the period of 1990-2001, and applying fixed effects, random effects and one-step difference GMM methods, some important findings by this study are the followings. First, the reduction of state ownership, the flow foreign capital and increasing urbanization have significant impacts on both urban income inequality and the urban-rural income disparity. Second, while the role of education in the urban-rural disparity is not significant, it appears highly significant in the increasing within-urban inequality. Third, inflation rate increased the urban-rural income gap, but has no significant impact on the urban income inequality. Fourth, there exists some evidence (but not robust) that economic growth worsened income distribution in urban areas, whereas it has negative (but not significant) impact on the urban-rural income disparity. Fifth, the gap between urban and rural areas also increased with the reduction of fiscal expenditure on agriculture. Sixth, provinces farther from the coast experienced increasing income inequality either within the urban areas or between the urban and rural areas.

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Appendix: Data

Empirical estimations are based on annual data covering 26 provinces over the period of 1990-2001. Data used in this paper are from various years of *China Statistical Yearbook*, *China Population Statistical Yearbook*, provincial statistical yearbooks and China's National Bureau of Statistics. Variables used in this paper are listed below.

(1) GINI: the urban Gini coefficient.
(2) URGAP: urban-rural income gap. It is defined as urban-rural per capita income ratio. Both urban and rural incomes are deflated by regional urban and rural CPIs. For Shanghai, Beijing and Tianjin, urban and rural CPIs are the same.
(3) GDPGR: the real growth rate of GDP per capita, measured at constant price level.
(4) COAST: a dummy variable. It takes on a value of 1 for 12 provinces or municipalities located in the coastal areas such as Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, Guangxi and Hainan; and takes on a value of 0 for the rest, i.e., Shanxi, Inner Monglia, Heilongjiang, Anhui, Jiangxi, Henan, Hunan, Sichuan, Guizhou, Yunnan, Shaanxi, Qinghai, Ningxia and Xinjiang.
(5) EDU: secondary school enrollment rate.
(6) INFL: the inflation rate, measured by CPI.
(7) SOE: proportion of workers and staff in state-owned entities in the total.
(8) TRADE: (imports + exports)/GDP ratio.
(9) FDI: FDI/GDP ratio.
(10) GOVEXP: government consumption/GDP ratio.
(11) AGREXP: the proportion of provincial fiscal expenditure on agriculture.
(12) URBAN: the proportion of nonagricultural population in the total provincial population.
(13) URBANGR: the growth rate of the proportion of nonagricultural population in the total.

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