Four Alternative Estimates of Surplus Labor and Their Influence on Urban-Rural Inequality in China

Furong Jin *

This study examines the effect of agricultural surplus labor on the urban-rural income gap in post-reform China. Using 29 Chinese provincial data from 1988 to 2011 and applying simultaneous equations, this study finds that surplus labor is an important factor for the increased inequality between urban and rural areas, and thus confirms Lewis's dual economy theory. Four different methods, namely, the classical method, international standard structure comparison, the sown-land-to-labor-ratio method, and the arable-land-to-labor-ratio method, are used to estimate agricultural surplus labor. Although the surplus labor forces estimated by the four methods significantly differ in their magnitudes (from 14 million to 80 million), their influence on urban-rural inequality is the same and robust. Provinces with more surplus labor have wider urban-rural income gaps, implying that the reduction of surplus labor is a fundamental means to reduce urban-rural inequality.

Keywords: Urban-rural inequality, Openness, Surplus labor, China

JEL Classification: J61, O15, O18, O33, R11

I. Introduction

After 1949, when the People's Republic of China was inaugurated, Mao Zedong led class struggle campaigns and advocated an isolated economy and thereby eventually caused the decline of his political career. Mao's successor, Deng Xiaping, embraced the cat theory ("It does not

* Researcher, China's Regional and Provincial Research Group, Korea Institute for International Economic Policy, Yangjaedaero Seocho-gu 137-747, Seoul, Korea (Tel) +82-2-3460-1282 (Fax) +82-2-3460-1279 (E-mail) furongjin@kiep.go.kr.
[**Seoul Journal of Economics** 2013, Vol. 26, No. 4]

matter if a cat is black or white for as long as it catches mice"), which was considered to represent a shift in Mao Zedong's way of thinking and an innovation (an open policy) and a practical political line that linked the market economy and the socialist-planned economy. Deng proposed this theory in 1978 during the 11^{th}-term third Chinese Communist Party General Assembly as a part of his vision of China's economic growth. Thirty-five years since, China has advanced with economic growth by shifting from an agricultural nation to an industrial nation.

China also proclaimed Xian Fun Lun, a theory that several Chinese nationals in certain areas should become rich first before they can lead other people and regions to become rich gradually. Under this theory, China has created economic zones in coastal cities and opened itself to the world.

To open itself to the world, China has introduced and utilized foreign capital, as well as foreign-developed technologies and management experiences, to create economic zones and economic development zones in coastal areas, to expand its external trade volume for increased earnings in foreign currencies, and to innovate its trade system to encourage local regions and corporations to boost their exports.

Economic reforms, which started with agricultural areas and with the opening up of China to the world, have gradually expanded into prompting state-owned enterprises in urban areas to innovate. This move gradually reduced planned economic areas and expanded market economy areas, indicating a shift to the market economy system.

China has had 35 years of remarkable achievements through innovation and its opening up to the world, but it is suffering from problems that include a wide gap in income among its people, regional differences in income and development, and a difference in development between rural and urban areas. Rapid economic growth has created problems, such as a wide gap in income among people in various nations, but China is suffering from more serious gaps in wealth among its people.

Starting from a low Gini coefficient for household income of 0.257 in 1984, China reached a high Gini coefficient for income of 0.403 in 1998 (UNU-WIDER, January 5, 2010) and of 0.474 in 2012 (National Bureau of Statistics of China, August 24, 2013), higher than the internationally accepted warning level of 0.4.[1]

[1] The Gini coefficient standard was set up as a warning system in the study of wealth inequality by global economists and sociologists. This standard is a

Between 1984 and 2012, whereas the income share of the top quintile in the total income rose from 34.1% to 51.9%, that of the bottom quintile dropped from 10.1% to 4.3%. The middle class (*i.e.*, the middle three quintiles) also suffered from the lapse because its share dropped by 12% points from 55.9% to 43.9% (UNU-WIDER, January 5, 2010).

This positive relationship between economic growth and income inequality in China poses many intriguing questions. What is the influence of economic development on changing income distribution? If government policies are designed to foster growth, what is their influence on inequality? What specific factors lie in the noticeable increase in income inequality in post-reform China? In this paper, answers to these questions are postulated, and inquiries are made regarding the influence of public policy on enhancing growth and equality.

Much literature is available on income inequality in China within urban areas (*e.g.*, Démurger, Fournier, and Li 2006; Knight and Song 1991), within rural areas (*e.g.*, Benjamin, Brandt, and Giles 2006; Knight and Song 1993; Griffin and Saith 1982), and between both urban and rural areas (*e.g.*, Sicular, Yue, Gustafsson, and Li 2007; Kanbur and Zhang 1999, Jin 2009), but no study has investigated the influence of agricultural surplus labor on income inequality. By relying on the factor of agricultural surplus labor in the simultaneous structure of growth and inequality, this study explains the forces that contribute to the changes in the distribution of income and growth in China.

In this paper, inequality is considered the urban-rural income gap for two reasons. First, existing literature attributes China's great inequality to the growing interregional and urban-rural inequality (Kanbur and Zhang 2005; Kanbur and Zhang 1999; Khan and Riskin 1999; World Bank 1997; Yang 1999; Yao and Zhu 1998; Zhao 1999). Moreover, the decomposition of income inequality shows that interregional inequality is related to the great urban-rural inequality (Kanbur and Zhang 1999; Tsui 1993). Theil decomposition by Li and Yue (2004) shows that the urban-rural income gap constitutes over 40% of the overall inequality. Further, no regional Gini coefficients were available for use in this study.

The remainder of the paper is structured as follows. Section II introduces four methods of estimating agricultural surplus labor in China and discusses their effectiveness and the trend of surplus labor. Section III discusses the estimation methodology and presents the data used in

universally accepted gauge of whether the gap between the rich and the poor is tolerable. The warning level of the system is 0.4.

the empirical work. Regression results and findings are presented in Section IV. Finally, Section V concludes.

II. Surplus Labor in China

A. Lewis' dual economy theory

In 1954, Lewis argued that standard economic models are less relevant to poor countries. The economies of these countries are in transition from primarily traditional subsistence agriculture to a modern industrialized economy. Lewis claimed that different tools are needed to explain how this transformation takes place. His work was one of the first contributions to the discipline of development economics, which was developed in the 1950s and 1960s.

In Lewis's highly influential article, "Economic Development with Unlimited Supplies of Labor," he analyzed the way poor countries with surplus labor transform their economic structures.

Lewis explained that many poor countries are characterized by a dual or two-sector economy that consists of a large and traditional (subsistence agriculture) sector and a small and modern (industrial) sector. Lewis rejected the neo-classical economic view of a fixed quantity of labor and instead argued that an unlimited supply of labor exists in many poor countries because of population pressures. Such supply keeps wages low. The traditional sector provides a large pool of cheap labor for the modern sector and thus promotes profits and growth in the modern sector.

Lewis explained the transition to a modern economy in the following way. Technological advances and capital formation in the modern sector increase profits, and increased profits are used to increase investments, which fuel further growth and employment in the sector. Eventually, a turning point is reached when no surplus labor remains and the dualistic nature of the economy ends, with wages rising to reflect productivity (Lewis 1954).

The following conjecture can be drawn from the Lewis Model: the income gap between the urban and rural sectors remains until the modern urban sector absorbs surplus labor in the traditional sector. Thus, the transfer of rural surplus labor to the urban sector is key to reducing income inequality in poor countries characterized by a dual economy.

As a large transitioning country, China also faces the dualistic problem, with its considerable labor allocated in primary industries (34.8% in

2011). The presence of surplus labor in the agricultural sector in China is related to the increased urban-rural income gap. Thus, the following hypothesis is proposed.

Hypothesis: A major reason for China's urban-rural income gap is the large amount of agricultural surplus labor. Slow urbanization and the resulting slow reduction in rural surplus labor have widened the urban-rural income gap and have thus increased the overall income inequality. China's income inequality will continue to increase unless the agricultural surplus labor disappears.

B. Estimation of surplus labor

How much agricultural surplus labor does China have then? Many scholars have attempted to answer this question since the 1990s. However, much divergence remains with regard to the definition and estimation of surplus labor and has thus significantly varied research results, which range from 40 million to 200 million. Four different methods of estimating the agricultural surplus labor in China are introduced as follows.

Classical method

The classical economic principle holds that land and capital are scarce, but labor supply is unlimited. From the view of classical economics, Lewis (1954) first proposed the concept of surplus labor. He argued that, according to the Law of Variable Proportions, only so much labor should be used with capital because the marginal productivity of labor will be reduced to zero. Thus, if some laborers from traditional sectors can be drawn out without reducing the agricultural gross output, this part of the labor force is surplus labor. Two methods can be used to measure this part of the labor force: in terms of the narrow-sense agricultural surplus labor and in terms of the broad-sense agricultural surplus labor. The former can be understood as the difference between the total supply of agricultural labor and the actual demand for agricultural labor given agricultural production technologies and farming methods. The premise of this calculation method is that technologies and management skills in agricultural production are constant. The latter can be understood as the difference between the total supply of agricultural labor and the actual demand for agricultural labor given the adoption of advanced agricultural production and management technologies. Wang and Ding (2006) indicated that the calculation of broad-sense surplus labor involves too many variables and understanding the status of surplus labor in this sense is less significant. Thus, narrow-sense surplus labor was calculated by the method suggested by Wang and Ding (2006).

In their study, the agricultural production function was described as

$$Y = F(T, K, D, A), \tag{1}$$

where T indicates the workdays, K the capital investment, D the land areas, and A the technology. The demand for workdays in the production of the maximum output Y' is computed as

$$T = F^{-1}(Y', K, D, A). \tag{2}$$

Assuming that L agricultural workers are present, the number of workdays provided by one worker in one year is computed as

$$t = T / L. \tag{3}$$

This number reflects the actual workload of one farmer. Then, a *rational* workload for one farmer must be set, that is, a rational number of workdays for a farmer in one year. Scholars generally agree that a farmer should have 270 workdays per year (Chen, 1992). Thus, the actual demand for agricultural labor may be calculated as

$$L' = T / 270. \tag{4}$$

Equations (1) and (2) indicate that the ratio of the agricultural labor demand to the supply can be calculated as

$$d = L' / L = t / 270. \tag{5}$$

Thus, the ratio of the agricultural surplus labor to the total agricultural labor is calculated as

$$r = 1 - t / 270. \tag{6}$$

TABLE 1
PER-LABOR WORKDAYS IN ONE YEAR AT DIFFERENT INCOME LEVELS
(Unit: yuan, hours)

Per capita income	691.95	1344.34	1927.54	2801	6582.93
Per farmer workdays	187.02	205.7	220.75	240.37	267.74

Source: Wang and Ding (2006)

Thus, only a farmer's workload t is required. Other information, such as agricultural output, land areas, number of livestock raised, and total workdays, is unnecessary. A survey from the Research Center for Rural Economy of the Ministry of Agriculture, which covered 22,000 rural households from 320 cities and counties in over 31 provinces, provided data on the number of workdays farmers have per year for different income levels. The data are presented in Table 1.

Table 1 shows that households with high per capita income have more per-farmer workdays. On the one hand, non-agricultural sectors in regions with high incomes are developed and thus increase labor transfer from rural to urban areas and significantly reduce agricultural labor. On the other hand, high incomes increase incentives for farmers and thus increase labor inputs.

After the per capita rural income of each year was converted into 2000 prices and compared with that in Table 1, the amount of surplus labor and its ratio were calculated for the sample of 29 provinces from 1988 to 2011. Data on the beginning and ending years are presented in Table 2.

Table 2 shows that China had about 14 million surplus laborers in 2011, about 5.1% of its total agricultural labor force. This figure is slightly underestimated because Tibet was excluded from the analysis. From 1988 to 2011, the volume of surplus labor in China was significantly reduced. In 1988, the number of surplus laborers was more than 76 million, five and a half times that in 2011. Surplus labor is concentrated in the inland regions, especially in the western region. In 2011, the shares of surplus labor in the total agricultural labor force in China's central and western regions were 5.6% and 8.4%, respectively. In the eastern areas, the share was only 0.3%. As for individual provinces, several coastal provinces and municipalities, such as Beijing, Tianjin, and Shanghai, even had labor shortages in agricultural production. By contrast, most of the western provinces in China still suffer from surplus labor. The three provinces with the highest surplus labor

TABLE 2

ESTIMATED AGRICULTURAL SURPLUS BY PROVINCE: CLASSICAL METHOD

(Unit: 10 thousand people, %)

Region	1988		2011	
	Surplus labor	Ratio	Surplus labor	Ratio
Beijing	7.3	9.0	-8.3	-14.4
Tianjin	12.5	14.4	-5.6	-7.6
Hebei	427.7	26.0	69.4	4.8
Shanxi	155.0	26.6	51.1	7.9
Inner Mongolia	117.5	25.6	32.1	5.9
Liaoning	127.7	22.0	19.7	3.0
Jilin	114.6	23.4	19.8	3.9
Heilongjiang	103.4	25.0	28.3	4.2
Shanghai	6.1	7.7	-5.4	-16.2
Jiangsu	312.1	19.3	-22.7	-2.8
Zhejiang	205.7	16.3	-53.2	-8.6
Anhui	457.2	25.3	88.9	6.0
Fujian	176.3	23.8	-0.6	-0.1
Jiangxi	280.8	26.1	36.7	4.3
Shandong	569.7	23.8	44.5	2.2
Henan	760.8	28.9	157.6	5.9
Hubei	336.3	24.3	47.1	5.3
Hunan	496.1	23.5	111.2	6.0
Guangdong	302.6	19.4	-23.6	-1.7
Guangxi	404.8	26.6	124.0	8.0
Hainan	34.8	22.5	13.4	6.4
Sichuan	1051.4	26.2	163.6	6.1
Guizhou	309.7	26.6	122.8	10.5
Yunnan	361.3	25.4	151.0	9.2
Shaanxi	253.1	26.9	74.0	9.0
Gansu	187.5	28.8	92.2	12.9
Qinghai	28.0	25.1	12.8	10.9
Ningxia	29.5	25.5	10.9	8.8
Xinjiang	61.9	23.8	36.1	9.0
Eastern region	2182.5	21.4	27.6	0.3
Central region	2704.3	25.8	540.7	5.6
Western region	2804.7	26.3	819.3	8.4
National total	7691.4	24.5	1387.6	5.1

Notes: Per capita income was calculated at 2000 prices. The interpolation law was used to calculate the workdays.

ratios (12.9%, 10.9%, and 10.5%) in 2011 were Gansu, Qinghai, and Guizhou.

TABLE 3

INTERNATIONAL STANDARD STRUCTURE AND SHARE OF AGRICULTURAL SECTOR

(Unit: %)

Per capita GNP (at 1964 prices)	Share of output of primary industry	Share of employment of primary industry
<100	0.522	0.712
100	0.452	0.658
200	0.327	0.557
300	0.266	0.489
400	0.228	0.438
500	0.202	0.395
800	0.156	0.3
100	0.138	0.252
>1000	0.127	0.159

Source: Chenery and Syrquin (1975).

International standard structure comparison

Chenery and Syrquin (1975) comprehensively studied normal variations in economic structure with the level of development. Using data from more than 100 countries from 1950 to 1970, they summed up the average share of primary industries at the different stages of national income of a country (Table 3).

Wang and Ding (2006) indicated that if these data are considered international standards, the ratio of surplus labor in a country can be expressed as the difference between the country's excess employment and its excess output, that is,

$$
\begin{aligned}
R &= \left(\left(\frac{L_1}{L}\right)_{real} - \left(\frac{L_1}{L}\right)_{standard}\right) - \left(\left(\frac{I_1}{I}\right)_{real} - \left(\frac{I_1}{I}\right)_{standard}\right) \\
&= \left(\frac{L_1}{L}\right)_{real} + \left(\frac{I_1}{I}\right)_{standard} - \left(\frac{L_1}{L}\right)_{standard} - \left(\frac{I_1}{I}\right)_{real},
\end{aligned}
\tag{7}
$$

where L and I indicate the total employment and GDP level, respectively, and L_1 and I_1 indicate the employment and output of primary industries, respectively.

After the provincial GDP of each year was converted into US dollars at current exchange rates and then into 1964 US dollars, the real output and employment shares of primary industries were compared with the

TABLE 4
AGRICULTURAL SURPLUS LABOR BY PROVINCE: STANDARD STRUCTURE COMPARISON

(Unit: 10 thousand people, %)

Region	1988		2011	
	Surplus labor	Ratio	Surplus labor	Ratio
Beijing	4.8	5.9	2.7	4.7
Tianjin	8.1	9.3	6.0	8.1
Hebei	588.2	35.8	349.0	24.4
Shanxi	181.6	31.1	202.7	31.5
Inner Mongolia	93.2	20.4	199.2	36.7
Liaoning	100.2	17.3	139.0	20.9
Jilin	102.5	20.9	157.0	30.8
Heilongjiang	87.8	21.2	181.1	26.7
Shanghai	5.8	7.3	0.9	2.7
Jiangsu	334.0	20.6	125.1	15.2
Zhejiang	322.9	25.6	59.4	9.6
Anhui	538.4	29.8	380.2	25.5
Fujian	207.0	28.0	106.1	17.1
Jiangxi	299.0	27.7	189.7	22.3
Shandong	809.0	33.8	501.4	25.3
Henan	930.2	35.3	793.6	29.9
Hubei	354.7	25.7	287.7	32.5
Hunan	654.3	31.0	516.8	27.7
Guangdong	419.4	26.9	265.1	18.9
Guangxi	594.0	39.0	551.6	35.7
Hainan	32.2	20.8	47.4	22.7
Sichuan	1509.7	37.6	782.2	29.1
Guizhou	439.1	37.7	625.6	53.7
Yunnan	642.0	45.1	713.6	43.3
Shaanxi	349.4	37.1	247.7	30.1
Gansu	261.0	40.0	340.2	47.6
Qinghai	36.1	32.3	35.4	30.0
Ningxia	40.8	35.3	49.6	40.0
Xinjiang	62.4	24.0	125.9	31.3
Eastern region	2831.5	27.8	1602.2	20.2
Central region	3148.5	30.0	2708.8	28.3
Western region	4027.7	37.7	3671.1	37.6
National total	10007.8	31.9	7982.1	29.3

Notes: Per capita income was calculated at 1964 US prices. The interpolation law was used in the calculation of the real output and employment shares of primary industries.

international standards. Using this method, Wang and Ding (2006) calculated the surplus labor in each province in 2003. Based on their work, the surplus labor for each province from 1988 to 2011 was calculated in this study. The data for 1988 and 2011 are shown in Table 4.

Table 4 shows that China had about 100 million agricultural surplus laborers in 1988 and 80 million in 2011. The estimated surplus labor in both absolute and relative terms was huge. As with the classical method, surplus labor was primarily allocated to the central and western regions.

Sown-land-to-labor-ratio method

The sown-land-to-labor-ratio method suggested by Hu (1997) determines surplus agricultural labor by estimating the ratio of sown land to effective labor. The effective agricultural labor for each year can be determined by dividing the land sown that year by the ratio. The surplus agricultural labor of a country is then equal to its total agricultural labor force minus its effective labor. A key point of this method is how it calculates the ratio of sown land to effective labor. One solution is that, supposing that no surplus agricultural labor is available in a year, the sown-land-to-labor ratio of that year is regarded as an unchanging coefficient. In this way, Hu (1997) estimated the surplus agricultural labor in China, assuming that China had no surplus labor in 1957. His estimates are presented in Table 5, and the estimated surplus labor for each province by this method is presented in Table 6.

The quantity of surplus labor in China decreased by 62 million people from 1988 to 2011 (from 136 million people to 74 million people), and the ratio of surplus agricultural labor to the total agricultural labor decreased by 16 percentage points in the same period (from 43.4% to 27.0%). The estimated surplus labor in both absolute and relative terms was similarly considerable. In contrast to the result of the above two methods, the eastern region had more surplus labor than the central region.

Arable-land-to-labor-ratio method

Chen (2004) argued that under current natural, social, economic, and technological circumstances, agricultural resources, production methodologies, and government policies regarding agriculture considerably affect the demand for agricultural labor. Among these factors, agricultural resources, especially arable land, are decisive factors. Chen considered 1952 a year with no surplus labor and thus fixed the ratio of arable

TABLE 5

AGRICULTURAL SURPLUS LABOR ESTIMATED BY SOWN-LAND-TO-LABOR-RATIO METHOD

(Unit: 10 thousand mu, 10 thousand people, %)

Year	Total sown areas of farm crops	Total agricultural labor	Agricultural surplus labor	Ratio of surplus labor
1957	235,866	19,310	0	0
1962	210,343	21,178	4000	18.89
1965	215,936	23,398	5639	24.10
1970	215,231	27,814	10,097	36.30
1975	224,318	29,460	10,989	37.30
1980	219,569	29,425	11,417	38.80
1985	215,439	31,187	13,504	43.30
1989	219,831	33,170	15,159	45.70
1990	222,543	38,808	20,529	52.90
1995	224,490	35,971	17,518	48.70

Note: The ratio of surplus labor is the author's calculation based on Hu (1997).
Source: Hu (1997).

land to labor to the level of that in 1952. Chen estimated surplus agricultural labor according to the following formula:

$$SL_t = L_t - (S_t / M_t), \tag{8}$$

where SL_t represents the surplus labor to be estimated, L_t is the real labor force (the supply of agricultural labor), S_t is the real area of arable land, and M_t represents the area under cultivation per capita:

$$M_t = 0.4966 * (1+\beta)^{(t-1952)}, \tag{9}$$

where 0.4966 represents the average area under cultivation per capita from 1949 to 1957 in hectares and β is the rate of change in agricultural management (caused by advances in agricultural production technology). Chen (2004) set β =0.0018 through computation.

Chen (2004) estimated the surplus agricultural labor of Shandong Province as an example. The estimated results from 1952 to 2002 are presented in Table 7.

Table 7 shows that Shandong Province had about 10 million surplus laborers in 2002 and that the ratio of surplus laborers to the total

TABLE 6
AGRICULTURAL SURPLUS LABOR BY PROVINCE: SOWN-LAND-TO-LABOR-RATIO METHOD

(Unit: 10 thousand people, %)

Region	1988		2011	
	Surplus labor	Ratio	Surplus labor	Ratio
Beijing	7.8	9.6	20.9	36.0
Tianjin	16.1	18.5	15.7	21.5
Hebei	565.5	34.4	355.7	24.8
Shanxi	92.4	15.8	177.1	27.5
Inner Mongolia	-101.8	-22.2	-330.8	-61.0
Liaoning	136.7	23.6	154.5	23.3
Jilin	-5.5	-1.1	-131.1	-25.7
Heilongjiang	-596.9	-144.1	-823.3	-121.5
Shanghai	0.1	0.2	-15.8	-47.4
Jiangsu	591.1	36.5	-119.4	-14.5
Zhejiang	732.9	58.1	314.3	51.0
Anhui	801.2	44.4	385.0	25.8
Fujian	421.4	57.0	339.7	54.8
Jiangxi	415.0	38.5	175.7	20.7
Shandong	1051.4	43.9	646.9	32.7
Henan	1170.5	44.4	904.3	34.1
Hubei	494.1	35.8	-98.0	-11.1
Hunan	1187.5	56.3	832.1	44.6
Guangdong	897.8	57.6	840.9	60.0
Guangxi	942.2	61.8	809.8	52.4
Hainan	64.9	41.9	105.8	50.7
Sichuan	2534.8	63.0	1096.4	40.8
Guizhou	756.2	64.9	548.7	47.1
Yunnan	906.0	63.6	827.5	50.3
Shaanxi	354.9	37.7	308.7	37.6
Gansu	214.0	32.8	212.6	29.7
Qinghai	48.7	43.6	50.8	43.1
Ningxia	8.5	7.3	-30.8	-24.9
Xinjiang	-100.8	-38.7	-209.6	-52.1
Eastern region	4485.9	44.0	2659.2	33.6
Central region	3558.2	33.9	1421.8	14.8
Western region	5562.8	52.1	3283.4	33.6
National total	13,606.9	43.4	7364.4	27.0

Source: Various issues of *China Statistical Yearbook*, provincial statistical yearbooks, and China's National Bureau of Statistics.

number of laborers was higher than 45%. The estimated numbers of surplus laborers by province for the initial and final years are shown in Table 8. The agricultural sector in China had about 53 million surplus

TABLE 7
AGRICULTURAL SURPLUS LABOR IN SHANDONG PROVINCE IN 1952-2002 AS ESTIMATED BY ARABLE-LAND-TO-LABOR-RATIO METHOD

(Unit: 10 thousand ha, 10 thousand people, %)

Year (t)	Arable land (S_t)	Supply of agricultural labor (L_t)	Demand for agricultural labor (S_t/M_t)	Agricultural surplus labor (SL_t)	Ratio of surplus labor (R_t)
1952	918.27	1801	1849.11	-48.11	-2.67
1965	800.09	2086	1573.9	512.1	24.55
1983	718.19	2498.83	1367.72	1131.11	45.27
1985	703.77	2365.65	1335.43	1030.22	43.55
1991	683.4	2647.19	1282.95	1364.24	51.54
2002	707	2370.91	1301.26	1069.65	45.12

Note: The ratio of surplus labor is the author's calculation based on Chen (2004).
Source: Chen (2004).

laborers in 2011, and the ratio of surplus labor to the total agricultural labor force was 19.4% then. The share of surplus labor was highest in the eastern areas and lowest in the central areas.

C. Which estimation method is reliable?

The estimated results of the four different methods presented (*i.e.*, the classical method, international standard structure comparison, the sown-land-to-labor-ratio method, and the arable-land-to-labor-ratio method) vary in terms of their magnitude and geographical distribution.

The estimated results of the classical method and international standard structure comparison are similar in terms of geographical distribution. According to the two methods, surplus labor was great in the inland regions of China, especially in its western region, and small in the eastern region. However, the two methods differ greatly in terms of the absolute and relative sizes of labor. Although the size of the agricultural surplus labor in China and the ratio of its surplus labor to its total labor force according to the classical method were about 14 million and 5.1%, respectively, the absolute and relative sizes in 2011 according to international standard structure comparison were 80 million and 29.3%, respectively.

The estimated results of the sown-land-to-labor-ratio and arable-land-to-labor-ratio methods are similar in terms of their absolute and relative sizes and their geographical distribution. According to the two methods,

TABLE 8

AGRICULTURAL SURPLUS LABOR BY PROVINCE: ARABLE-LAND-TO-LABOR-RATIO METHOD

(Unit: 10 thousand people, %)

Region	1988		2011	
	Surplus labor	Ratio	Surplus labor	Ratio
Beijing	2.4	3.0	16.1	27.7
Tianjin	5.1	5.9	-6.7	-9.2
Hebei	405.0	24.6	289.1	20.2
Shanxi	-116.1	-19.9	-91.1	-14.2
Inner Mongolia	-461.3	-100.7	-752.0	-138.7
Liaoning	-77.4	-13.4	-76.2	-11.5
Jilin	-255.8	-52.2	-492.1	-96.5
Heilongjiang	-1253.2	-302.6	-1464.7	-216.1
Shanghai	17.9	22.5	-10.8	-32.4
Jiangsu	758.5	46.8	-41.0	-5.0
Zhejiang	933.0	74.0	268.9	43.6
Anhui	977.3	54.2	455.3	30.5
Fujian	505.1	68.3	379.5	61.2
Jiangxi	632.5	58.7	337.5	39.7
Shandong	1095.4	45.7	620.2	31.3
Henan	1322.6	50.2	1219.8	45.9
Hubei	721.5	52.2	41.0	4.6
Hunan	1480.2	70.2	1177.7	63.2
Guangdong	1084.2	69.6	889.7	63.4
Guangxi	1038.7	68.2	782.4	50.6
Hainan	73.5	47.4	77.0	36.9
Sichuan	2828.5	70.4	1208.2	44.9
Guizhou	815.4	70.0	353.0	30.3
Yunnan	895.8	62.9	546.6	33.2
Shaanxi	271.4	28.8	88.7	10.8
Gansu	-3.9	-0.6	-128.3	-17.9
Qinghai	4.6	4.1	19.8	16.8
Ningxia	-34.5	-29.8	-76.5	-61.8
Xinjiang	-320.3	-123.0	-344.5	-85.6
Eastern region	4802.9	47.1	2405.8	30.4
Central region	3508.9	33.4	1183.4	12.4
Western region	5034.4	47.2	1697.5	17.4
National total	13,346.3	42.5	5286.6	19.4

Source: Various issues of China Statistical Yearbook, provincial statistical yearbooks, and China's National Bureau of Statistics

China had about 53 million to 74 million surplus agricultural laborers, and the ratio of its surplus labor to its total agricultural labor force was about 19.4% to 27.0% in 2011. The ratio of the surplus labor to the total agricultural labor was higher in the eastern region than in the central region, contrary to fact.

The sown-land-to-labor-ratio and arable-land-to-labor-ratio methods have an advantage to a certain extent because no surplus labor existed in China during the earlier half of the 20^{th} century. Thus, these assumptions are reasonable. However, supposing that these ratios have not changed since then is an unreasonable hypothesis. Technological progress in agriculture would significantly affect the ratio. Among several technologies, labor-saving technology increases this ratio, and land-saving technology decreases it. Land-saving technology is more prevalent in China than labor-saving technology. Thus, the ratio of sown land to effective labor gradually declines and creates an upward bias of the estimated surplus labor.

Heterogeneity is another problem with these estimation methods. In reality, the ratio of the total crop-sown farm area to the effective labor differs across provinces. Applying the ratio of the benchmark year for each province inevitably increases bias. This result is produced because many other researchers pay attention only to the total amount of surplus labor but not to its distribution across provinces.

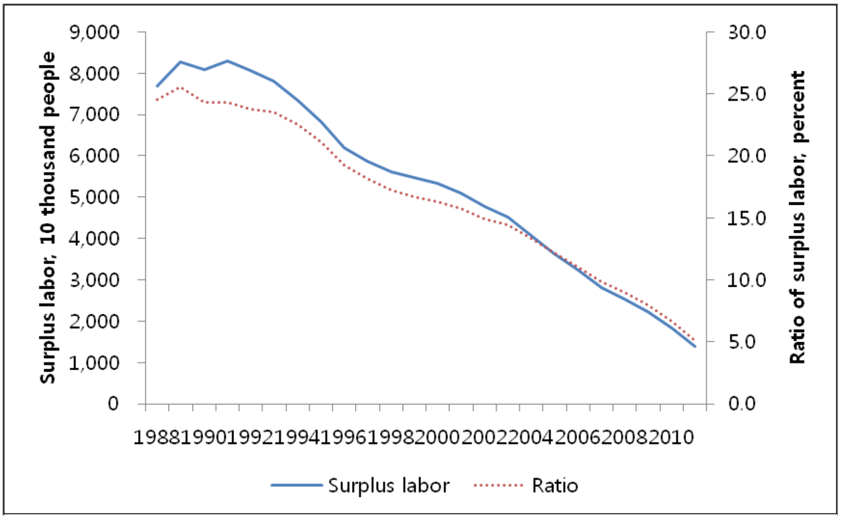
Regarding international standard structure comparison, the predicted values of the structure of production and labor allocation are based on diverse countries at different time periods. Because countries considerably differ in their level of industrial development, structure, and characteristics, the comparability of countries is low.

A comparison of the results of the different methods indicates that the classical method is the most creditable.

D. Trend of surplus labor

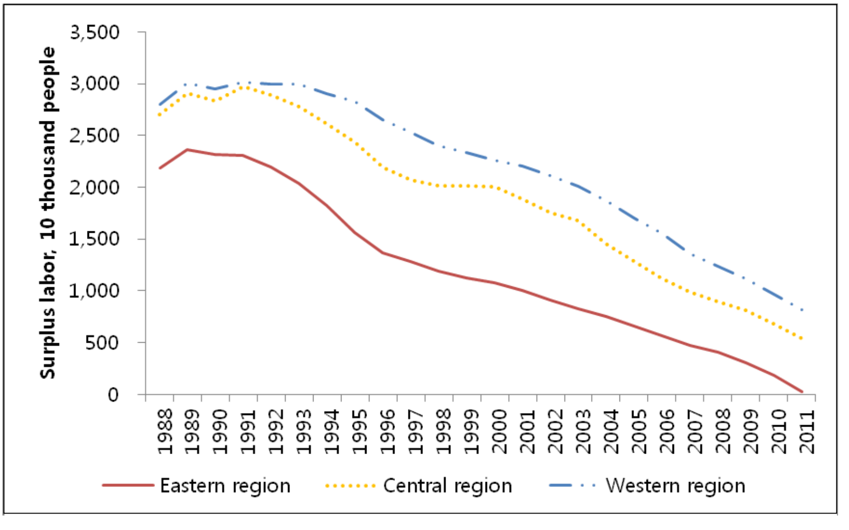
Figure 1 shows the evolution of the national surplus agricultural labor in China from 1988 to 2011. Surplus labor was estimated by the classical method. Both the absolute amount of surplus labor and its ratio to the total agricultural labor force rapidly decreased over this period.

Figures 2 and 3 illustrate the evolution of the average surplus agricultural labor in the eastern, central, and western regions of China. All regions sufficiently reduced their surplus labor and the relative surplus labor significantly decreased in coastal provinces.



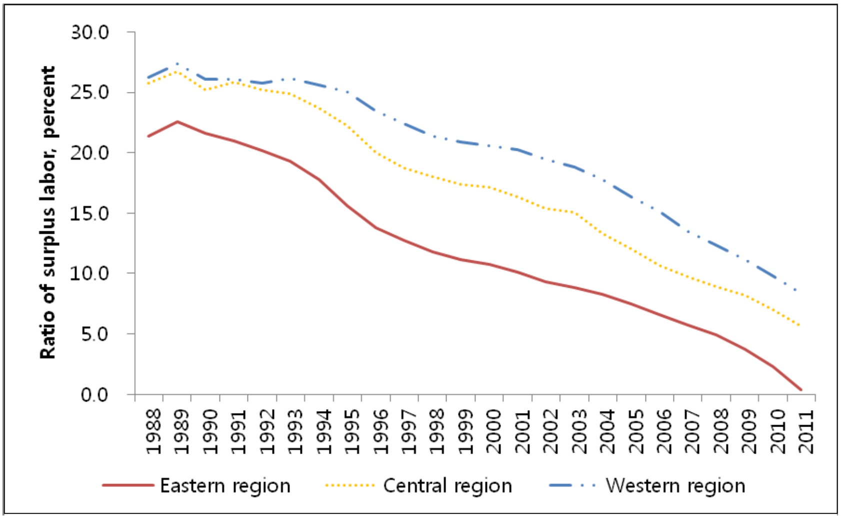
Source: Various issues of *China Statistical Yearbook*.

FIGURE 1
EVOLUTION OF SURPLUS LABOR IN CHINA



Source: Various issues of *China Statistical Yearbook*.

FIGURE 2
EVOLUTION OF AMOUNT OF SURPLUS LABOR BY REGION



Source: Various issues of *China Statistical Yearbook*.

FIGURE 3
EVOLUTION OF SHARE OF SURPLUS LABOR BY REGION

III. Research Design

A. Methodology

As mentioned in the introduction, this study aims to investigate the influence of surplus agricultural labor on the inequality between urban and rural areas. The study also aims to investigate whether growth and urban-rural inequality are simultaneously determined and whether they are subject to the same set of determining factors. Thus, the simultaneous system of equations was used in this study.

As in Lundberg and Squire (2003), the simultaneous system of equations of economic growth and urban-rural income inequality takes the following form:

$$\begin{aligned} &\textit{Growth equation} && gdpgr=\mathbf{X}'\boldsymbol{\alpha}+\mathbf{Z}'\boldsymbol{\beta}+u_{it}, \\ &\textit{Urban-rural inequality equation} && urine=\mathbf{Y}'\boldsymbol{\phi}+\mathbf{Z}'\boldsymbol{\gamma}+\varepsilon_{it}, \end{aligned} \tag{10}$$

where X is a vector of "economic growth" variables, Y of "urban-rural income inequality" variables, and Z of variables common to both sets.

Error terms in the system have two components: time-invariant heterogeneity across provinces that is specific to the province but excluded from the explanatory variables and time-varying parameters associated with the regressors. Thus,

$$u_{it} = \mu_i + \nu_{it} \text{ and } \varepsilon_{it} = \sigma_i + \omega_{it}. \tag{11}$$

Time-invariant province-specific heterogeneity was less severe because data from within China were used. Regardless, several dummy variables were incorporated into the empirical model to address heterogeneity, as in Wan *et al.* (2006). The endogeneity of two-way causality between the variables of economic growth and urban-rural income inequality is treated by specifying and estimating the simultaneous system of equations.

In this system of equations, a set of determining factors, including surplus agricultural labor (the variable of interest), were added:

$$\begin{aligned} &gdpgr = f_1(urgap,\ inigdp,\ popgr,\ invt.\ infl,\ soe,\ gov,\ urbangr,\ center,\ west) \\ &urgap - f_2(gdpgr,\ surlab,\ inf,\ soe,\ agr,\ center,\ west) \end{aligned} \tag{12}$$

The first equation in the system is the growth equation, in which the dependent variable is the real per capita GDP growth rate. The explanatory variables included were the population growth rate (*popgr)* as a proxy for change in the rate of labor force participation (Blomström, Lipsey, and Zejan 1996) and the investment rate (*invt*) as physical capital (Barro 1991, 1997; Barro and Lee 1994; Caselli, Esquivel, and Lefort 1996; Levine and Renelt 1992; Mankiw, Romer, and Weil 1992). Both variables are the standard growth determinants directly predicted by the Solow growth model. To include government involvement in the economy, inflation (*infl*) (Barro 1997, 2000; Clarke 1997; Levine and Renelt 1992; Kormendi and Meguire 1985) and government consumption (*gov*) (Barro 1991, 1997, 2000; Clarke 1997; Barro and Lee 1994) were added to the equation. Geographical variables (*center* and *west*) were also included in the growth equation, as in Levine and Renelt (1992) and Sala-i-Martin (1997).[2] Also controlled were structural change (*soe*) and urbanization (*urbangr*). These variables are defined in the following section. Urban-rural inequality was entered in the growth equation.

The urban-rural income gap equation in the system explains income surplus labor, inflation, the size of the state sector or privatization,

[2] Most of the literature on the determinants of growth was obtained from the compilation of Durlauf and Quah (1999).

geographical location, and fiscal expenditure for agriculture (agr). Because the definitions of these variables are discussed in detail in the following section, they are not repeated here.

B. Data

A panel data set that covered 29 provinces from 1988 to 2011 was used to estimate the simultaneous equations. Unless indicated otherwise, the data used in this paper were obtained from various issues of *China Statistical Yearbook*, the *China Population Statistical Yearbook*, provincial statistical yearbooks, and China's National Bureau of Statistics. The variables used for the estimations are listed below.

(1) *gdpgr*=real per capita GDP growth rate, measured at a constant price level
(2) *urgap*=urban-rural income gap, defined as the ratio of urban disposable income per capita to rural net income per capita. Provincial urban and rural CPIs deflate both urban and rural incomes, respectively. The urban and rural CPIs of Beijing, Tianjin, and Shanghai are the same.
(3) *inigdp*=log of per capita GDP in 1988
(4) *popgr*=population growth rate. This annual statistic on the total population is taken at midnight of the 31st of December.
(5) *invt*=ratio of total investment in fixed assets to GDP. Total investment in fixed assets refers to the volume of activities in construction and purchases of fixed assets of the province as well as related fees, expressed in monetary terms, for that year.
(6) *infl*=inflation rate, measured by the overall consumer price index in each province
(7) *soe*=proportion of workers and staff in state-owned entities in the total labor force
(8) *gov*=ratio of the total government expenditure to the provincial GDP
(9) *urbangr*=urbanization, defined as the growth rate of the proportion of the non-agricultural population in the total provincial population
(10) *center*=geographical dummy for the central provinces of China, including Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, and Hunan
(11) west=another geographical dummy for China's western provinces, including Inner Mongolia, Guangxi, Sichuan, Guizhou, Yunnan,

Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang

(12) *agr*=share of provincial fiscal expenditure for agriculture in the provincial GDP

(13) *surlab*1=surplus labor, measured as the ratio of surplus agricultural labor to the total provincial agricultural labor in the initial year of 1988 and estimated by the classical method

(14) *surlab*2=surplus labor, measured as the proportion of surplus agricultural labor in the total provincial agricultural labor in 1988 and estimated by international standard structure comparison

(15) *surlab*3=surplus labor, measured as the proportion of surplus agricultural labor in the total provincial agricultural labor in 1988 and estimated by the sown-land-to-labor-ratio method

(16) *surlab*4=surplus labor, measured as the proportion of surplus agricultural labor in the total provincial agricultural labor in 1988 and estimated by the arable-land-to-labor-ratio method

IV. Empirical Results

Table 9 shows the regression results of the simultaneous equations. Surplus agricultural labor was estimated by four methods: the classical method, international standard structure comparison, the sown-land-to-labor-ratio method, and the arable-land-to-labor-ratio method.

The overall results shown in Table 9 are encouraging. The independent variables explain over 25% of the variation in growth and more than 55% of the variation in inequality. The F-statistic was significant at the 1% level, and the signs of the coefficients were basically expected.

Regarding the growth equation, the standard growth determinants directly predicted by the Solow growth model (*i.e.*, population growth and investments) significantly influenced the expected signs. Thus, the real per capita GDP growth rate increased with more physical investments and decreased with a higher population growth rate. From the perspective of the influence of the government on the economy, provinces that were larger than the state and spent more than the national government had lower growth rates, as expected. The reported sign of the initial GDP indicates that growth rates converged across provinces, except in Model (1), although the influence of the initial GDP on growth was not significant. Provinces in the central and western areas experienced low economic growth. The macroeconomic conditions measured by the inflation rate and urbanization contributed to the growth of the

TABLE 9
SURPLUS LABOR AS DETERMINANT OF INEQUALITY IN SIMULTANEOUS DYNAMICS

	Model (1)		Model (2)		Model (3)		Model (4)	
	Coefficient	z value	Coefficient	z value	Coefficient	z value	Coefficient	z value
gdpgr								
urgap	4.567	(4.46)***	0.988	(1.13)	1.898	(1.84)*	2.203	(2.10)**
inigdp	0.712	(0.83)	-1.197	(-1.62)	-1.289	(-1.54)	-1.245	(-1.47)
popgr	-0.468	(-5.80)***	-0.495	(-5.91)***	-0.466	(-5.85)***	-0.465	(-5.86)***
invt	0.101	(8.25)***	0.129	(10.71)***	0.114	(9.25)***	0.109	(8.90)***
infl	0.083	(4.59)***	0.068	(3.75)***	0.073	(4.06)***	0.075	(4.15)***
soe	-0.001	(-0.08)	-0.029	(-2.04)**	-0.026	(-1.76)*	-0.025	(-1.66)*
gov	-0.159	(-5.04)***	-0.108	(-3.50)***	-0.103	(-3.29)***	-0.104	(-3.29)***
urbangr	0.041	(1.38)	0.060	(1.97)**	0.061	(2.09)**	0.057	(1.97)**
center	-1.126	(-2.77)***	-1.026	(-2.52)**	-1.366	(-3.40)***	-1.448	(-3.61)***
west	-4.140	(-6.04)***	-1.935	(-2.93)***	-2.949	(-4.23)***	-3.237	(-4.64)***
constant	-7.689	(-0.87)	15.214	(2.02)**	14.120	(1.63)	13.168	(1.50)
R2	0.250		0.399		0.344		0.334	
No. of obs.	696		580		696		696	
No. of groups	29		29		29		29	
urgap								
gdpgr	0.058	(7.01)***	0.060	(8.30)***	0.070	(9.24)***	0.073	(9.44)***
surlab1	0.033	(6.64)***						
surlab2			0.027	(12.99)***				
surlab3					0.004	(9.65)***		
surlab4							0.002	(8.50)***
infl	-0.009	(-3.69)***	-0.009	(-4.22)***	-0.012	(-5.17)***	-0.012	(-5.20)***
soe	-0.008	(-4.39)***	-0.006	(-4.11)***	-0.003	(-2.14)**	-0.003	(-1.89)*
agr	-0.011	(-1.43)	-0.022	(-3.13)***	-0.0001	(-0.01)	0.002	(0.31)
center	0.170	(3.20)***	0.216	(4.93)***	0.424	(9.19)***	0.413	(8.79)***
west	0.997	(16.68)***	0.891	(16.28)***	1.148	(21.17)***	1.178	(21.23)***
constant	1.688	(10.98)***	1.699	(12.08)***	1.734	(11.67)***	1.739	(11.49)***
R2	0.561		0.624		0.574		0.556	
No. of obs.	696		696		696		696	
No. of groups	29		29		29		29	

Notes: *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

urbanization variable, except in Model (1).

Regarding the inequality equation, surplus agricultural labor, the most important variable in this study, had a significant reverse effect on urban-rural inequality in all cases, confirming Lewis's dual economic theory. Another robust variable that affected urban-rural inequality was inflation. Similar to other transition countries, China had a high inflation rate during its reform era, especially in its earlier reform period, and the rates were higher in rural areas than in urban areas. The negative significant influence of inflation on urban-rural inequality indicates that inflation may have a strong redistributive influence through its effect on farmers, whose nominal incomes are not adjusted proportionally to increases in prices in contrast to those of urban citizens.

Government spending on agriculture only slightly reduces urban-rural inequality because of two main reasons. First, the endogeneity problem may exist; provinces with more unequal urban-rural income gaps invest more in agricultural production. Second, in many provinces, government expenditure on agriculture as a percentage of total government spending decreased during this period.

Geographical dummies are positively and significantly associated with rising inequality in China. As indicated by the coefficients of the location dummy variables, the income disparity between the urban and rural sectors is more severe in the western region than in the central region. Moreover, this disparity is more severe in the central region than in the coastal region. These results are consistent with the results obtained by Li and Yue (2004) and Wan *et al.* (2006).

Concerning the growth-inequality dynamics, high inequality increases growth. The opposite link is that growth had a significant positive influence on urban-rural inequality.

V. Summary and Concluding Remarks

The relationship between growth and inequality has long been a major concern of social scientists. However, the relationship between inequality and the process of economic development is poorly understood. This relationship is especially relevant because economic literature reports both positive and negative relationships between growth and inequality across nations.

This study examined whether growth and urban-rural inequality are simultaneously determined and, if so, whether they have the same set of determining factors. This study sheds light on surplus agricultural labor.

Using a panel data set that covered 29 provinces from 1988 to 2011 and applying simultaneous equations, this study produced several important findings, as follows.

First, the relationship between growth and inequality in China is clear. Rising urban-rural inequality fosters growth [except in Model (2) of Table 9], and growth involves urban-rural inequality.

Second, surplus labor is a strong driver of rising urban-rural inequality in China, confirming Lewis's dual economy theory. Four different methods were used to measure surplus agricultural labor: the classical method, international standard structure comparison, the sown-land-to-labor-ratio method, and the arable-land-to-labor-ratio method. Although the estimated surplus labor forces differed significantly in terms of their magnitude (from 14 million to 80 million), their influence on urban-rural inequality was the same and robust. Provinces with more surplus labor had more unequal urban-rural income distribution, implying that reduction of surplus labor is one of the fundamental ways of reducing urban-rural inequality.

Third, provinces in the inland regions of China experienced greater urban-rural inequality. In particular, the urban-rural divide was more severe in the western than in the central region and more severe in the central region than in the coastal region.

Meanwhile, surplus labor is closely linked to the issue of migrant workers in China because more surplus workers might increase the outflow of migrant workers from a region. Moreover, the number of migrant workers in a region may strongly influence the rural income and urban-rural inequality of that region. The influence of migrant workers is not considered in this study because data at the provincial level are unavailable, but the issue should be addressed in future research.

(Recieved 05 March 2013; Revised 20 October 2013; Accepted 21 October 2013)

Appendix A. Basic statistics of used variables

Variable	Obs	Mean	Std. Dev.	Min	Max
gdpgr	696	9.98	4.03	-3.74	39.00
urgap	696	2.73	0.66	1.14	4.76
surlab1	696	23.02	5.13	7.70	28.87
surlab2	696	27.67	9.71	5.88	45.06
surlab3	696	27.07	41.25	-144.15	64.89
surlab4	696	12.26	77.79	-302.64	74.00
inigdp	696	7.21	0.46	6.53	8.53
popgr	696	1.10	1.52	-8.05	18.98
invt	696	40.56	15.68	15.33	93.39
infl	696	6.28	7.44	-3.20	29.40
soe	696	68.78	13.47	22.17	90.55
gov	696	14.57	6.69	4.92	57.92
agr	696	8.42	2.84	2.13	17.09
urbangr	696	2.15	4.00	-13.54	58.61
center	696	0.28	0.45	0.00	1.00
west	696	0.34	0.48	0.00	1.00

Note: See section 3 for the definitions of the variables.

Appendix B. Correlation matrix of used variables

Variable	gdpgr	urgap	surlab1	surlab2	surlab3	surlab4	inigdp	popgr	invt	infl	soe1	gov	agr	urbangr	center	west
gdpgr	1.000															
urgap	0.189	1.000														
surlab1	0.060	0.518	1.000													
surlab2	0.034	0.669	0.810	1.000												
surlab3	0.092	0.306	0.095	0.432	1.000											
surlab4	0.089	0.184	-0.056	0.299	0.971	1.000										
inigdp	-0.050	-0.625	-0.918	-0.884	-0.321	-0.191	1.000									
popgr	-0.317	-0.195	-0.323	-0.243	-0.042	-0.001	0.302	1.000								
invt	0.415	0.343	-0.023	-0.029	-0.019	-0.037	0.031	-0.161	1.000							
infl	-0.002	-0.145	-0.016	-0.006	0.005	0.006	0.006	0.038	-0.196	1.000						
soe	-0.224	0.157	0.447	0.335	-0.093	-0.172	-0.439	-0.083	-0.260	0.277	1.000					
gov	0.003	0.552	0.207	0.221	-0.059	-0.156	-0.227	-0.051	0.560	-0.159	0.119	1.000				
agr	0.034	0.440	0.565	0.532	-0.012	-0.127	-0.591	-0.169	0.257	0.100	0.292	0.477	1.000			
urbangr	0.119	0.020	0.031	0.081	0.124	0.133	-0.041	-0.069	-0.053	0.060	-0.043	-0.138	-0.081	1.000		
center	-0.014	-0.148	0.285	0.012	-0.237	-0.186	-0.228	-0.166	-0.113	-0.008	0.070	-0.160	-0.010	-0.074	1.000	
west	-0.066	0.654	0.426	0.535	0.076	-0.068	-0.493	-0.069	0.141	0.014	0.438	0.564	0.542	-0.064	-0.448	1.000

Note: See section 3 for the definitions of the variables.

References

Barro, Robert J. “Inequality and Growth in a Panel of Countries.” *Journal of Economic Growth* 5 (No. 1 2000): 87-120.

______. *Determinants of Economic Growth: A Cross-Country Empirical Study*. Cambridge: The MIT Press, 1997.

______. “Institutions and Growth, an Introductory Essay.” *Journal of Economic Growth* 1 (No. 2 1996): 145-48.

______. “Economic Growth in a Cross Section of Countries.” *The Quarterly Journal of Economics* 106 (No. 2 1991): 407-43.

Barro, R. J., and Lee, J. W. “Source of Economic Growth.” *Carnegie-Rochester Conference Series on Public Policy* 40 (1994): 1-46.

Benjamin, Dwayne, Brandt, Loren, and Giles, John. “Inequality and Growth in Rural China: Does Higher Inequality Impede Growth?” IZA Discussion Paper (No. 2344 2006).

Blomström, M., Lipsey, R. E., and Zejan, M. “Is Fixed Investment the Key to Economic Growth?” *The Quarterly Journal of Economics* 111 (1996): 269-76.

Caselli, F., Esquivel, G., and Lefort, F. “Reopening the Convergence Debate: A New Look at Cross Country Growth Empirics.” *Journal of Economic Growth* 1 (No. 3 1996): 363-90.

Chen, Xianyun. “The Methodological Research of Measuring Rural Residual Labor Forces.” *Statistical Research* 21 (No. 2 2004): 50-3 (in Chinese).

Chen, Xi-kang. *Analysis of Input-Occupation-Output of Urban and Town Economics in China*. Beijing: Science Press, 1992 (in Chinese).

Chenery, Holiis B., and Syrquin, Moises. *Patterns of development, 195-1970*. Oxford: Oxford University Press, 1975.

Clarke, Todd E. “Cross-country Evidence on Long-run Growth and Inflation.” *Economic Inquiry* 35 (No. 1 1997): 70-81.

Démurger, Sylvie, Fournier, Martin, and Li, Shi. “Urban Income Inequality in China Revisited (1988-2002).” *Economics Letters* 93 (No. 3 2006): 354-59.

Griffin, K., and Saith, A. “The Pattern of Income Inequality in Rural China.” *Oxford Economic Papers* 34 (No. 1 1982): 172-206.

Hu, Angang. “An Analysis on Employment Situation in China.” *Management World* 9 (No. 3 1997): 36-54 (in Chinese).

Jin, Furong. “Foreign Direct Investment and Income Inequality in China.” *Seoul Journal of Economics* 22 (No. 3 2009): 311-39.

Kanbur, Ravi, and Zhang, Xiaobo. "Fifty Years of Regional Inequality in China: A Journey through Central Planning, Reform and Openness." *Review of Development Economics* 9 (No. 1 2005): 87-106.

______. "Which Regional Inequality? The Evolution of Rural-urban and Inland-coastal Inequality in China from 1983 to 1995." *Journal of Comparative Economics* 27 (No. 4 1999): 686-701.

Khan, Azizur, Rahman, Griffin, Keith, and Riskin, Carl. "Income Distribution in Urban China during the Period of Economic Reform and Globalization." *American Economic Review* 89 (No. 2 1999): 296-300.

Knight, John, and Song, Lina. "The Spatial Contribution to Income Inequality in Rural China." *Cambridge Journal of Economics* 17 (No. 2 1993): 195-213.

______. "The Determinants of Urban Income Inequality in China." *Oxford Bulletin of Economics and Statistics* 53 (No. 2 1991): 123-54.

Kormendi, Roger C., and Meguire, Philip G. "Macroeconomic Determinants of Growth: Cross-country Evidence." *Journal of Monetary Economics* 16 (No. 2 1985): 141-63.

Levine, R., and Renelt, D. "A Sensitivity Analysis of Cross-country Growth Regressions." *American Economic Review* 82 (1992): 942-63.

Lewis, W. A. "Economic Development with Unlimited Supply of Labour." *The Manchester School* 22 (No. 2 1954): 139-91.

Li, Shi, and Yue, Ximing. "Income Distribution and Public Policy in China." The 253th Unirule Institute of Economics Seminar paper, 2004.

Lundberg, M., and Squire, L. "The Simultaneous Evolution of Growth and Inequality." *Economic Journal* 113: 326-44.

Mankiw, N. G., Romer, D., and Weil, D. N. "A Contribution to the Empirics of Economic Growth." *The Quarterly Journal of Economics* 107 (1992): 407-37.

National Bureau of Statistics of China, Online Database, Available at: http://www. stats.gov.cn. August 24, 2013.

Sala-i-Martin, X. X. "Transfer, Social Safety Nets, and Growth." IMF Staff Papers 44 (No. 1 1997): 81-102.

Sicular, Terry, Yue, Ximing, Gustafsson, Bjorn, and Li, Shi. "The Urban-rural Income Gap and Inequality in China." *Review of Income and Wealth* 53 (No. 1 2007): 93-126.

Tsui, K. "Decomposition of China's Regional Inequalities." *Journal of Comparative Economics* 17 (1993): 600-27.

UNU-WIDER. World Income Inequality Database, Available at: http://www.wider.unu. edu. January 5.

Wan, Guanghua, Lu, Ming, and Chen, Zhao. "The Inequality-growth Nexus in the Short and Long Run: Empirical Evidence from China." Journal of *Comparative Economics* 34 (2006): 654-67.

Wang, Jiangui, and Ding, Shouhai. "A Re-estimation of China's Agricultural Surplus Labor—The Demonstration and Modification of Three Prevalent Methods." *Frontiers of Economics in China* 1 (No. 2 2006): 171-81.

World Bank. *Sharing Rising Incomes: Disparities in China*. Washington, DC: World Bank, 1997.