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Working Paper — Digitized Version

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Discussion Papers, No. 75

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Suggested Citation: Aaberge, Rolf; Li, Xuezheng (1992) : The Trend in Income Inequality in Urban Sichuan and Liaoning, 1986 1990, Discussion Papers, No. 75, Statistics Norway, Research Department, Oslo

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Discussion Paper

Central Bureau of Statistics, P.B. 8131 Dep, 0033 Oslo 1, Norway

No. 75

September, 1992

THE TREND IN INCOME INEQUALITY IN URBAN SICHUAN AND LIAONING, 1986-1990

by

Rolf Aaberge¹⁾ and Xuezheng Li²⁾

ABSTRACT

This paper discusses in what extent the economic growth in China in the 1980's has improved the economic well-being in urban regions of the provinces Sichuan and Liaoning and moreover whether or not the economic growth has been attained at the cost of increased inequality. The study is based on individual household data from the State Statistical Bureau's Urban Household Survey during the 1986-1990 period.

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Acknowledgement

We would like to thank Anne Skoglund who have typed and edited the paper.

1. Introduction

Since 1979 China has carried out important economic reforms both in the agricultural sector and in the nonagricultural sectors in order to increase productivity and improve the level of living of Chinese households. To achieve these objectives economic controls have gradually been relaxed and market incentives have been introduced. Although the Chinese government still determines the wages of workers in state- and collective-owned enterprises and in the public sector, more economic incentives are provided for the workers, of which the introduction of a bonus payments is the most important. Altogether, these reforms resulted in a rapid increase in productivity and output. Faced by the hypothesis that there are a trade-off between economic policies that guarantee a minimum income with low level of inequality and policies that provide a higher overall level of income at the cost of higher inequality, the following questions may be addressed:

- (i) have households increased their level of living?
- (ii) has the structure in the composition of different income factors changed?
- (iii) how is the impact on the distribution of income?

These important policy questions will be studied by means of individual household data from the State Statistical Bureau's Urban Household Survey during the 1986-1990 period. In this paper we focus on urban household income inequality in the provinces Sichuan and Liaoning. By contrast, most studies on income inequality in China consider nationwide income inequality and its sensitivity to changes in the urban/rural income gap.

The evaluation of inequality in the distribution of income is of fundamental importance in order to make judgement on welfare and the level of living in a society. Most of the available empirical information on economic inequality in developing countries refers to the distribution of income among earners. This information constitutes an important part of a

complete description of the labor market and related distributions of income, but it is less helpful in the analysis of inequality as a welfare issue. A more relevant approach is to compare income levels among households of equal size and composition. This paper focuses mainly on couples with one child which, as a result of the current birth control policy, turn out to be the predominating household group in China. However, to allow for comparison of relative economic position of persons, regardless of which type of household they live in, we also introduce household income divided by household size as a welfare indicator.

Our methodological approach is mainly based on a measure of inequality, called the A-coefficient, which is closely related to the Gini coefficient. The essential difference is that the A-coefficient is more sensitive than the Gini coefficient to inequality in the lowest part of the income distribution. This means that the A-coefficient exhibits a higher degree of inequality aversion than the Gini coefficient, irrespective the functional form of the income distribution in question. For that reason, the A-coefficient always takes larger values than the Gini coefficient, which means that the cost of inequality always is larger if the society's ethical norms coincides with the A-coefficient than if it coincides with the Gini coefficient.

The following section discusses the properties of the employed measures of inequality and suggests a method for interpreting the magnitude of changes in inequality. Sections 3 and 4 deal with the description of the trend and structure in household income inequality in urban Sichuan and Liaoning during the 1986-1990 period. Section 5 examines the distribution of well-being across persons by applying household income divided by household size as welfare indicator. Section 6 summarizes the findings and the conclusions of the paper.

2. Measurement and Decomposition of Inequality

In order to evaluate the deviation of each household's income from that of a household living in a society of complete equality, the standard approach is to employ the Lorenz curve. The Lorenz curve relates the cumulative proportion of income units to the cumulative proportion of income received when units are arranged in ascending order. Thus, the Lorenz curve captures the essence of inequality when inequality is defined as the deviation from the state of equality and restricted to satisfy the principles of transfers and scale invariance. The principle of scale invariance states that inequality should remain unaffected if each income is altered in the same proportion and it requires, therefore, the inequality measure to be independent of the scale of measurement. The principle of transfers implies that if a transfer of income takes place from a richer to a poorer person without changes in the relative positions, the level of inequality diminishes. When employed as a criterion for ranking income distributions the Lorenz curve is, however, incomplete. Therefore, several summary measures of inequality have been derived to provide complete ranking of distributions. The most widely used measure of inequality is the Gini coefficient, which satisfies the principles of scale invariance and transfers. The reader is referred to Sen (1973) for a more comprehensive discussion of the normative implications of different measures of inequality.

2.1. Measures of inequality

As is wellknown, the Gini coefficient (G) is related to the Lorenz curve (L) in the following way

$$(2.1) \quad G = \int_0^1 [1 - 2L(u)] du.$$

The Gini coefficient offers a method for ranking distributions and quantifying the differences in inequality between distributions which is widely used in applied work. This practice, however, is questionable. Evidently, no single measure can reflect all aspects of inequality of a distribution, only summarize it to a certain extent. Consequently, it is important to have alternatives to the Gini coefficient. As pointed out by Atkinson (1970), the Gini coefficient assigns more weight to transfers in the centre of a unimodal distribution than at the tails. As a supplement to the Gini coefficient, we will employ an inequality measure - the A-coefficient - that assigns more weight to transfers at the lower tail than at the centre and the upper tail. For any distribution whatsoever, the inequality is higher when measured by A than by G. Therefore, a social decision-maker who adopts the A-coefficient for judging income distributions with respect to inequality displays more aversion to inequality than a decision-maker who adopts the Gini coefficient.

The A-coefficient, see Aaberge (1986), has a similar geometric interpretation and relation to the inequality curve M defined by

$$(2.2) \quad M(u) = \frac{E[X|X \leq F^{-1}(u)]}{EX}, \quad 0 \leq u \leq 1,$$

as the Gini coefficient has to the Lorenz curve. Here X has distribution function F. The A-coefficient is defined by

$$(2.3) \quad A = \int_0^1 [1 - M(u)] du.$$

If X is an income variable, then M(u) for a fixed u expresses the ratio of the mean income of the poorest 100u per cent of the population to the mean income of the population. As is wellknown, the egalitarian line of the Lorenz curve is the straight line joining the points (0,0)

and (1,1). The egalitarian line of the M-curve is the horizontal line joining the points (0,1) and (1,1). Thus, the family of M-curves is bounded by a unit square, while the family of Lorenz-curves is bounded by a triangle. Therefore, there is a sharper visual distinction between two different M-curves than between the two corresponding Lorenz curves. Note that the M-curve will be equal to the diagonal line ($M(u)=u$) if and only if the underlying distribution is uniform (0,a) for an arbitrary a. The A-coefficient then takes the value 0.5, while the maximum attainable value is 1 and the minimum attainable value is 0.

Note that $M(u) = L(u)/u$, which implies

$$(2.4) \quad A = \int_0^1 \left[1 - \frac{L(u)}{u} \right] du.$$

Nonparametric estimators for G and A are given by

$$(2.5) \quad \hat{G} = \frac{\frac{1}{n^2} \sum_{i=2}^n \sum_{j=1}^i (X_{(i)} - X_{(j)})}{\bar{X}}$$

and

$$(2.6) \quad \hat{A} = \frac{\frac{1}{n} \sum_{i=2}^n \sum_{j=1}^i \frac{1}{i} (X_{(i)} - X_{(j)})}{\bar{X}}$$

respectively, where $X_{(1)} \leq X_{(2)} \leq \dots \leq X_{(n)}$ are the ordered observations.

2.2. Interpreting changes in measures of inequality in terms of a hypothetical redistribution

In order to compare changes in inequality over time for a given population, the standard procedure is to provide estimates of one or more measures of inequality. However,

since there do not exist any theoretical grounds for the unit interval as scale of measurement for inequality measures, a method for quantifying how important any observed change in inequality might be is needed. A method suggested by Blackburn (1989) involves a hypothetical redistribution of a constant amount of income, from every income unit below the median level of income to every income unit above the median, so as to make the value of an inequality measure for the distribution in question (for which the redistribution is applied) equal to the inequality for some other distribution. In this paper we propose a somewhat different approach. The similarity consists of adopting the idea of a hypothetical intervention of a tax/transfer reform. Suppose, for example, that the Gini coefficient increased from G_1 in year 1 to $(k+1)G_1$ ($k > 0$) in year 2, i.e., an increase of $100k$ per cent. As will be proved below this increase in inequality corresponds to introducing an equal-sized lump-sum tax of $100k$ per cent of the mean income in year 1 followed by transferring the collected tax revenue as proportional transfers where each unit receives $100k$ per cent of its income in year 1. Note that this intervention leaves the mean income unchanged. By contrast, suppose the Gini coefficient declined from year 1 to year 2, i.e. $k < 0$. Introducing a proportional tax with tax rate equal to $100(-k)$ per cent and then transferring the derived tax as equal-sized amounts (the mean tax) to the units, the Gini coefficient decreases by $100(-k)$ per cent. Thus, if inequality declines the introduced intervention consists of a series of progressive transfers, while increased inequality corresponds to introduce a series of regressive transfers.

Let X be a random income variable with cumulative distribution function F_1 and $\mu_1 = EX_1$. Now, introducing the above intervention, where $-1 < k < 1$ is the tax/transfer rate, the income after intervention is distributed according to \tilde{X}_2 defined by

$$(2.7) \quad \tilde{X}_2 = (1+k)X_1 - k\mu_1.$$

It follows readily from (2.7) that $EX_2 = EX_1$, i.e., the mean income is unchanged. Let \tilde{F}_2 be the cumulative distribution function for \tilde{X}_2 . Thus, from the equation (2.7) we get

$$(2.8) \quad \tilde{F}_2(x) = F_1\left(\frac{1}{1+k}(x + k\mu_1)\right)$$

which is equivalent to

$$(2.9) \quad \tilde{F}_2^{-1}(t) = (1+k)F_1^{-1}(t) - k\mu_1.$$

where F_1^{-1} and \tilde{F}_2^{-1} are the left inverse of F_1 and \tilde{F}_2 , respectively. Since F_1 and \tilde{F}_2 have equal means, (2.9) implies the following relationship between the corresponding Lorenz curves L_1 and \tilde{L}_2 ,

$$(2.10) \quad \tilde{L}_2(u) = (1+k)L_1(u) - ku, \quad 0 \leq u \leq 1.$$

Hence, we obtain the following relationship between the corresponding A-coefficients and Gini coefficients,

$$(2.11) \quad \tilde{A}_2 = (1+k)A_1$$

and

$$(2.12) \quad \tilde{G}_2 = (1+k)G_1.$$

Thus, if we experience a decline in inequality ($k < 0$) then \tilde{L}_2 is a mixture of L_1 and the Lorenz curve for complete equality. By contrast, if $k > 0$ then L_1 is a mixture of \tilde{L}_2 and the equality curve. In order to avoid negative incomes after redistribution it is (in situations with increase in inequality) necessary to require the condition $\min X_1 > (k/k+1)\mu_1$ to be fulfilled. For example, if income inequality increases by 20 per cent then the lowest income has to be larger than 1/6 of the mean income.

2.3. Decomposition of inequality

Given the inequality in the distribution function F measured by A or G , the next step is to identify the sources that make substantial contribution to the inequality. Assume that the main variable X is the sum of s different factor components,

$$(2.13) \quad X = \sum_{i=1}^s X_i.$$

According to Aaberge (1986), A admits the following decomposition

$$(2.14) \quad A = \sum_{i=1}^s \frac{\mu_i}{\mu} \alpha_i$$

where μ_i/μ is the ratio between the means of X_i and X , respectively, and α_i can be interpreted as the conditional A -inequality of factor i given the units rank order in X . Analogously,

$$(2.15) \quad G = \sum_{i=1}^s \frac{\mu_i}{\mu} \gamma_i$$

where γ_i is related to G and has a similar interpretation as α_i related to A .

Notice that α_i and γ_i are measures of correlation between factor i , X_i , and X . Assume for example that $\mu_i > 0$. Then, a negative value of α_i or γ_i expresses negative correlation and means that factor i has an equalizing effect on the inequality in the distribution F of X . A positive value expresses a disequalizing effect on the inequality in F . For $\mu_i < 0$, then positive values of α_i and γ_i express an equalizing effect on the inequality in F . We call α_i and γ_i concentration coefficients which is in accordance with Mahalanobis (1960).

If α_i and γ_i are equal to 0, then every household (or individual) receives an equal amount of factor i . Thus, factor i does neither hold a disequalizing nor an equalizing effect on the distribution F of X . We say that factor i holds a neutral effect.

The above interpretation of the concentration coefficients is based on a consideration where the influence of the different factor components on the overall income inequality is judged simultaneously. If we instead are interested in the impact on overall income inequality from increasing factor i income solely, given that all the concentration coefficients are assumed fixed, this follows from the following elasticities which are established by straightforward differentiation,

$$(2.16) \quad \frac{\partial \log A}{\partial \log \mu_i} = \frac{\mu_i}{\mu} \left(\frac{\alpha_i}{A} - 1 \right) \quad i = 1, 2, \dots, s$$

and

$$(2.17) \quad \frac{\partial \log G}{\partial \log \mu_i} = \frac{\mu_i}{\mu} \left(\frac{\gamma_i}{G} - 1 \right) \quad i = 1, 2, \dots, s.$$

The formulas (2.16) and (2.17) yield the marginal effects on A and G from a small increase of an income factor, conditional on fixed concentration coefficients. From the expressions (2.16) and (2.17) we see that overall inequality will increase (decrease) if and only if the current concentration coefficient is larger (smaller) than the overall inequality. Hence, we may obtain a decline in inequality even if the corresponding concentration coefficient exhibits a disequalizing effect.

3. The trend in household income inequality

According to Blank and Blinder (1986) income inequality has, historically, increased during economic recessions and declined during recoveries. These cyclical swings in inequality, however, do not coincide with the evidence given by Danziger et al. (1989). Their results are related to the economic recovery in the United States during the 1982-1987 period

and revealed a substantial increase in income inequality. However, this evidence is entirely restricted to pure market economies and thus not directly transferable to the mixed economic system in China. During the recent decade a series of market-oriented economic reforms have been introduced in order to increase productivity and improve the level of living of Chinese households. Important aspects of the reforms were to decentralize decisions to the local government level or even to the firm level and allow firms to retain a larger fraction of profits and to make use of bonus payment. Altogether, the economic reforms resulted in a considerable increase in productivity and output and on average in the level of living. Now, the question is whether or not the success in the Chinese economy has been attained at the cost of increased income inequality. This question will be discussed by means of individual household data from the State Statistical Bureau's Urban Households Survey for urban Sichuan and Liaoning during the 1986-1990 period. The Sichuan province is situated in the central part of China and is the largest province with about 110 million people or 10 per cent of the total population in 1990. Liaoning is situated in the northeast of China and had a population of about 40 million people in 1990. The 1990-data have previously been applied by Aaberge et al. (1992) to examine the structure of economic inequality in 1990. Their results refer to distributions of households income, expenditure and savings.

In this section we focus on income inequality among households living in urban regions of Sichuan and Liaoning. A household is defined to include all persons living in the same dwelling and having common board. The results for all households provide important information about household inequality, but must be interpreted with caution when used as a basis for analysis of welfare. This is mainly due to variation in household size and composition. However, by emphasizing comparison of relative economic position of households of equal size and composition we avoid to adjust for differences of this type.

In this section we will mainly focus on couples with 1 child less than 18 years. However, to allow for comparison of well-being across persons irrespective of which type of household they live in, we also introduce household income divided by household size as a welfare indicator in Section 5. Our emphasis on couples with one child is firstly due to the fact that this particular household group constitutes roughly half the population of urban households in these provinces and secondly due to the fact that the majority of the children are living together with their parents in three-person families. In that respect we also obtain important information about economic inequality among children.

Total household income includes all cash income received by the household during the year, but excludes sources of spending such as bank deposits withdrawn, money borrowed from relatives or friends, and repayment of debt by others. In order to give a suggestion of the trend in the magnitude of the income differences between couples with 1 child, Table 1 provides mean incomes in 1990 Yuan by each decile of couples with 1 child living in urban Sichuan and Liaoning, respectively. For 1986-1989 the household incomes are adjusted for price changes using the urban consumer price indexes for Sichuan and Liaoning.

Table 1. Annual mean income^{*)} for couples with 1 child living in urban Sichuan and Liaoning by decile groups, 1986-1990

Province	Sichuan					Liaoning				
Decile group	1986	1987	1988	1989	1990	1986	1987	1988	1989	1990
1	3348	3152	2902	2761	2836	3089	3372	3226	906	3495
2	4058	3889	3567	3470	3529	3658	3886	3807	3095	4036
3	4347	4189	3961	3749	3967	3890	4197	4226	3960	4362
4	4558	4451	4280	4084	4413	4073	4435	4473	4364	4651
5	4734	4716	4595	4307	4764	4276	4618	4757	4657	4993
6	4945	5062	4827	4608	5051	4468	4818	5066	4943	5310
7	5201	5393	5177	5001	5427	4634	5032	5366	5237	5543
8	5479	5702	5623	5441	5780	4782	5275	5655	5563	5849
9	5982	6180	6218	5997	6312	5131	5619	6104	5904	6284
10	7261	7075	7918	7235	7294	6392	6552	7102	6901	7542
All	4991	4981	4907	4665	4937	4439	4781	4978	4553	5207

^{*)} Yuan figures are at 1990 prices.

The income figures in Table 1 show that the 1986-1990 period was one of relatively steady growth in the mean income of 1 child couples living in urban Liaoning, while the corresponding mean incomes in urban Sichuan were reasonably steady at the 1986 level. These regularities were, however, distorted in 1989 by a notable decline in the level of income, which was mainly caused by sharp increases in the consumer prices in 1988 and in 1989. Note, however, that the extremely low mean income of the lowest decile group in Liaoning in 1989 can be due to a bias caused by the sample design. Until 1990 the industrial structure formed the basis for selection of households in Liaoning; households were selected as clusters according to the addresses of the employers. Because of the restructuring of the industry in Liaoning several enterprises were closed down in 1989, which again led to reduced annual wage earnings for the affected employees. It appears, however, that the sample households were more heavily affected by plant closures than the remaining part of the population. Thus, the 1989-figures for Liaoning must be interpreted with caution. By contrast,

in Sichuan the survey design and selection of households were based on the dwelling addresses of the households.

As a result of the economic changes during the 1986-1990 period the mean income in urban Sichuan changed from being 12 per cent above the mean income in urban Liaoning in 1986 to become 5 per cent below the mean income in urban Liaoning in 1990. The figures in Table 1 demonstrate that this pattern is particularly visual among the poor. In order to sum up the annual income differences displayed in Table 1, Table 2 provides estimates of the A-coefficient and the Gini coefficient, respectively. Similar estimates for all households are given in Table 3.

Table 2. Estimates^{*)} of the A-coefficient and the Gini coefficient in distributions of income for couples with one child living in urban Sichuan and Liaoning, 1986-1990

Province	Sichuan					Liaoning				
	1986	1987	1988	1989	1990	1986	1987	1988	1989	1990
Number of observations	264	253	212	210	199	185	273	276	298	323
A-coefficient	.175 (.009)	.195 (.008)	.228 (.011)	.228 (.013)	.227 (.010)	.164 (.012)	.157 (.007)	.192 (.008)	.328 (.018)	.182 (.007)
Gini coefficient	.115 (.006)	.126 (.005)	.156 (.008)	.151 (.008)	.148 (.007)	.107 (.008)	.102 (.005)	.125 (.006)	.188 (.013)	.122 (.006)

^{*)} Standard deviations are given in parentheses.

Table 3. Estimates^{*)} of the A-coefficient and the Gini-coefficient in distributions of income for households living in urban Sichuan and Liaoning, 1986-1990

Province	Sichuan					Liaoning				
	1986	1987	1988	1989	1990	1986	1987	1988	1989	1990
Number of observations	600	599	550	550	550	600	600	600	600	597
A-coefficient	.235 (.008)	.245 (.007)	.283 (.008)	.301 (.009)	.303 (.010)	.229 (.007)	.245 (.008)	.283 (.009)	.355 (.012)	.257 (.008)
Gini coefficient	.156 (.005)	.162 (.005)	.188 (.006)	.199 (.006)	.200 (.007)	.155 (.005)	.171 (.006)	.189 (.007)	.221 (.009)	.174 (.006)

^{*)} Standard deviations are given in parentheses.

According to Table 2 income inequality among couples with 1 child living in urban Sichuan increased considerably during the 1986-1988 recovery. By contrast, mean real income did not change. When measured by the A-coefficient income inequality for this household group stabilized on the 1988-level during the 1988-1990 period. Similarly, income inequality for couples with 1 child living in urban Liaoning increased during the 1986-1988 period and then in 1990 declined below the 1988-level. Between 1986 and 1990, the increase in inequality in Liaoning was 11 per cent measured by the A-coefficient and 14 per cent measured by the Gini coefficient. In Sichuan the corresponding changes in inequality were 30 per cent and 29 per cent, respectively.

The results for all households reported in Table 3 more or less confirm the picture given by Table 2. Due to heterogeneity in household size and composition the level of inequality was, however, substantially higher for all households than for couples with 1 child.

In order to give an interpretation of the magnitude of changes in the A-coefficient, we shall employ the hypothetical intervention discussed in Section 2.2. Between 1986 and 1988 the A-coefficient for couples with 1 child living in urban Sichuan and Liaoning increased by 30.3 per cent and 17.1 per cent, respectively. In Sichuan this increase in inequality corresponds to imposing an equal-sized lump sum tax equal to 30.3 per cent of the mean income in 1986 followed by redistributing the collected tax revenue as proportional transfers equal to 30.3 per cent of each couple's income in 1986. Thus, this specific intervention is composed of a series of regressive transfers, each of which increases inequality. For instance, the first decile group faces a hypothetical income loss of 0.303 (4991-3348) Yuan = 497 Yuan. By contrast, the tenth decile group faces an income gain of 687 Yuan.

If, however, the Gini coefficient forms the basis of the measurement of inequality, then income inequality among couples with one child living in urban Sichuan and Liaoning

increased between 1986 and 1988 by 35.7 per cent and 16.8 per cent, respectively. Consequently, the increased inequality in Sichuan was higher when measured by the Gini coefficient than measured by the A-coefficient. This distinction is due to the fact that both the lower and the central part of the 1986-distribution were heavily affected during the 1986-1988 period. Moreover, from the discussion in Section 2.1 we know that the Gini coefficient is much more sensitive to the changes in the central part of the distribution than the A-coefficient. By contrast, the A-coefficient puts its main focus on changes concerning the lowest 20 per cent of the distribution.

To get a better understanding of the hypothetical intervention mentioned above, we provide in Table 4 decile-specific mean incomes determined by a hypothetical intervention of the 1986-incomes of couples with one child so as to make the value of inequality measures equal to their values in 1988. For the sake of comparison recall the figures of the 1986-columns of Table 1.

Table 4. Mean income for couples with one child living in urban Sichuan and Liaoning by decile groups after a hypothetical redistribution of the incomes in 1986 so as to make the values of the A-coefficient and the Gini coefficient equal to their respective values in 1988

Province	Sichuan		Liaoning	
Level of inequality Decile group	A = 0.228	G = 0.156	A = 0.192	G = 0.125
1	2855	2762	2858	2862
2	3775	3725	3524	3527
3	4152	4117	3796	3798
4	4427	4403	4010	4011
5	4656	4642	4248	4249
6	4931	4928	4473	4473
7	5264	5275	4667	4667
8	5627	5653	4840	4840
9	6282	6335	5249	5247
10	7948	8670	6725	6721
All	4991	4991	4439	4439

4. Decomposition of household income inequality

Since it is of obvious interest to identify the sources that made substantial contributions to the level and changes in the level of inequality in urban Sichuan and Liaoning during the 1986-1990 period, this section is devoted to decomposition of overall inequality with respect to five basic income sources: wage earnings in state-owned units, wage-earnings in collective-owned units, other income from work units, income from current transfers and other income.

Wage earnings in state-owned or collective-owned units are the total wages of household members employed in state-owned or collective-owned enterprises, government

offices and other institutions. Such wages consist of base wage, bonuses, floating salary and contractual income. Floating salary is a flexible salary, the amount of which depends upon the quality of work produced. Contractual income is the income that staff and workers in some state-owned and collective-owned enterprises earn from work they are contracted to perform. The amount of the contractual income is equal to the total income derived from the contracted activities minus all production costs, taxes, and profits set by contract.

Other income from work units consists mainly of housing subsidies and covering of medical insurance from the work unit.

Income from current transfers includes pension and compensation for increasing food prices.

Other income consists of income from selfemployment, secondary employment, property and gifts and other special income.

As demonstrated in Section 2.3, the applied decomposition method views each income factor's contribution to overall income inequality as the product of its fraction of and correlation with total income. In analyzing each income factor's contribution to overall inequality this method has the advantage over the common stepwise methods of being independent of the order by which the income factors are entering. The standard approach in applied work is to compare inequality with and without the income factor in question. For example, in examining the question whether working wives decrease family income inequality, Horwath (1980) and Danziger (1980) employed this approach. Thus, their results depend on whether one compares family income inequality with income inequality between husbands or with income inequality between wives. In answering this type of questions a more relevant approach is to employ methods which are independent of the ordering of income factors.

The results of the decomposition of the income inequality, as measured by the A-coefficient, are given in Tables 5 and 6. As a supplement, corresponding results for the Gini coefficient are given in Appendix 2.

Table 5. Decomposition of the A-coefficient^{a)} in distributions of household income for couples with one child living in urban Sichuan with respect to (1) wage earnings in state-owned units, (2) wage earnings in collective-owned units, (3) other income from work units, (4) income from current transfers and (5) other income

Year (level of inequality)	Income factor	Fraction of overall inequality (per cent)	Fraction of total income (per cent)	Concentration coefficient
1986 (0.175)	1	89.4	66.6	0.235
	2	-17.9	15.5	-0.202
	3	10.1	8.9	0.199
	4	3.5	0.9	0.656
	5	14.9	8.1	0.326
1987 (0.195)	1	80.7	67.3	0.234
	2	-9.3	14.5	-0.124
	3	10.4	8.2	0.247
	4	2.7	0.8	0.678
	5	15.5	9.2	0.328
1988 (0.228)	1	91.0	61.0	0.341
	2	-15.1	13.4	-0.257
	3	11.1	9.0	0.282
	4	3.2	9.0	0.080
	5	9.8	7.6	0.296
1989 (0.228)	1	93.6	60.6	0.353
	2	-15.2	12.8	-0.269
	3	11.3	8.8	0.294
	4	4.1	11.0	0.085
	5	6.2	6.8	0.211
1990 (0.227)	1	92.2	61.2	0.342
	2	-18.6	12.5	-0.338
	3	12.5	8.8	0.321
	4	3.7	10.4	0.081
	5	10.1	7.1	0.324

^{a)} The estimated A-coefficients are given in parentheses.

Table 6. Decomposition of the A-coefficient^{*)} in distributions of household income for couples with one child living in urban Liaoning with respect to (1) wage earnings in state-owned units, (2) wage earnings in collective-owned units, (3) other income from work units, (4) income from current transfers and (5) other income

Year (level of inequality)	Income factor	Fraction of overall inequality (per cent)	Fraction of total income (per cent)	Concentration coefficient
1986 (0.164)	1	99.0	63.7	0.254
	2	-18.5	21.4	-0.141
	3	10.3	7.2	0.233
	4	1.3	0.7	0.314
	5	7.9	7.0	0.184
1987 (0.157)	1	115.3	51.6	0.350
	2	-36.1	29.3	-0.193
	3	6.7	8.7	0.121
	4	-4.9	0.5	-1.595
	5	19.0	9.9	0.301
1988 (0.192)	1	98.1	53.6	0.351
	2	-25.3	22.4	-0.216
	3	7.2	7.5	0.184
	4	5.1	9.5	0.102
	5	14.9	7.0	0.411
1989 (0.328)	1	62.9	52.6	0.392
	2	12.4	21.7	0.187
	3	9.6	8.7	0.360
	4	5.9	10.0	0.192
	5	9.2	7.0	0.432
1990 (0.182)	1	104.4	53.7	0.354
	2	-23.0	21.8	-0.192
	3	8.7	8.2	0.193
	4	0.4	9.7	0.007
	5	9.5	6.6	0.264

^{*)} The estimated A-coefficients are given in parentheses.

The first and the second column of Tables 5 and 6 display each income factor's relative contribution to overall inequality and to total income, respectively. The third column gives the concentration coefficients. Table 5 shows that all income factors, except wage earnings in collective-owned units, has a disequalizing effect on the distributions of income

for couples with one child living in urban Sichuan. The major income factor, wage earnings in state-owned units, accounted for 60-68 per cent of total income and for 80-94 per cent of overall inequality. By contrary, wage earnings in collective-owned units reduced inequality by 9-19 per cent. The predominating contribution from wage earnings in state-owned units on household income inequality is in accordance with the findings of Hu et al. (1986) that wages and bonus payments are greatly influenced by affiliation to state-owned enterprises. From 1986 to 1987 the increased inequality was mainly due to a reduced equalizing effect of wage earnings in collective-owned units. The corresponding concentration coefficient increased from -0.202 to -0.124. Between 1988-1990 the concentration coefficient of wage earnings in collective-owned units decreased below its 1987 value, while this income factor's fraction of total income stabilized on about 13 per cent. Thus, during the 1988-1990 period wage earnings in collective-owned units again increased its equalizing effect. Despite this fact, income inequality, as measured by the A-coefficient, increased by 17 per cent from 1987 to 1988 and was steady at its 1988 level up to 1990. The increased income inequality was mainly due to a rising disequalizing effect of wage earnings in state-owned units. This effect was not outweighed by a declining disequalizing effect of income from current transfers. During the 1988-1990 period income from current transfers accounted for 9-11 per cent of total income and merely of 3-4 per cent of inequality, which means that income from current transfers was approximately evenly distributed across couples with one child living in urban Sichuan. The notable decline in the income fraction of wage earnings in state-owned units from the 1986-1987 period to the 1988-1990 period was accompanied by a corresponding increase in the income fraction of income from current transfers. This fact is due to a change in the reporting routines between 1987 and 1988, when compensation for increasing food prices changed classification from being included in wage earnings to be included in current

transfers. Nevertheless, the change in reporting routines do not distort our main conclusion of a rising disequalizing effect of wage earnings in state-owned units.

The results for urban Liaoning, reported in Table 6, roughly correspond to the changes reported for urban Sichuan. We shall, however, comment upon some noteworthy exceptions. Firstly, the atypical large income inequality in 1989 was mainly due to the fact that the effect of wage earnings in collective-owned units changed from being equalizing in 1988 to be disequalizing in 1989. By 1990, wage earnings from collective-owned units again contributed to reduced income inequality. Secondly, the income fraction of wage earnings in collective-owned units was about 9 per cent points larger in urban Liaoning than in urban Sichuan, while the income fraction of wage earnings in state-owned units was about 8 per cent lower. Thirdly, in contrast to urban Sichuan income from current transfers contributed significantly to income inequality in 1989. By 1990, however, this income factor had a neutral impact on income inequality among couples with one child, irrespective of province. This means that income from current transfers was evenly distributed across couples with one child living in urban Liaoning and Sichuan, respectively.

For both provinces the above decomposition results for the 1986-1990 period reveal that wage earnings in collective-owned units along with wage earnings in state-owned units were the predominating income sources of the poor couples with one child and that wage earnings in state-owned units was the predominating income source of the rich couples.

Next, by using (2.16) and the estimates of Tables 5 and 6 we derive effects on income inequality from marginal changes of one income factor while the remaining income factors are kept fixed. During the 1986-1990 period, a small increase in wage earnings in state-owned units would have caused the largest increase in income inequality among couples with one child, irrespective of province. In Sichuan the elasticity of wage earnings in state-owned units

was steady about 0.3 between 1988 and 1990. By contrast, the corresponding elasticity for Liaoning varies between 0.1 and 0.5. The main explanation for this variation was the atypical high level of income inequality in 1989. If, however, we had increased wage earnings in collective-owned units in 1990 by 1 per cent, then income inequality among couples with one child living in urban Sichuan and Liaoning would be reduced by 0.3 per cent and 0.4 per cent, respectively. For the interpretation of these results, however, note that possible effects of behavioral responses are disregarded.

5. Per capita household income

In Section 3 we mainly focused on the differences in economic well-being among couples with one child. However, also a few results including all households were reported. As a basis for welfare judgements, however, these results must be interpreted with caution. This is, *inter alia*, due to variation in household size and composition. To deal with these problems the standard approach is to construct an equivalence scale. Our approach is simply to employ household income divided by household size as welfare indicator. However, if important economies of scale are present then this method will underestimate the welfare levels of large households relative to smaller ones. In many analyses of welfare this is the major argument for introducing adult equivalents, where additional household members are given weights less than unity. For example, children are often given a weight equal to one-half of an adult. The standard practice, however, is to construct equivalence scales on the basis of empirical consumer demand models. This practice is controversial since demand data are uninformative with respect to interpersonal welfare comparability. Thus, although the equivalence scale approach certainly is attractive from a theoretical point of view, it suffers from arbitrary choices of the cardinal dimension of welfare (see Pollak and Wales (1979),

Deaton and Muellbauer (1980), Fisher (1987), and Blundell and Lewbel (1991)). For the interpretation of the results in this section it is important to bear these difficulties in mind. Moreover, the present results concern individuals rather than households and are, for that reason, based on the additional assumption that the welfare level of an individual is equal to per capita household income of the household within which he/she actually lives.

Table 7 provides estimates of the mean, the A-coefficient and the Gini coefficient in distributions of per capita household income among persons.

Table 7. Estimates of the mean^{*)}, the A-coefficient and the Gini coefficient in distributions of per capita household income among persons living in urban Sichuan and Liaoning, 1986-1990

Province	Sichuan					Liaoning				
	1986	1987	1988	1989	1990	1986	1987	1988	1989	1990
Number of observations	2115	2103	1846	1784	1784	2300	2112	2034	2027	1983
Mean	1529 (11)	1536 (10)	1541 (12)	1492 (12)	1643 (14)	1326 (8)	1600 (9)	1645 (10)	1537 (12)	1708 (11)
A-coefficient	.254 (.004)	.248 (.004)	.279 (.005)	.280 (.005)	.274 (.004)	.237 (.004)	.221 (.004)	.218 (.004)	.331 (.007)	.224 (.004)
Gini coefficient	.170 (.003)	.170 (.003)	.190 (.003)	.189 (.003)	.187 (.003)	.157 (.003)	.148 (.003)	.146 (.003)	.200 (.005)	.147 (.003)

^{*)} Yuan figures are at 1990 prices. Standard deviations are given in parentheses.

The major trend in per capita household income inequality among persons is, as displayed by Table 7, roughly in correspondance with the findings in Section 3 about income inequality among households. There are, however, some noteworthy exceptions. Firstly, while income inequality among all households and among couples with one child living in urban Sichuan increased between 1986 and 1987, per capita income inequality among persons did not change. Secondly, except for an atypical high level of inequality in 1989, per capita income inequality among persons living in urban Liaoning roughly kept fixed during the

1986-1990 period. By contrast, income inequality among all households increased between 1986 and 1988, while income inequality among couples with one child increased from 1986/1987 to 1988.

6. Summary and conclusions

The 1980's has been a period of economic reforms and growth in China. China's new economic system is characterized by the introduction of market forces combined with market regulations and public ownership. The question is whether or not the success in the Chinese economy has improved the overall level of living in urban regions of the provinces Sichuan and Liaoning and if so whether or not this improvement has been attained at the cost of increased income inequality. This paper discusses this question by means of individual household data from the State Statistical Bureau's Urban Household Survey for urban Sichuan and Liaoning during the 1986-1990 period.

As a result of the current birth control policy in China couples with one child turn out to be the dominating household group accounting for roughly 35 per cent of the households in Sichuan and 50 per cent of the households in Liaoning. For that reason this particular household group is emphasized in this study.

Our findings show that the 1986-1990 period was one of relatively steady growth in mean real income of couples with one child living in urban Liaoning, while the corresponding mean real income in urban Sichuan did not change much during this period of time. As a result of this development, the mean real income in urban Sichuan changed from being 12 per cent above the mean real income in urban Liaoning in 1986 to a level of 5 per cent below the mean real income in urban Liaoning in 1990. This particular pattern is even more visual among the poor couples with one child where the difference in mean real income between

urban Sichuan and Liaoning already switched in 1987 from being highest in Sichuan to becoming highest in Liaoning. However, the increase in level of well-being among couples with one child in urban Liaoning was achieved at the cost of increased inequality. Although the urban Sichuan couples with one child did not increase their level of living during the 1986-1990 period they still experienced increased inequality. Thus a higher degree of inequality in Sichuan than in Liaoning in 1986 was maintained during this period of time.

In order to give an interpretation of the magnitude of changes in inequality the paper introduces a convenient intervention method. Based on the Gini coefficient, the income inequality among couples with one child living in urban Sichuan and Liaoning increased between 1986 and 1990 by 29 and 14 per cent, respectively. In Sichuan this increase in inequality corresponds to an intervention consisting of an equal-sized lump sum tax equal to 29 per cent of the mean income in 1986 followed by a redistribution of the collected tax revenue as proportional transfers equal to 29 per cent of each couple's income in 1986. Thus, this specific intervention corresponds to a series of regressive transfers, each of which increases inequality.

So far we have only referred to results that concerns couples with one child. The results for all households are in line with those indicated for couples with one child. However, due to heterogeneity in household size and composition the level of inequality was substantially higher for all households than for couples with one child.

In order to identify the sources that made substantial contributions to the level and changes in level of inequality during the 1986-1990 period, the annual overall inequality was decomposed with respect to five basic income factors. Our findings for Sichuan show that the major income factor, wage earnings in state-owned units, accounted for 60-68 per cent of total income and for 80-94 per cent of overall inequality. The predominating contribution from

wage earnings in state-owned units on household income inequality is generally a result of the Chinese wage system where wages and bonus payments are greatly influenced by affiliation to state-owned enterprises. The observed increase in income inequality during the 1986-1990 period was mainly due to a rising disequalizing effect of wage earnings in state-owned units. The results for urban Liaoning roughly corresponds to the structure reported for urban Sichuan. The disequalizing effect of wage earnings in state-owned units, however, were even stronger in Liaoning than in Sichuan. For both provinces the decomposition results reveal that wage earnings in collective-owned units along with wage earnings in state-owned units were the predominating income sources among the poor couples while wage earnings in state-owned units was the predominating income source among the rich couples.

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APPENDIX 1

The Urban Household Survey of China

The annual Urban Household Survey of China is a sample survey which covers all provinces. The survey collects data on household size and composition, employment status, education level, income structure and quantities and expenditures by type of commodities.

A particular attractive feature of this survey is its continuity in recording the income and consumption data. Each household is keeping daily records of its cash income and consumption quantities and expenditures for monthly collection by survey officials.

The sample of households is selected by adopting a two-stage sampling design. At each stage stratified systematic sampling is used. In the first stage, a sample of cities and county towns is selected by the State Statistical Bureau (SSB) and provincial statistical bureaus. The cities and county towns are according to the size of their non-agricultural populations selected by means of a systematic sampling procedure. In the second stage 100 households are selected randomly from each selected city and county town. The total sample size is about 15 000 households. In addition to provide daily income and consumption accounts the selected households are every month asked questions about household size and composition and about education and employment status of the household members.

In order to reduce non-response and the extent of measurement errors the Urban Household Survey has been based on a rotation sample since 1988. The rotation proportion is 1/3 and the rotation period is one year. Furthermore, SSB has also worked out a comprehensive set of instructions for survey officials in order to improve the data quality. Its main content deals with the survey officials behavior towards the field operations. They are, for instance, asked to help the selected households with housework and child care and otherwise comply with the households customs.

Income concepts

Total income is all cash income received by the household during the year, but excluding such incomes as bank deposits withdrawn, money borrowed from relatives or friends, and repayment of debt by others.

Wages in state-owned or collective-owned units are the total wages of household members employed in state-owned or collective-owned enterprises, institutions, government offices and other organizations. Such wages consist of base wage, bonuses, floating salary and contractual income. Floating salary is an unfixed salary, the amount of which depends upon the quality and quantity of work produced. Contractual income is the income that staff and workers in some state-owned and collective-owned enterprises earn from work they are contracted to perform. The amount of the contractual income is equal to the total income derived from the contracted activities minus all production costs, taxes, and profits set by contract.

APPENDIX 2

Decomposition of the Gini coefficient

Note that Tables 5A and 6A correspond to Tables 5 and 6, respectively.

Table 5A. Decomposition of the Gini coefficient in distributions of household income with respect to (1) wage earnings in state-owned units, (2) wage earnings in collective-owned units, (3) other income from work units, (4) income from current transfers and (5) other income for couples with one child living in urban Sichuan

Year (level of inequality)	Income factor	Fraction of overall inequality (per cent)	Fraction of total income (per cent)	Concentration component
1986 (0.115)	1	90.7	66.6	0.157
	2	-24.0	15.5	-0.118
	3	10.9	8.9	0.141
	4	3.9	0.9	0.499
	5	18.5	8.1	0.265
1987 (0.126)	1	78.1	67.3	0.147
	2	-9.8	14.5	-0.086
	3	10.6	8.2	0.164
	4	3.4	0.8	0.561
	5	17.7	9.2	0.241
1988 (0.156)	1	86.6	61.0	0.221
	2	-15.1	13.4	-0.174
	3	11.7	9.0	0.204
	4	2.2	9.0	0.039
	5	14.4	7.6	0.295
1989 (0.151)	1	88.2	60.6	0.220
	2	-12.7	12.8	-0.149
	3	11.1	8.8	0.191
	4	2.4	11.0	0.033
	5	11.0	6.8	0.247
1990 (0.145)	1	89.3	61.2	0.216
	2	-15.8	12.5	-0.188
	3	13.2	8.8	0.221
	4	1.3	10.4	0.019
	5	12.0	7.1	0.250

Table 6A. Decomposition of the Gini coefficient in distributions of household income with respect to (1) wage earnings in state-owned units, (2) wage earnings in collective-owned units, (3) other income from work units, (4) income from current transfers and (5) other income for couples with one child living in urban Liaoning

Year (level of inequality)	Income factor	Fraction of overall inequality (per cent)	Fraction of total income (per cent)	Concentration component
1986 (0.107)	1	108.7	63.7	0.182
	2	-25.6	21.4	-0.127
	3	8.0	7.2	0.119
	4	1.9	0.7	0.298
	5	7.0	7.0	0.106
1987 (0.102)	1	108.1	51.6	0.214
	2	-35.7	29.3	-0.125
	3	5.4	8.7	0.064
	4	-0.2	0.5	-0.038
	5	22.4	9.9	0.231
1988 (0.125)	1	94.3	53.6	0.219
	2	-23.8	22.4	-0.133
	3	7.2	7.5	0.199
	4	4.0	9.5	0.052
	5	18.3	7.0	0.331
1989 (0.188)	1	65.8	52.6	0.235
	2	8.6	21.7	0.074
	3	10.1	8.7	0.217
	4	4.5	10.0	0.084
	5	11.0	7.0	0.299
1990 (0.122)	1	100.2	53.7	0.228
	2	-24.2	21.8	-0.136
	3	8.1	8.2	0.121
	4	-0.4	9.7	-0.005
	5	16.3	6.6	0.303

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