

## 8. Economic and Demographic Aspects of Taiwan's Rising Family Income Inequality

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### 1 INTRODUCTION

One of the lines of research for which John Fei is best remembered is his joint work with Gustav Ranis and Shirley Kuo which devised a new methodology for decomposing income inequality and applied this methodology to understand growth with equity in Taiwan (Fei et al. 1978, 1979). That research, which ended with data for the 1970s, examined why family income inequality had *fallen* in Taiwan's economic growth.

Since 1980, however, family income inequality in Taiwan has risen slowly but steadily. In this chapter, we apply decomposition methodologies devised by Fei and co-authors and by Shorrocks to Taiwan's Family Income and Expenditure Surveys to quantify the sources of Taiwan's rising family income inequality.

Our principal finding is that labor income inequality accounts for more than 100 percent of the observed change—that is, household income inequality would have increased even more had not business income, property income and transfer income contributed to an equalization of incomes. However, the reason for this is not that individual earnings became more unequally distributed, because they did not. Rather, working people combined into households in a way that led to increased household income inequality. This, along with the decline of multigenerational families in Taiwan, indicates the prime importance of demographic factors in explaining Taiwan's rising income inequality.

As it turns out, similar conclusions have been reached simultaneously in the paper by Schultz (1997) and in a working paper by Chu (1997). Their findings are discussed further below.

## 2 CONTRIBUTION, METHODS AND DATA

Let us begin by stating two major facts about Taiwan. The first is Taiwan's rapid economic growth for more than a generation. The other is the fall in family income inequality up to 1980 and the rise in inequality thereafter. Table 8.1 shows that during this economic growth the Gini coefficient of household income fell from 0.32 in the 1960s to 0.28 in 1980, before rising again to 0.32 by 1994. As shown in Figure 8.1, there was a Lorenz-worsening of the distribution of household income between 1980 and 1992, which means that other inequality measures besides the Gini coefficient would also indicate rising inequality.

A number of factors have been put forth as reasons for this increase. The Taiwan government attributes the increasing family income inequality since 1980 to change in family size, the increase of old-aged or retired families, growing concentration of education, and transformation of the industrial structure (Republic of China 1993). Chu (1995) mentioned a different set of factors, including: a falling rate of increase in the supply of labor, both low skill and high skill; the growing importance of property income and falling importance of agricultural income; rising stock prices and real estate prices; and changing household composition. Deaton and Paxson (1994) observed that much of the dispersion in household consumption in Taiwan can be accounted for by the dispersion of household size.

Given that there are these many factors that have a role to play in determining income inequality, some method is needed for assigning quantitative importance to these various factors. One such method is that devised by Fei et al. (1978, 1979) and Pyatt et al. (1980) for work on Taiwan, which has since been used as well in studies of Pakistan (Ayub 1977), Colombia (Fields 1979), and the United States (Shorrocks 1983; Karoly and Burtless 1995). The inequality of total income is decomposed into components attributable to each factor component (for example, labor income, capital income, land income). Fei et al. showed that the Gini coefficient of total income can be decomposed into a weighted sum of 'pseudo-Ginis', the weights being given by the corresponding factor shares:

$$G(Y) = \sum_k \phi_k G(Y_k), \quad (8.1)$$

where

$Y$  = total income,

$Y_k$  = income from the  $k$ 'th factor component,

Table 8.1 Gini coefficients of household disposable income in Taiwan, 1968-95

Year	Gini coefficient
1968	0.326
1969	na
1970	0.294
1971	na
1972	0.291
1973	na
1974	0.287
1975	na
1976	0.280
1977	0.284
1978	0.287
1979	0.285
1980	0.277
1981	0.281
1982	0.283
1983	0.287
1984	0.287
1985	0.290
1986	0.296
1987	0.299
1988	0.303
1989	0.303
1990	0.312
1991	0.308
1992	0.312
1993	0.316
1994	0.318
1995	0.317

Source: Republic of China, *Report on the Survey of Family Income and Expenditure in Taiwan Area of Republic of China*, 1995, Table 4.

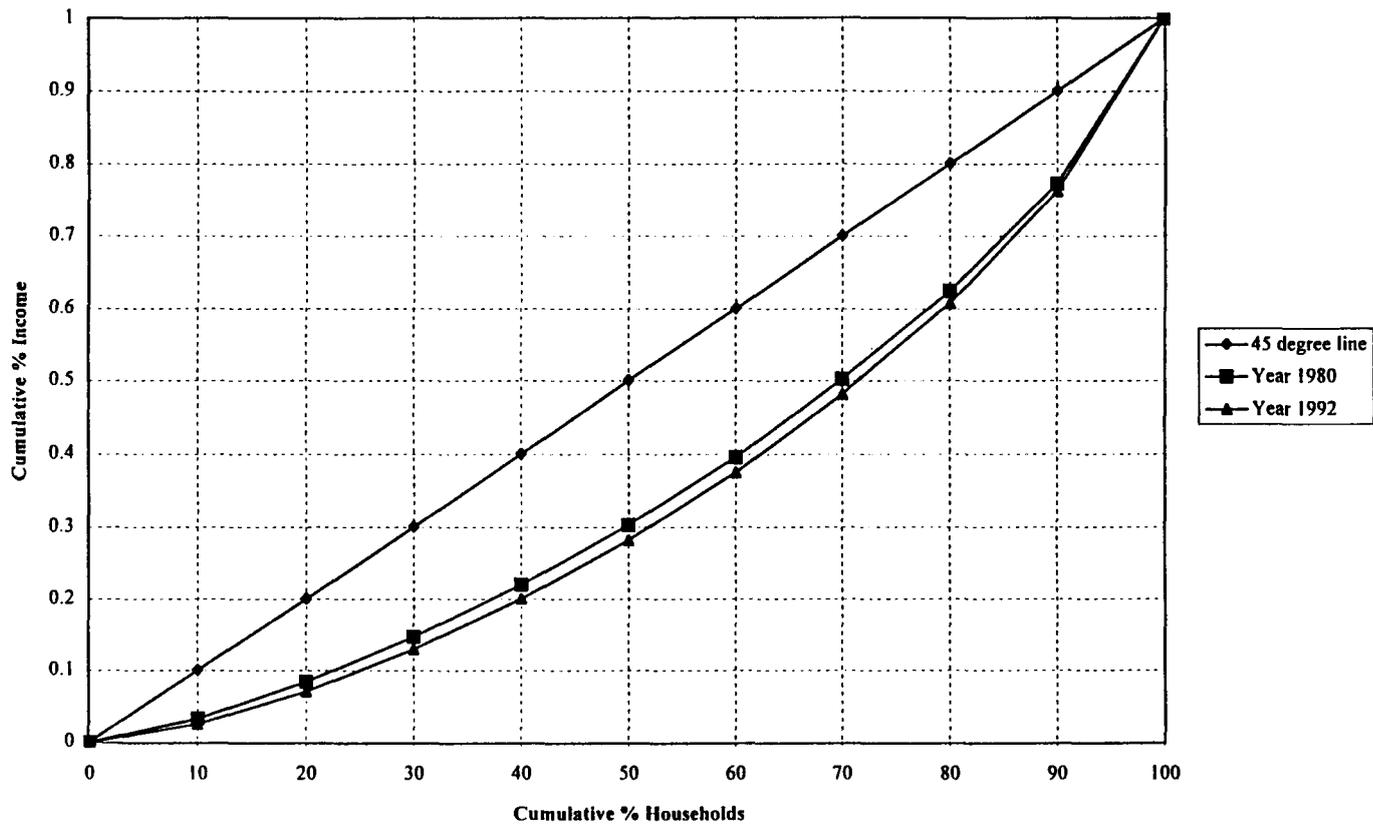


Figure 8.1 Taiwan: Lorenz curves of total household income, 1980 and 1992

$\phi_k \equiv \sum_i Y_{ik} / \sum_k \sum_i Y_{ik}$  = share of income from factor  $k$  in total income,  $G(Y_k)$  is the ‘pseudo-Gini coefficient’ of income from factor  $k$ . (The pseudo-Gini coefficient of a factor component is the Gini coefficient that would be obtained if income recipients are arrayed in increasing order of total income rather than in increasing order of income from that factor.)

Pyatt et al., based on Rao (1969), showed that the pseudo-Gini coefficient (which they call the ‘concentration ratio’) is in turn the product of the ordinary factor Gini  $G(Y_k)$  and a ‘rank correlation ratio’

$$R_k = \frac{\text{cov}(Y_k, \rho)}{\text{cov}(Y_k, \rho)} = \frac{\text{covariance between factor income amount and total income rank}}{\text{covariance between factor income amount and factor income rank}} \quad (8.2)$$

and therefore

$$G(Y) = \sum_k \phi_k G(Y_k) R_k. \quad (8.3)$$

Dividing (8.3) by  $G(Y)$ , one obtains

$$100\% = \sum_k \phi_k G(Y_k) R_k / G(Y) \equiv \sum_k S_k, \quad (8.4)$$

the sum of the Fei-Ranis-Kuo-Pyatt-Chen relative factor inequality weights. These weights are used in the first decomposition exercise reported below.

The second method is one developed by Shorrocks (1982). As above, the  $i$ 'th recipient unit's total income  $Y_i$  is the sum of its income from each of several factor components, for example, labor income, capital income, transfer income, and so on:

$$Y_i = \sum_k Y_{ik}.$$

Shorrocks defines a ‘relative factor inequality weight’  $S_k$  to be the percentage of income inequality that is accounted for by the  $k$ 'th factor — for instance, how much of the inequality of total income is accounted for by the inequality of labor income, capital income, transfer income and so on? He then shows that under a number of axioms on the decomposition itself, the relative factor inequality weights  $S_k$  are given by

$$S_k = \text{cov}(Y_k, Y) / \sigma^2(Y) \quad (8.5)$$

such that

$$\sum_k S_k = 1 \quad (8.6)$$

for *any* inequality index  $I(Y_1, \dots, Y_N)$  which is continuous and symmetric and for which  $I(\mu, \mu, \dots, \mu) = 0$ . Virtually all inequality indices satisfy these conditions, including the Gini coefficient, the Atkinson index, the generalized entropy family, the coefficient of variation and various centile measures.

We then have two alternative source decomposition methods, the Pyatt et al. method given by (8.1)-(8.4) and the Shorrocks method given by (8.5)-(8.6). It should be noted that the relative inequality weights given by the two methods (the  $S_k$  in equation (8.4) and the  $S_k$  in equation (8.5)) are not the same as each other, the difference being due to the different decomposition rules used by the different authors.

Data for this study come from Taiwan's Family Income and Expenditure Surveys for 1980 and 1992 (the latest year available to us). We have information on individuals' labor-market earnings, agricultural income, nonagricultural business income, property income (which includes imputed rent for owner-occupied housing) and transfers. We aggregate these income sources to the household level, so we then have total household labor-market earnings, total household agricultural income, and so on. These totals are then summed up within households to give total household income.

### 3 RESULTS

The decomposition results are presented in Table 8.2. According to both the Pyatt et al. decomposition and the Shorrocks decomposition, the majority of household inequality was due to labor-market income in both 1980 and 1992. Looking at the changes over time, according to the Fei et al. decomposition, *all* of the increase in household inequality was due to labor-market income. All other income sources actually contributed negatively to the increase in inequality — that is, they caused the distribution of income to become more equal. The Shorrocks decomposition gives similar results for the causes of changing income inequality with one exception: according to the Shorrocks decomposition, agricultural income also contributed to the increase in inequality, although

Table 8.2 *Decompositions of household income inequality in Taiwan, 1980 and 1992*

Gini coefficients, 1980 and 1992		
	1980	1992
Gini coefficient	0.290	0.320

## Pyatt et al. decomposition, 1980 and 1992

	Share of Gini coefficient explained, 1980 (%)	Share of Gini coefficient explained, 1992 (%)	Change in Gini coefficient explained, 1980-92
Labor income	65.2	74.1	160.6
Business income	21.7	16.8	- 30.8
Agricultural income	0.8	0.1	- 6.7
Property income	11.2	9.5	- 7.0
Transfer income	1.0	- 0.6	- 16.2

## Shorrocks decomposition, 1980 and 1992

	Share of Gini coefficient explained, 1980 (%)	Share of Gini coefficient explained, 1992 (%)	Change in Gini coefficient explained, 1980-92
Labor income	58.8	67.9	156.4
Business income	25.2	17.7	- 55.2
Agricultural income	0.9	3.0	23.4
Property income	13.6	11.3	- 11.1
Transfer income	1.5	0.1	- 13.5

to a much smaller degree than labor-market income did.

These results lead us to conclude that in order to explain the increase in the inequality of total household income, we should focus on labor-market income—precisely the conclusion reached by Fei et al. (1978, 1979) for Taiwan for an earlier time period.

Given that family income inequality increased and that the decomposition highlights the overwhelming importance of labor income

inequality in that increase, one would expect to find a substantial increase in the inequality of household labor incomes. Indeed this occurred: the Gini coefficient in Taiwan rose between 1980 and 1992 from 0.447 to 0.486. This could have been caused by an increase in the inequality of the earnings of individuals. It could also have been caused by the way that individuals are combined into households.

In fact, the inequality of labor earnings among individuals was *not* a contributing factor. In these data, the Gini coefficient for all people with positive earnings fell from 0.346 in 1980 to 0.311 in 1992, and the 1992 Lorenz curve dominated the 1980 one (Figure 8.2). This is not the first study to have found a lack of an increase in inequality of individual labor earnings: Fields and O'Hara (1996) found this for data from Taiwan's Manpower Utilization Survey (see Figure 8.3), as did Chu (1997) for the Family Income and Expenditure data. The inequality of labor earnings did not increase, because some key earnings differentials remained unchanged: Gindling et al. (1995) found a 'remarkably stable' rate of return to education from 1978 to 1991, and Zveglic et al. (1997) found that the mean gender earnings ratio remained at 65 percent between 1978 and 1992. On the other hand, some factors pushed labor earnings inequality up (in Fields and O'Hara's regression model, these included education, gender and hours of work) while others pushed it down (in this category are experience, job tenure and marital status). These inequality-increasing and inequality-decreasing factors almost exactly offset one another, which is why the 1980 and 1992 Lorenz curves in Figure 8.3 coincide.

If the increasing total household income inequality was *not* the result of increasing inequality of labor-market outcomes for individual workers in Taiwan, rising inequality must be attributable to changing household structure. Two trends in household structure appear to have caused the increase in labor-market income inequality at the household level: an increase in the number and share of older people living without grown children or other younger relatives, and an increase in the labor-market participation of the wives of prime-aged men.

Taiwan's population has been aging, the share of people 60 years of age and over having increased from 6.1 percent in 1980 to 10.9 percent in 1992. At the same time, the share of older people living without an adult relative at least one generation younger than themselves increased from 24.5 percent to 36.3 percent. As a result of these two changes, the share of all households that have an older person living without a relative of a younger generation rose from 5.5 percent to 11.9 percent. These households are much more likely than others to have no labor-market income: in 1992, 53.2 percent of these households had no labor-market income, compared with 16.4 percent of other households. As a result of

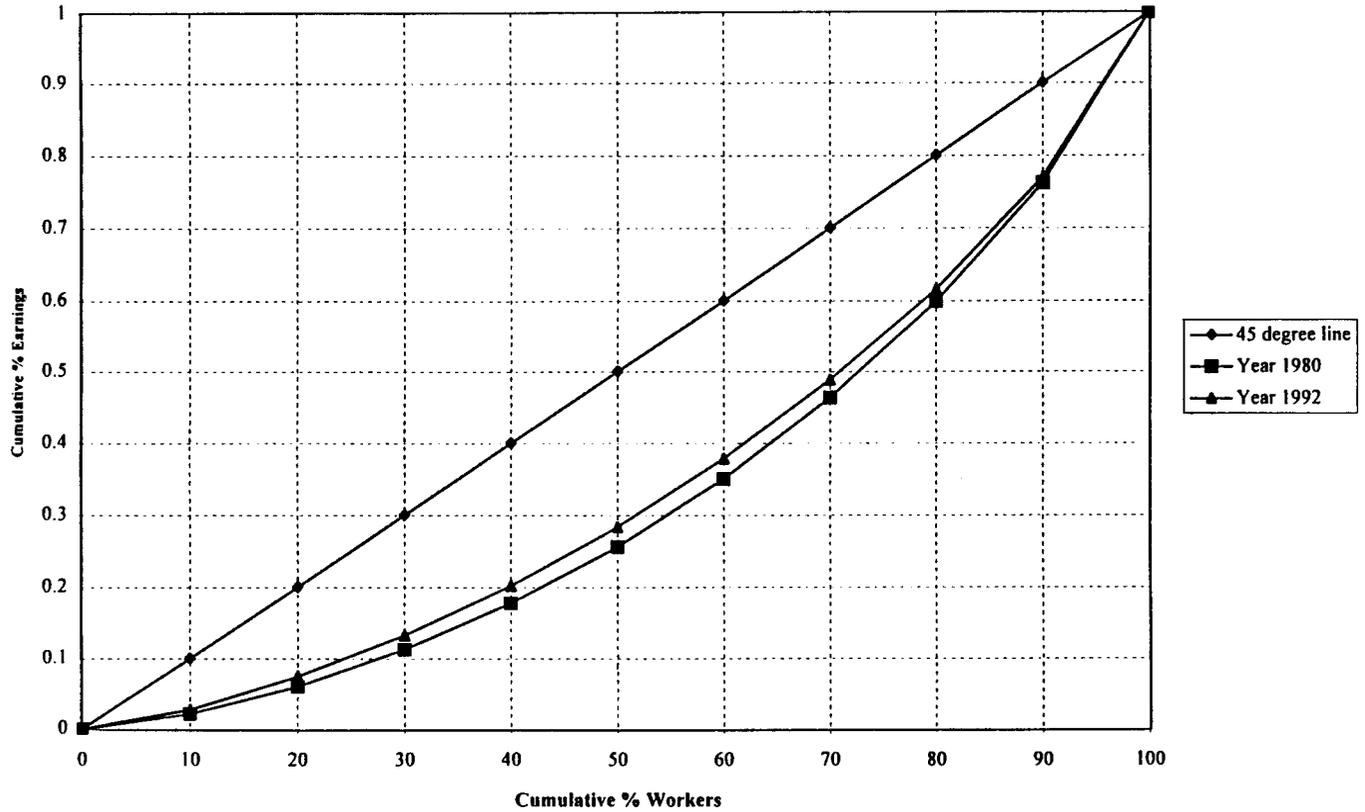
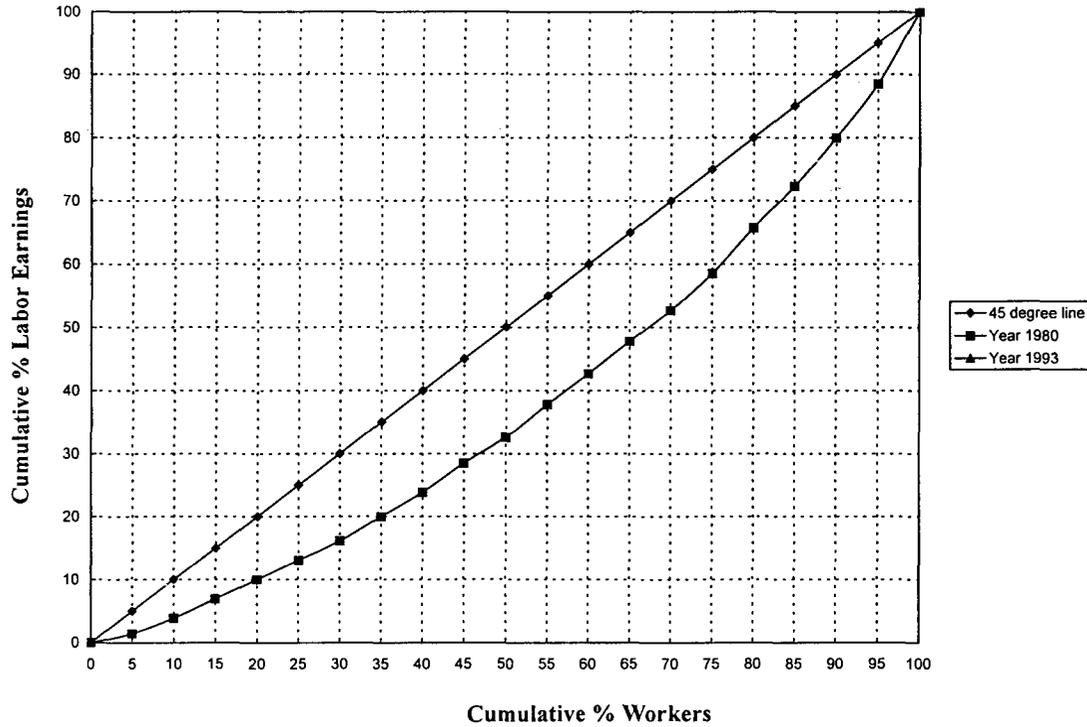


Figure 8.2 Taiwan: Lorenz curves of earnings, 1980 and 1992



Source: Fields and O'Hara 1996.

Figure 8.3 Taiwan: Lorenz curves of earnings, 1980 and 1993

the increase in the share of these households, the share of households that had no labor market income rose from 18.5 percent to 23.2 percent. This is one way in which the changing demographic structure in Taiwan contributed to rising income inequality among households.

Another demographic factor is the increased labor-market participation of wives. The labor-market participation rate of wives of prime-aged men (men aged 23-59) increased in Taiwan from 23.3 percent to 31.4 percent between 1980 and 1992. In theory, this could lead to either an increase or a decrease in household-level labor income inequality. If it were predominantly the wives of lower-earning men who are now working, this could lower the inequality of labor incomes at the household level. This may be true to some extent, as the correlation of the earnings of husbands and wives who both worked fell from +0.654 to +0.570. However, when the labor-market earnings of all husbands and wives are taken into account, assigning zero values to those who did not work, we find an increase in the overall correlation of husbands' and wives' earnings, from +0.249 in 1980 to +0.342 in 1992. This increase is consistent with a heightened correlation between husbands' education and wives' education: in our data, from +0.646 in 1980 to +0.710 in 1992 (see also Republic of China, table 25, 1995). So for the population as a whole, the increased labor-force participation of women is estimated to have increased inequality.

All of the previous analysis has been done using total household income unadjusted for household size. As discussed above, however, there were important changes in household structure between 1980 and 1992. In order to address this, we make a simple per capita size adjustment. We find that the inequality of per capita household income was essentially unchanged between 1980 and 1992 (Gini coefficients of 0.322 and 0.324 respectively). When we calculate Gini coefficients using individuals as the unit of analysis instead of households, we calculate a Gini coefficient of 0.299 and 0.304 for the two years. As Figures 8.4 and 8.5 show, the Lorenz curves in the two years are essentially identical. Thus, there was no increase in inequality in Taiwan since 1980 for any relative inequality measure of individual incomes – a result corroborated by Schultz's (1997) calculations of the log variance of income per household member and per adult.

The way to reconcile the increasing inequality of household incomes with constant inequality of per capita incomes is to observe that while mean household size fell for all parts of the income distribution, it fell most dramatically at the bottom (Table 8.3). Consequently, the addition of many small households at the bottom end of the income distribution

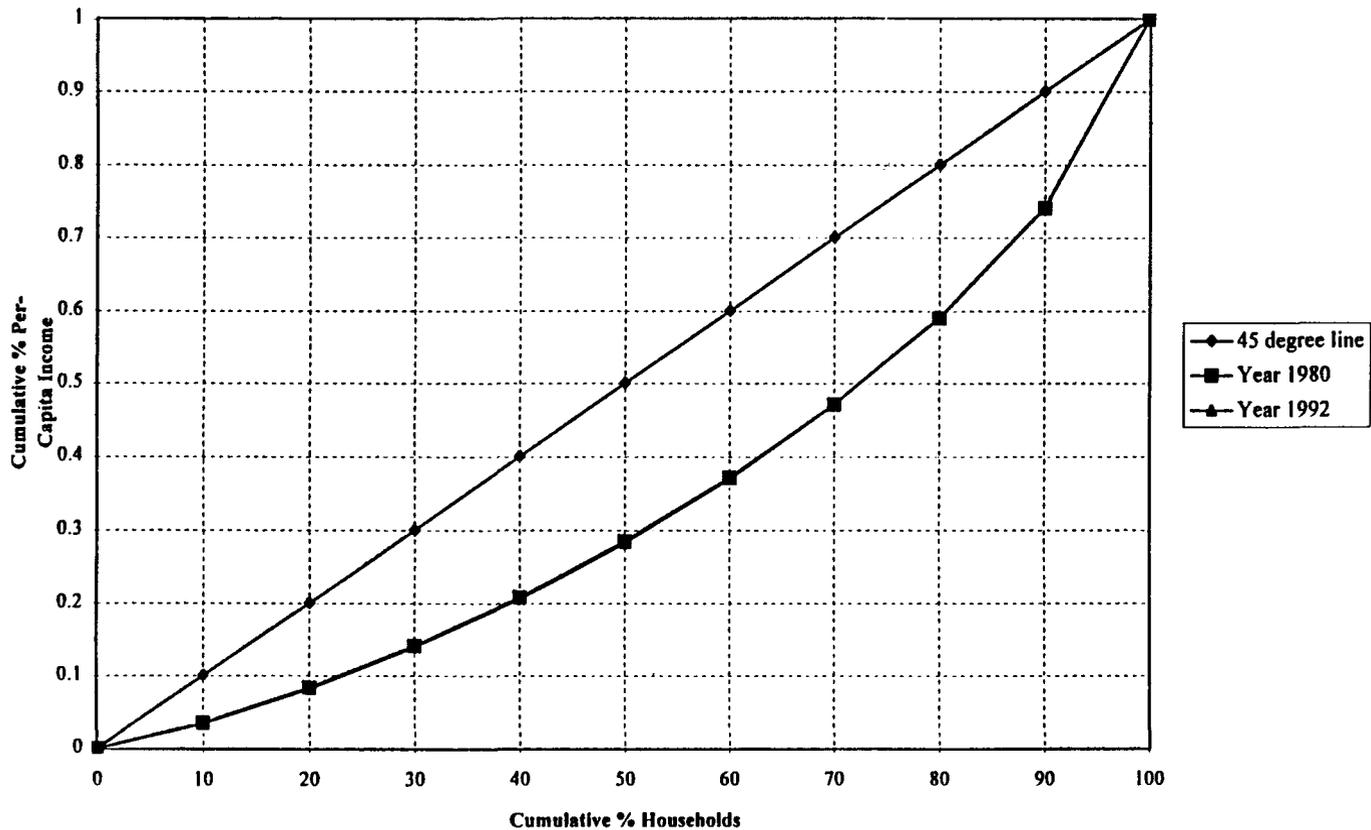


Figure 8.4 Taiwan: Lorenz curves of percapita household income, by households, 1980 and 1992

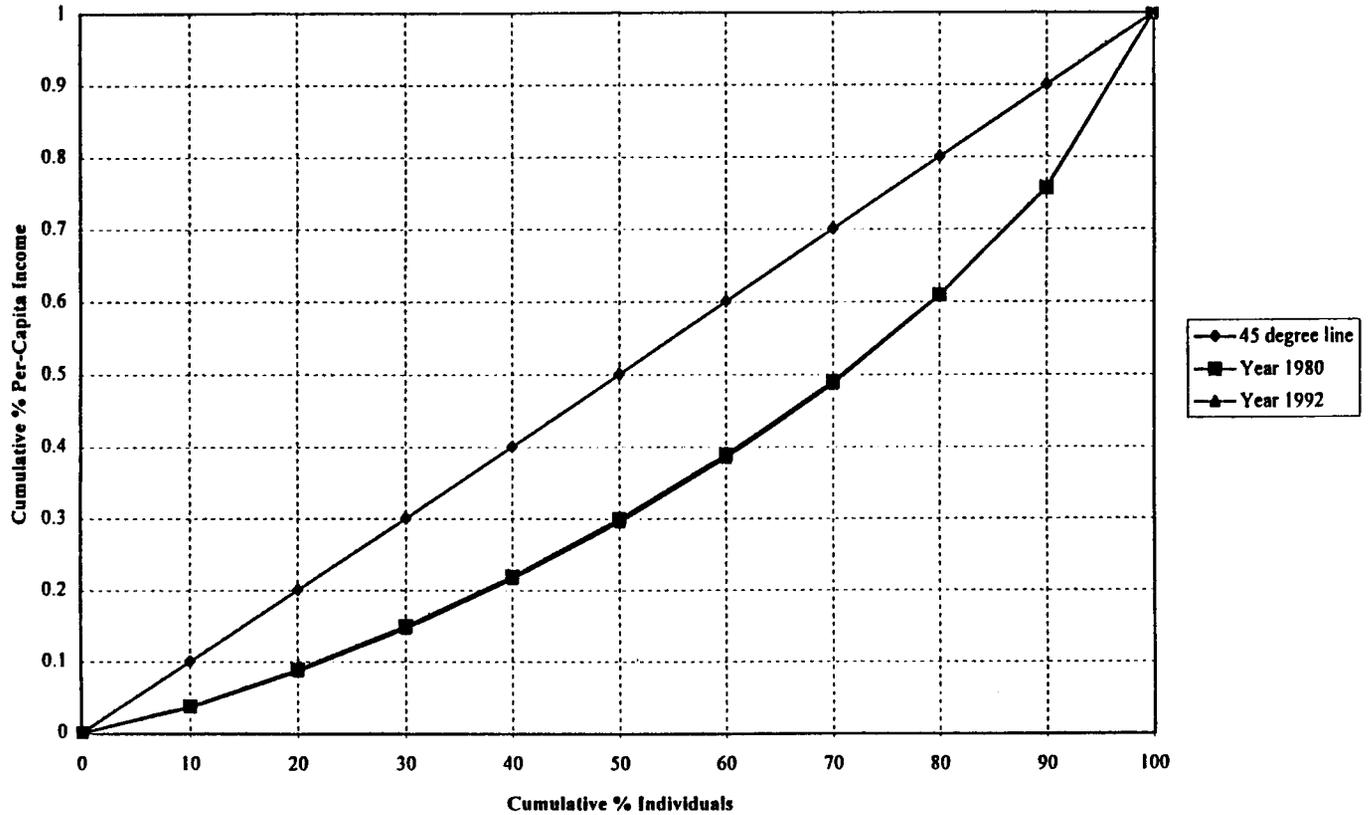


Figure 8.5 Taiwan: Lorenz curves of percapita household income, by individuals, 1980 and 1992

*Table 8.3 Mean household size by income level*

Income quintile	1980	1992	% Change
1	3.63	2.62	- 32.3
2	4.77	4.02	- 17.0
3	5.03	4.35	- 14.5
4	5.28	4.57	- 14.4
5	5.86	4.94	- 17.0
Overall	4.91	4.10	- 18.0

raised household income inequality but did not translate into enough additional low per capita incomes to raise per capita income inequality.

#### 4 CONCLUSIONS

Until 1980, Taiwan achieved a remarkable combination of rapid economic growth and declining income inequality. The year 1980 marked the low point in household income inequality, which then began to rise, slowly and steadily. This chapter has attempted to determine why inequality has been rising.

Using two methods of decomposing the inequality of total household income into the shares attributable to each source of income we determined that all, or nearly all, of the increase in inequality was due to increased inequality of labor-market income. However, previous research and calculations made here show that the inequality of the earnings of individuals did not rise, and by some measures fell, over this time period. These two apparently contradictory facts can both be true, because household inequality depends on how the incomes of individuals are combined. Two changes that have taken place in Taiwan help to explain the apparent contradiction. First, there has been an increase in the number of older people living in households without younger family members present. This has contributed to an increase in the number of households with no labor-market income at all. Second, there has been an increase in the labor-market participation of women married to prime-aged men. As a result, the correlation of the earnings of husbands and wives increased.

Another issue related to household structure is that while the inequality of total household income increased, there was no increase in the

inequality of per capita income, either among households or among individuals. This is because of a larger decline in household size at the bottom of the income distribution than at the top.

Altogether, these findings suggest that because labor-market returns are not becoming more unequal and because the inequality of per-capita incomes has not been increasing, rising income inequality at the household level may be a less serious concern in Taiwan than first appears. Whether the increase in the number of older people living by themselves independently of their children is problematical is a social issue about which others are better able to speak.

### **A PERSONAL POSTSCRIPT FROM GARY FIELDS**

John Fei used to say that the value of the decomposition procedure that he helped create was that it guided researchers to understand where to look in order to understand income inequality better. When John and I spoke in 1996, in what proved to be our last conversation just before he died, we speculated about why changes in the labor market and in the distribution of capital incomes might have produced rising inequality in Taiwan. If I imagine how John would have reacted to the findings in this chapter, he would have closed his eyes so that he could concentrate better, sat silently for a long time while he pondered what he had just heard, and then made a wise pronouncement about the next direction for research on demographic patterns to take. Our loss is that we cannot know what that pronouncement would have been.

John was also keen to welcome young researchers to be friends of Taiwan. He would have liked Jesse Leary's presence here today. Jesse and I are grateful to the conference conveners for making that possible.

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