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Income inequality, volatility, and mobility risk in China and the US

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ABSTRACT

A unified index of income inequality, volatility, and mobility risk is presented, and measurements based on US and Chinese panel data calculated. China is found to have higher-income volatility than the US in recent data, so that long-run inequality is comparable in the two countries, and short-run inequality overstates long-run inequality more in China than in the US. In both countries volatility and income inequality are increasing over time.

1. Introduction

Increasingly popular, the many comparisons of trends and levels of inequality (e.g. Li, Squire & Zou, 1998 and Dowrick & Akmal, 2005) or mobility (e.g. McMurrer & Sawhill, 1998) are vitiated because they do not link inequality and mobility measurements and they do not incorporate measurements of the volatility of income. This paper demonstrates via a comparison of China and US that simple measures based on survey data produce very different pictures of inequality in the two countries based on cross-sectional or panel-data views of income.

China has experienced a marked increase in cross-sectional income inequality, as shown by Wan and Zhang (2006) and Ravallion and Chen (2007). Many authors (e.g. Khan & Riskin, 1998; Li, 1999; Yang, 1999; Gustafsson & Li, 2001a,b; Meng, 2004; Wu & Perloff, 2005) have found that income inequality has increased markedly in China, and regard this as an undesirable[1] by-product of rapid growth, but few claim to understand the full explanation for this trend. Large-scale political and economic reforms have clearly played a role, but Hauser and Xie (2005) found that increases in returns to human capital and political affiliation do not fully account for the observed rise in inequality. Zhou (2000) likewise finds simple models unable to explain the rise in inequality.

There has been a long-running argument about rising inequality in the US, as well, with labor market institutions (Dinardo, Fortin, & Lemieux, 1996) and skill-biased technical change (Autor, Katz, & Kearney, 2008) frequently advanced as explanations. At the same time, numerous authors (e.g. Gosselin, 2004; Moffitt & Gottschalk, 1995; Hacker, 2006; Dynan, Elmendorf, & Sichel, 2008; Dahl, Schwabish, & DeLeire, 2008; Shin & Solon, 2008; Gosselin & Zimmerman, 2007; Nichols & Zimmerman, 2008) have debated the degree to which income volatility has increased over time, and what this means for household income security (see also Gosselin's, 2008 book for further discussion).

That long-run inequality is lower than short-run inequality in the presence of volatile incomes has been widely understood at least since Schumpeter (1955) and Friedman (1962); see also Shorrocks (1978), who defined mobility in terms of this difference. If

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[1] Not all view inequality as a bad thing: Luo and Zhu (2008) argue that rising income inequality in China takes the form of "a race to the top" that "unleashes competitive pressure and creates incentives for investment in skills." The dominant view is that inequality is a concern to be balanced against overall growth, however, as expressed by e.g. Xu and Zou (2000): "While the income distribution worsened, the total pie for the Chinese grew."

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we regard volatility as noise that can be smoothed over by capital markets or self-insurance, we may regard increases in the volatility of income as welfare neutral. On the other hand, to the extent that short-run income fluctuations cannot be insured against, they lower well-being, holding constant the mean level of income. I will focus exclusively on measuring trends in three kinds of income risk (inequality, volatility, and mobility), without characterizing their welfare consequences.[2]

I present an aggregate measure of income risk as half the squared coefficient of variation (or the general entropy measure with parameter 2, denoted GE_2) of incomes measured over both people and time. The aggregate measure can be decomposed into an inequality component measuring dispersion in mean incomes, a volatility component measuring the average dispersion of fluctuations about person-specific trends, and a mobility component measuring the dispersion of person-specific trends. I apply this decomposition to Panel Study of Income Dynamics (PSID) data from the United States and China Health and Nutrition Survey (CHNS) data from China to characterize trends in inequality, volatility, and mobility risk over the last decade.

While short-run income inequality is higher in China, I find that long-run income inequality is a larger share of the aggregate income risk in the US than in China, and that volatility is higher and increasing more quickly in China than in the US. Mobility risk plays a small role in aggregate income risk in this decomposition. The results on volatility are similar to those reported by Ding and Wang (2008) who show that the household income mobility in China was high between 1989 and 2000, due primarily to what they term *exchange* (roughly analogous to volatility). Khor and Pencavel (2006) use retrospective data for China (not true panel data) but find transitory shocks (analogous to volatility) were much more important in China than in the US in the early 1990s.

2. Methods

Suppose we observe L people,[3] indexed by i running from 1 to L, observed at T points in time, for $N = LT$ observations on income y. Consider first a decomposition by population subgroup following Shorrocks (1984) where the population is all person-years and subgroups are people:

$$GE_2 = -\frac{1}{2\bar{y}^2}\left[L^{-1}\sum_{i=1}^{L} T^{-1}\sum_{t=1}^{T}\left(\bar{y}_i\right)^2 - \bar{y}^2\right] + \frac{1}{2\bar{y}^2}\left[L^{-1}\sum_{i=1}^{L} T^{-1}\sum_{t=1}^{T} y_{it}^2 - \left(\bar{y}_i\right)^2\right] = I + D$$

where $\bar{y}_i$ indicates the within-person sample mean of income over all time periods observed, and $\bar{y}$ is the sample mean of income over all persons and time periods. The first term I represents variation across individuals in their mean income over some time period of T years, i.e. T-year inequality. The second term D represents variation of individual income around mean income.

We can further decompose the second term into a component due to individual trends in income, and a component due to variations around trend. This is most intuitively understood by imagining regressing individual income on a time trend and a constant *for each individual* in the sample, and letting the sum of squared residuals be defined as the component due to variations around trend. The difference between D and the mean over individuals of the individual-specific sum of squared residuals (or variation in detrended and demeaned income) is the individual-specific variance of predicted income over T years, which is roughly proportional[4] to the mean across individuals of the squared individual-specific trend (all divided by twice mean income squared).

Similarly, we could subtract off the mobility risk component M from D, the individual-specific deviations around mean income, to get V, a measure of volatility. Writing

$$GE_2 = I + (D - M) + M = I + V + M,$$

I will call the terms V for "volatility" and M for "mobility risk" though of course other measures of those concepts are also possible. V now captures squared deviations around the linear individual-specific trend in income. M measures the extent to which incomes grow or fall over time; it represents the expected squared trend in incomes.

The essence of the decomposition can be seen in a regression of income on a time index, where the time index t is taken to have zero mean in any period of T years under consideration:

$$y_{it} = u_i + r_i t + e_{it}.$$

The regression equation indicates that individuals have distinct trends r_i and distinct mean incomes u_i over all T years; in addition the variance of the idiosyncratic error may differ. The variation in individual-specific mean incomes over all T years divided by twice mean income squared measures I, long-run inequality. The variation in predicted individual incomes over all T years divided by twice mean income squared measures M, mobility risk. The variation in e_{it} (or variation in detrended demeaned income) over all T years divided by twice mean income squared measures V, volatility.

Note in particular that this decomposition of variance over time and people does not correspond to any of the usual decompositions of variance in ANOVA or related methods (as would be the case if we could represent the regression as including

[2] See for example Gottschalk and Spolaore (2002) for connections to social welfare. I will follow the lead of Sen (1973) in pursuing descriptive measures.

[3] Another choice of analysis unit is of course possible, for example family or household, but these are much less convenient when dealing with panel data, since composition may change over time.

[4] Specifically, the variance of predicted values is the squared growth rate times the variance of the time index, where the time index t is always defined so that it has mean zero, so that the constant term measures mean income. If the time index increments by one, the variance of predicted values $r_i t$ for an individual i is the square of the growth estimate r_i times the variance of t or $r_i^2(T^2-1)/12$. With five time periods, this is twice squared average growth.