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Approaches to the Analysis of Income and Employment

Income Mobility in Germany, the United States, and the United Kingdom

By Christian Schluter*

Summary

This brief paper highlights some research findings contained in the paper entitled "Income Dynamics in Germany, the USA, and the UK — Evidence from Panel Data" (Schluter 1998a), presented at GSOEP98, which is also available on the Internet at: http://sticerd.lse.ac.uk/casedps.htm. The BHPS data were made available through the ESRC Data Archive. Partial financial support from the British Council is gratefully acknowledged.

1. Introduction

In the study of income dynamics it is often fruitful to distinguish between the changing shape of the cross-sectional income distribution and the extent to which people move up or down the income ladder (see also Quah 1995). The cross-sectional evidence suggests that Germany differs markedly from both the United States and the United Kingdom. In both countries, income distributions clearly shift around, and the distributions have ceased to be unimodal. Inequality in the United States rises unambiguously as the Lorenz curves shift out; in the 1990s Lorenz curves in the United Kingdom cross. By contrast, the German income distribution appears to have hardly changed and inequality changes, although statistically significant, are small. Furthermore, the conventional wisdom is that the United States and the United Kingdom are more mobile societies than Germany. In conjunction with the cross-sectional evidence this suggests that Germany is a country in stasis. It is the validity or otherwise of this conventional wisdom which we address below.

2. The Data

GSOEP, PSID, and BHPS are high quality panels, very similar in design, which are well suited for an international comparison of income dynamics. Annual interviews started in 1984, 1968, and 1990, respectively. As Germany and the United States move through a largely synchronized business cycle, we examine the years 1984 to 1994 (GSOEP) and 1982 to 1992 (PSID). The youth of the BHPS only permits an analysis of the years 1990 to 1994. The income concept to be examined in this paper is real annual equivalized post-tax, post-benefit personal income, derived in all three datasets by the data providers through a tax-benefit simulation. The equivalization factor is the square-root of the household size for Germany and the United States, and the McClements' scale in the case of the United Kingdom. In order to reduce the consequences of measurement error, samples have been left-censored at arbitrary but low levels (DM 1.000, $500, £500 p.a.). Sample sizes are of the order of 10,000 observations. All estimates are weighted to reflect the different sample inclusion probabilities.

Measuring Mobility

The literature contains several approaches to the problem of quantifying mobility, which are not necessarily mutually exclusive. However, a common framework is absent since, in contrast to the role of the transfer principle in the literature on inequality measurement, no single principle commands universal consensus. For a derivation of the asymptotic distribution of the estimators of the mobility measures used below see Trede (1995) or Schluter (1998b), and for a characterization of the robustness properties of the mobility measures, see Cowell and Schluter (1998).[1]

The point of departure of the first approach is to define and to estimate transition matrices $P_t = [p_{ij}(t)]$, where $p_{ij}(t)$ is the conditional probability of occupying state j in time t given that i was occupied in the previous period. The maximum likelihood estimator is $p_{ij}(t) = n_{ij}(t) / \Sigma_j n_{ij}(t)$, the fraction of people who occupied state i and now occupy state j.

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[1] Standard errors of the estimates are not reported here for the sake of brevity but are available on request from the author.

Such transition matrices are arbitrary discretizations of an underlying continuous process. For the income partition, both number and width of the income groups have to be selected. One particular discretization will be examined. Four income groups are determined with respect to the contemporaneous median in period t-1. The width of the first three income groups is constant — one-half of the contemporaneous median — but the number of people falling into these income groups (the marginal probabilities) varies across cells. By contrast, a discretization according to deciles would result in constant marginal probabilities, but the width of the income intervals would vary.

A mobility index is a function over the space of transition matrices. A popular index is the Prais-Shorrocks index,

$$(1)\quad M_S(P) = \frac{n-tr(P)}{n-1} = \frac{n}{n-1}\left[\frac{1}{n}\sum_i (1-p_{ii})\right] = \frac{n-\sum_i \lambda_i}{n-1},$$

where $tr(P)$ is the trace of the nxn transition matrix P and λ_j its js ordered eigenvalue. Since $1-p_{ii}$ is the probability of leaving state i, the index is the inverse of the harmonic mean of the expected durations of remaining in a given income group. Note that this index only weights the incidence of leaving a given state and ignores the size of the income change. Mobility is deemed greater the larger the index is.

Another index is given by

$$(2)\quad M_E(P) = \frac{n-\sum_i |\lambda_i|}{n-1}.$$

This index captures the speed of convergence of the underlying Marlov process since all eigenvalues of the stochastic matrix are bounded by one. $M_S(P)$ equals $M_E(P)$ if P's eigenvalues are all real and non-negative (which they actually happen to be for the chosen income partitions and the data under scrutiny). The approach focusing on the convergence speed can be simplified by concentrating on the dominant convergence term, *viz.*, the second largest eigenvalue λ_2:

$$(3)\quad M_{LE}(P) = 1-|\lambda_2|$$

This index would be attractive if the economy followed a (first order) Markov process. However, as is demonstrated below, the transition probabilities are time-varying and, as shown elsewhere (Schluter 1997), a simple first order Markov process does not describe the data well.

A second class of mobility indices — often labeled stability indices — avoids the discretization problem, takes account of the size of the income jumps, and implicitly attaches different weights to different parts of the distribution. Despite these advantages, the tradeoff between these two and the implicit value judgements is not made explicit. This class, proposed by Shorrocks (1976) and Maasourni and Zandvakili (1986), is based on the comparison between the inequality of income averaged over the entire period and a weighted average of contemporaneous inequalities. Let F_t denote the cross-sectional income distributions at times $t = 1,...,T$, F the distribution function of income averaged across this observation period, and I the chosen inequality measure. The proposed mobility index is

$$(4)\quad M = 1 - \frac{I(F)}{\sum_{t=1}^{T} w_t\, I(F_t)},$$

where the weights are often $w_t = \mu_1(F_t) / \mu_1(F)$, the contemporaneous mean divided by the mean of average income. The inequality index we have selected is a member of the class of Generalized Entropy indices $GE_\alpha(F)$ with sensitivity parameter $\alpha \neq 0, 1$, defined by

$$(5)\quad GE_\alpha(F) = \frac{1}{\alpha^2-\alpha}\left[\frac{\mu_\alpha(F)}{[\mu_1(F)]^\alpha} - 1\right],$$

where $\mu_\alpha(F) = \int y^\alpha dF(y)$. This inequality index exhibits greater sensitivity to the bottom of the distribution, the smaller α is. M inherits this property. In order to compare this index to the Prais-Shorrocks index, we restrict attention to two consecutive years.

3. Results

The point estimates of the mobility indices are depicted in Figure 1, and some staying probabilities for the "median" income partition in Figure 2. As regards Germany, Figure 1 makes clear that the stable shapes of the cross-sectional distributions in the top panels disguise substantial movement beneath the surface. The Prais index of the median income partition suggests a similar downward trend in mobility, except for an increase in 1986-87 and 1990-91. This simple picture becomes more blurred when examining the time series of the staying probabilities — an important step since the Prais index simply aggregates the incidences of leaving a given state, which often move in opposite directions. During the boom, the rich (p_4) enjoy increased staying probabilities, whereas the poor (p_1) only benefit in its initial phase. After 1986, the increase in p_{11} may reflect the increased fraction of the long-term poor who failed to escape poverty during the economic expansion. This series exhibits a large jump at the onset of the recession. Comparing the magnitudes of all changes in Figure 2, it is evident that p_{11} drives the overall Prais index. The stability indices present a more volatile picture, but despite some disagreement also suggest a downward trend in mobility. The top-sensitive M_{GE_2} picks up the improved fortunes of the rich during the boom, but the bottom-sensitive $M_{GE_{-1}}$ implies an increase in mobility after 1988-89. Such conflicting evidence reveals the problem embodied in the index: the value judgement determining the tradeoff between the size of the income jump and the weights attached to different parts of the distribution is not made explicit.

The indices for the United States suggest, similarly, that mobility has fallen except for the last year. The Prais index for the decile partition has a visible downward trend, but the

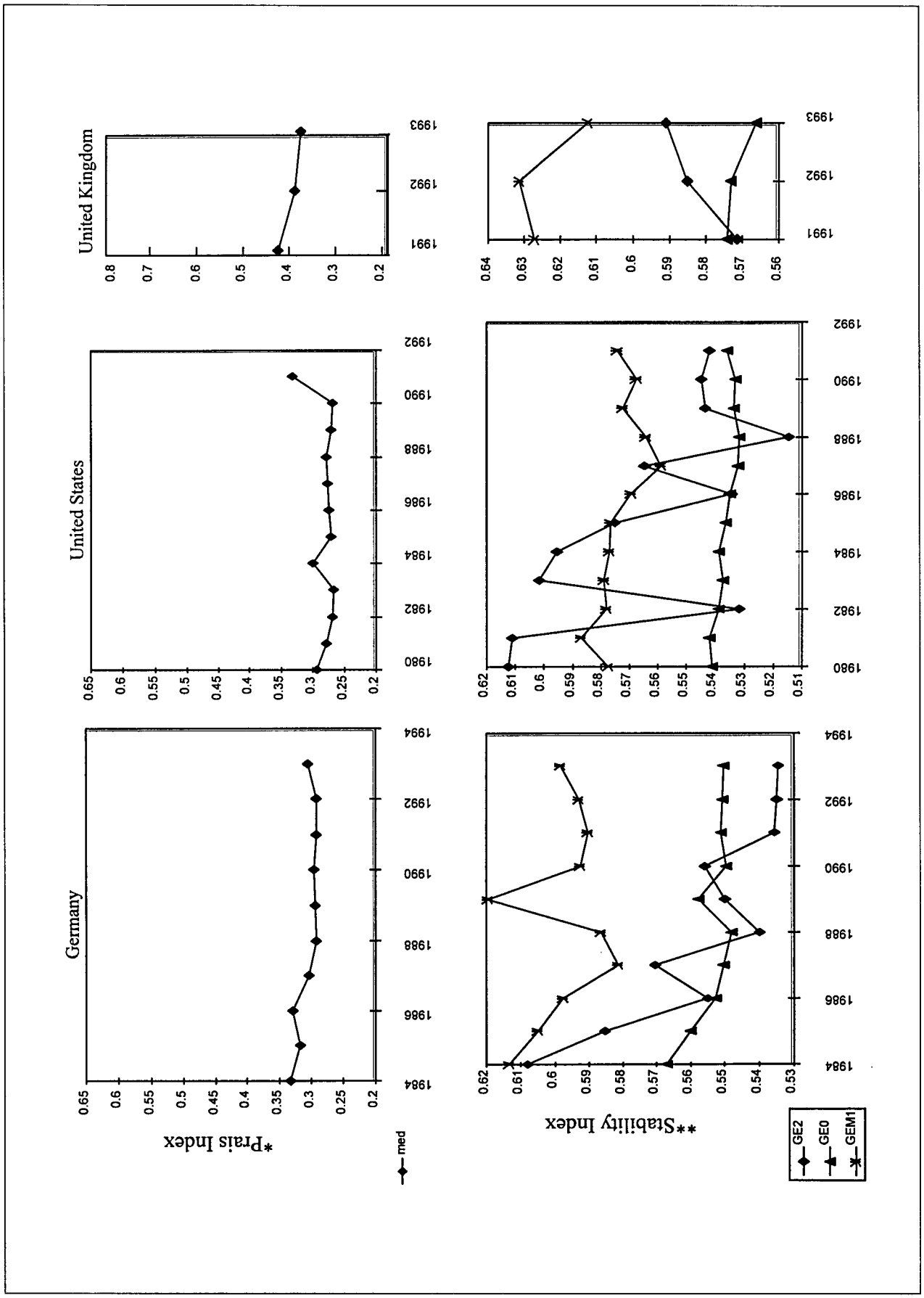
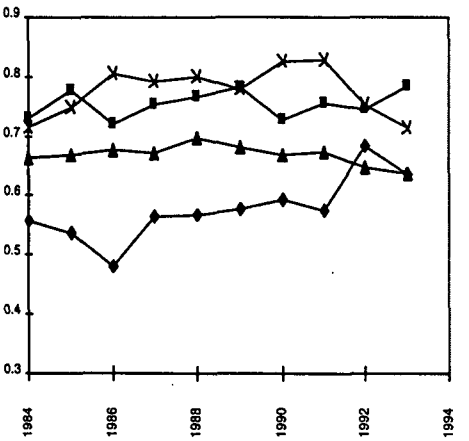


Figure 1

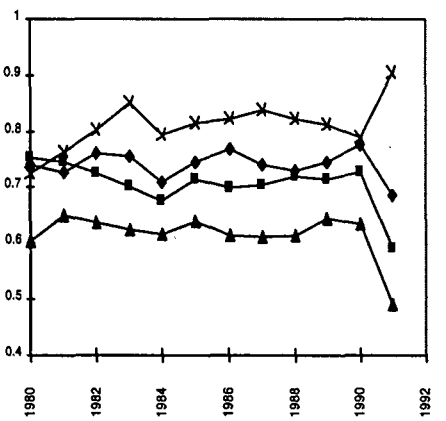
Prais Index for the Median Income Partition (defined in the text).*
Stability Indices Based on the Generalized Entropy Index with Sensitivity Parameters, 2, 0, −1.**

Figure 2

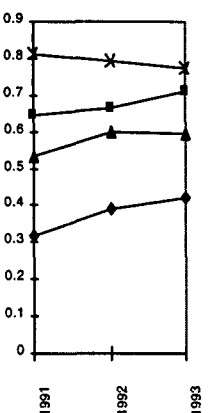
Staying Probabilities



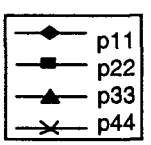
Germany



United States



United Kingdom



Note* Staying probabilities: Pij is the (conditional) probability of being in income group j given that income group i was occupied in the last period. The groups are based on the "median" partition; 1 is the lowest income group (the poor) and 4 the highest.

index for the median partition is almost constant. A glance at the staying probabilities reveals that these often move in opposite directions, but, contrary to the German case, no single staying probability drives the index. The top-sensitive stability index M_{GE_2} is most erratic, but the others move more in line.

Comparing the results for the United States and Germany, the United States is often deemed to be the less mobile society. This seeming paradox is resolved, however, by examining the various staying probabilities. The poor in Germany are substantially more mobile than in the United States, and this difference is sufficient to tip the overall balance in Germany's favor, as the more mobile middle class in the United States cannot compensate for this effect.

The Prais indices suggest a fall in mobility in the United Kingdom, which results from a sufficiently large increase in all staying probabilities except p_{44}. All these probabilities are lower than in both Germany and the United States, but this is a consequence of the arbitrary discretizations. Increasing the first income interval would substantially increase p_{11}. (See Schluter 1998a for a depiction of the continuous stochastic kernel estimates.) The increase in p_{44}may explain the different overall assessment of the top-sensitive M_{GE_2}, which entails an upward mobility trend while the other stability indices suggest a downward trend.

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