DOES INCOME MOBILITY EQUALIZE LONGER-TERM INCOMES? NEW MEASURES OF AN OLD CONCEPT

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ABSTRACT

This paper develops a new class of measures of mobility as an equalizer of longer-term incomes – a concept different from other notions such as mobility as an equalizer of opportunity, mobility as time-independence, positional movement, share movement, income flux, and directional income movement. A set of axioms is specified leading to a class of indices, one easily-implementable member of which is applied to data for the United States and France. Income mobility is found to have equalized longer-term earnings among U.S. men in the 1970s but not in the 1980s or 1990s. In France, though, income mobility was equalizing throughout.

JEL Codes: C43, D31, J3, J6

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DOES INCOME MOBILITY EQUALIZE LONGER TERM INCOMES? NEW MEASURES OF AN OLD CONCEPT

Income Mobility as an Equalizer of Longer-Term Incomes

It has long been recognized that cross-sectional distributions of economic well-being (hereafter referred to as "income") provide an incomplete and perhaps distorted picture of longer-term economic well-being. Joel Slemrod (1992), for instance, has maintained that what he graphically calls "time-exposure income" gives a better picture of inequality than does "snapshot income." In any given year, people may have incomes which are transitorily high or low for reasons such as unemployment, illness, youth, good or bad luck, or exceptional economic events. As Joseph Schumpeter once put it, the distribution of incomes is like the rooms in a hotel – always full but not necessarily with the same people (Isabel V. Sawhill and Mark Condon, 1992). Economic mobility studies provide information about changes of people among rooms and changes in the rooms themselves.

One of the primary motivations for economic mobility studies is to gauge the extent to which longer-term incomes are distributed more or less equally than are single-year incomes. For instance, Anthony F. Shorrocks (1978) has said: "Mobility is regarded as the degree to which equalization occurs as the period is extended. This view captures the prime importance of mobility for economists." Anthony B. Atkinson, François Bourguignon, and Christian Morrisson (1992) write in a similar vein: "One of the reasons why mobility is of interest is that it reduces inequality in the lifetime sum of earnings relative to that in a single period." Paul Krugman (1992) states: "If income mobility were very high, the degree of inequality in any given year would be unimportant, because the distribution of lifetime income would be very even. . . An increase in income mobility tends to make the distribution of lifetime income more equal." Sarah Jarvis and Stephen

P. Jenkins (1998) put it thus: "To some people, greater inequality at a point in time is more tolerable if accompanied by significant mobility; mobility smoothes transitory variations in income so that 'permanent' inequality is less than observed inequality."

What unites all of the preceding statements is a concern with income mobility as an equalizer of longer-term incomes along with the judgment that the extent of such equalization is of ethical relevance. Atkinson and Bourguignon (1982) argued this explicitly. Let an evaluator adopt a social valuation function whereby the social valuation of recipient i's income in period j is a decreasing function of i's income in period k – that is, the higher is the recipient's income in one year, the lower is the marginal value of a given income amount in the other year. Thus, in the two period case, $V = V(y_{i1}, y_{i2})$ with $V_{12} < 0$, where y_{i1} and y_{i2} are base-year and final-year income respectively. It follows that for given marginal distributions of base-year incomes $y_1 = (y_{11}, \ldots, y_{n1})$and final-year incomes $y_2 = (y_{11}, \ldots, y_{n1})$, all social valuation functions of this form would judge that the more equalization of longer-term incomes there is through income mobility, the better the economy is performing. (This is in an analogous sense to judgments made in a cross sectional context to the effect that the more (less) equal is the distribution of single-period income, the better (worse) the economy is doing.)

We thus have an old, clear, well-defined, ethically-relevant concept: income mobility as an equalizer of longer-term incomes. What I argue in this paper is that although current mobility measures do a good job of measuring other mobility concepts, they do not adequately gauge this one. Thus, in this paper, I develop a class of measures of the concept of mobility as an equalizer of longer-term incomes. This class cannot be derived from any currently-available mobility measure, because it has different axiomatic foundations.

I then apply an easily-implementable member of the new class to U.S. and French data and reach the following principal conclusions. For the United States, the new index shows that labor income mobility equalized longer-term incomes in the 1970s but not in

the 1980s and 1990s; this is the first time that this fact has been noted. Also, in the U.S., the time path of mobility-as-an-equalizer-of-longer-term incomes is very different from the time paths of other mobility concepts. Turning to the case of France, in contrast to the United States, income mobility has equalized longer term incomes since the late 1960s. And unlike the U.S., the time path of mobility-as-an-equalizer-of-longer-term incomes is u-shaped and is matched by u-shaped patterns for other mobility concepts.

Why Equalizing Longer-Term Incomes Is Not the Same as Equalizing Single-Period Incomes

Equalization of longer-term incomes is a fundamentally different concept from equalization of single-period incomes. To illustrate the difference, suppose we draw samples of two persons from an economy in a base year and a final year and measure the incomes of each person in each of the two years. Assume the data are drawn from comparable cross sections in base and final year but that the people are not the same in the two years (or if they are the same, the surveys do not record who is who). Let the distribution of income in the base year be $y_1 = (1, 3)$, and in the final year, $y_2 = (1, 5)$. In a very straightforward sense, it is clear that the movement from y_1 to y_2 has disequalized single-period incomes.

The limitation of cross-sectional data is that income data are reported for different samples of people , which makes income mobility impossible to study. Suppose instead that the observations $y_1 = (1, 3)$ and $y_2 = (1, 5)$ had come from panel data, so that we can identify which person is which in each survey. Adopt the notational convention of arraying income recipients in an arbitrary order in the base-year distribution, keep these identified individuals in the same position in the terminal year, and denote the movement from a base-year personalized vector to a final-year personalized vector by $\rightarrow$. Then there are two possible patterns of longitudinal income changes consistent with y_1 becoming y_2:

I: $(1, 3) \rightarrow (1, 5)$

and

II: $(1, 3) \rightarrow (5, 1)$.

What has happened to the inequality of longer-term incomes in the two cases? Suppose that we take as our measure of longer-term incomes the average income of each individual over the period in question, as is used in much of the literature on Friedman's permanent income hypothesis. In case I, the distribution of longer-term incomes is

$L_I = (1, 4)$

and in case II, it is

$L_{II} = (3, 2)$.

A straightforward way of gauging whether the underlying mobility processes have equalized or disequalized the distribution of longer-term income in each case is to compare the inequality of L_I and L_{II} with the inequality of their common base year income distribution y_1. For any reasonable concept of inequality, the answer is clear: L_I is more unequal than y_1 while L_{II} is more equal than y_1. It is in this sense that case I may be said to illustrate a mobility process that disequalizes longer-term incomes while case II illustrates one that equalizes longer-term incomes.

This is the concept of mobility as an equalizer of disequalizer of longer-terms incomes. Given this concept, we need a measure of it. Below, I review how standard measures treat such processes, and upon finding that they do not distinguish well between equalizing and disequalizing processes, I propose a new class of measures that does draw such a distinction.

Equalization or Disequalization of Longer-Term Incomes: Standard Mobility Measures and the Need for a New One

Suppose that for each of a number of individuals, we have data on base year income y_{i1} and on final year income y_{i2}. Income mobility is defined on the vector of

(y_{i1}, y_{i2}) pairs.

Imagine the following income mobility process. Starting with a given vector of base-year incomes, suppose that all persons except one keep the same income as before. The one exception is the richest person in the economy (call him "Gates"), whose income rises by 50%: (100, 200, 20000) → (100, 200, 30000). By any of the standard definitions of income inequality, this "Gates-gains" process increases inequality.

What do the usual mobility measures say about this process? Most measures – including the trace of the quantile transition matrix, the coefficient of rank correlation, the mean number of absolute ranks changed, and many others – would record no mobility in this process. This is because these measures are all based on quantiles of an income transition matrix, none of which change as long as everyone maintains the same rank in the income distribution as before. What these measures measure is positional movement, and they rightly record that there is none of it in the Gates-gains process as long as Gates keeps his #1 position, and all other incomes are unchanged.

What about other mobility concepts in the Gates-gains case? Time-dependence is said to be perfect (or equivalently, time-independence is said to be zero) if all final-year incomes are perfectly predictable from base-year incomes. But because this is not the case when Gates gains, we have a non-zero amount of time-independence. Share-movement takes place when recipients' income shares change, which is clearly the case here. Income flux arises when somebody's income has changed; that has happened here. Directional income-movement is positive when someone experiences an income gain, which has also happened. Table 1 displays the changes in measures of each of these concepts.

All of these concepts, and the measures of them, tell us different things about the Gates-gains process. None, however, indicates that the change (100, 200, 20000) →

(100, 200, 30000) disequalizes longer-term incomes. So if equalization of longer-term incomes is what we are interested in, the mobility measures just reviewed do not measure it.

Consider what would happen if, instead of Gates gaining 50%, Gates were to lose 50%. Clearly, this should equalize longer-term incomes. Combining this with the judgment just made in the preceding paragraph, any measure of longer-term income equalization should:

i) Be negative if Gates gets richer, holding other incomes constant.

ii) Be positive if Gates gets poorer, holding other incomes constant.

iii) Equal zero if Gates' and everybody else's incomes are unchanged.

These three conditions are in fact the defining characteristics of an equalization measure when only the richest person's income changes.

The problem is that none of the mobility measures in Table 1, or the concepts they represent, fulfills these three conditions. The only mobility measure in Table 1 that changes signis $(1/n)\ \Sigma\ (\log y_{2i} - \log y_{1i})$, which goes from being positive if (100, 200, 20000) $\rightarrow$ (100, 200, 30000) to being negative if (100, 200, 20000) $\rightarrow$ (100, 200, 10000). The change in sign has nothing to do with the equalization of longer-term incomes, however. This is because an equalizing process in which a 50% income gain is enjoyed by the poorest person in the economy (100, 200, 20000) $\rightarrow$ (150, 200, 20000) exhibits the same change in $(1/n)\ \Sigma\ (\log y_{2i} - \log y_{1i})$ as a disequalizing process in which the 50% gain accrues to the richest person in the economy. (Cf. the final entries in columns (1) and (3) of Table 1.) The reason for this is that what $(1/n)\ \Sigma\ (\log y_{2i} - \log y_{1i})$ measures is directional income movement gauged in terms of percentage changes, and in both (100, 200, 20000) $\rightarrow$ (100, 200, 30000) and (100, 200, 20000) $\rightarrow$ (150, 200, 20000), one person has a 50% income increase and the other two have 0% changes.

A measure of equalization of longer-term incomes should be positive if (100, 200, 20000) $\rightarrow$ (100, 200, 30000), negative if (100, 200, 20000) $\rightarrow$

(100, 200, 10000), and zero if (100, 200, 20000) → (100, 200, 20000). But this doesn't happen for any existing measure. Positional-movement measures are zero in all three cases. Time-independence, share-movement, and income flux measures are positive for both (100, 200, 20000) → (100, 200, 30000) and (100, 200, 20000) → (100, 200, 10000), even though (100, 200, 20000) → (100, 200, 30000) is disequalizing and (100, 200, 20000) → (100, 200, 10000) is equalizing. And $(1/n) \Sigma (\log y_{2i} - \log y_{1i})$ is positive for both (100, 200, 20000) → (100, 200, 30000) and (100, 200, 20000) → (150, 200, 20000), even though the first disequalizes long-term income and the second disequalizes it.

We may conclude that the various income mobility measures – even the income movement measures (d) and (e) -- do not adequately distinguish between income change processes which equalize longer-term incomes and those which disequalize them. This insensitivity is what motivates the development in this paper of a new class of measures – ones that do distinguish between equalizing and disequalizing mobility processes.

Equalization of Longer-Term Incomes versus Equalization of Opportunity

As noted above, Shorrocks (1978) conceptualized income mobility as the degree to which income equalization occurs as the observation period is lengthened. Shorrocks defined rigidity of the income distribution as follows. For the case of T annual observations on income, his rigidity index compares the inequality of T-period incomes with the inequality of single-period incomes. Let $y_i(t)$ denote the income of individual i at time t and y_t be the vector of such incomes in the population: $y_t \equiv (y_1(t), \ldots, y_n(t))$. Similarly, let $y_i(T) \equiv y(y_i(1), \ldots, y_i(T))$ be a measure of the T-period income of individual i and let $y_T \equiv (y_1(T), \ldots, y_n(T))$ be the corresponding vector of such incomes. Shorrocks's rigidity index has in the numerator the inequality of T-period incomes using an inequality measure I(.), and in the denominator a weighted average of the inequality in each year. ,which is the ratio of the mean income in that year to the mean income over T years:

$$R = \frac{I(y_T)}{\frac{1}{T}\sum_{t=1}^{T} w_t I(y_t)} = \frac{I(y_T)}{\frac{1}{T}\sum_{t=1}^{T} \frac{\mu_t}{\mu_T} I(y_t)}.$$

Shorrocks's mobility measure is then M ≡ 1 – R.

Roland Bénabou and Efe A. Ok (1998) noted a feature of Shorrocks's measure which they regard as problematical and may strike other observers likewise: Shorrocks's measure treats equalizing and disequalizing changes in essentially identical fashion. This point can be illustrated by calculating Shorrocks's index in the preceding examples. We find that the mobility process (100, 200, 20000) → (100, 200, 30000) produces a value for Shorrocks's M of 4.99 x 10^{-5}, while the mobility process (100, 200, 20000) → (100, 200, 10000) produces the index value 5.91 x 10^{-5}. Naturally, had all incomes remained unchanged at (100, 200, 20000), Shorrocks's M would have been equal to zero. Shorrocks's M therefore ranks these three processes, in order of mobility, as: "Gates loses", then "Gates wins," and finally "no change." Thus, neither the sign nor the relative magnitudes of Shorrocks's M conveys any information about whether the mobility process is an equalizing or a disequalizing one.

In view of this fact, we might proceed in one of two directions. The line pursued by Bénabou and Ok is to formulate the fundamental concept of mobility as an equalizer of <u>opportunity</u> and to suggest measures of this concept. By contrast, the equalization concept developed here is mobility as an equalizer of <u>longer-term incomes</u>. The distinction between equality of opportunity and equality of longer-term incomes becomes clear by looking at the following example.

Let there be a group of n agents with base-year incomes $y_1, y_2, \ldots, y_n$. Now suppose these agents pool their money and set up a winner-take-all lottery which pays off $y_1 + y_2 + \ldots + y_n$ to the winner and zero to the losers. Let this be a fair lottery so that each agent has a one-n'th chance of winning. In the Bénabou-Ok sense, establishing such a lottery is <u>equalizing</u> – in fact, perfectly equal – because final year income opportunities

are equal ex ante for everyone. However, in the sense to be developed below, the winner-take-all mobility process is disequalizing – in fact, perfectly unequal – because final year incomes are more unequal than initial incomes ex post. The distinction here is not accidental: Bénabou and Ok state repeatedly that their interest is in mobility as an equalizer of ex ante opportunities, not ex post outcomes. My interest is precisely the opposite. Accordingly, in what follows I develop an axiomatically-justified family of indices of equalization of ex post outcomes.

Mobility as Equalization of Longer-Term Incomes: An Axiomatic Approach

Let y_{it} denote the income of individual i in time period t. Let l_i be a measure of the longer-term economic well-being of person i and let s_i be a measure of i's shorter-term economic well-being, with corresponding n-vectors $l \equiv (l_1 \ldots l_n)$ and $s \equiv (s_1 \ldots s_n)$ in the population as a whole. I(l) and I(s) are measures of inequality of l and s respectively.
If our interest were merely in ordinal comparisons – that is, whether mobility has been equalizing or disequalizing of longer-term incomes -- we could choose criteria for inequality comparisons such as Lorenz curve comparisons applied to measures of l and s such as those specified below. Instead, let us proceed to an axiomatic development of cardinal indices of mobility.

The crucial concept in what follows is an equalization function. This function, denoted $E_{l,s}$ = E(I(l), I(s)) tells us how much more or less equal is the distribution of economic well-being in the long-term compared with economic well-being in the short-term. Of course, it is the nature and extent of economic mobility that determines whether equalization or disequalization takes place over time.

The equalization function is assumed to have the following properties:

E1. Normalization. I(l) = I(s) $\Rightarrow$ E(.) = 0.

E2. Equalization. I(l) < I(s) $\Rightarrow$ E(.) > 0.

E3. Disqualization. I(l) > I(s) $\Rightarrow$ E(.) < 0.

E4. Greater equalization.

a. For two alternative l vectors $l_1, l_2 \in L$,

$$I(l_1) < I(l_2) < I(s) \Rightarrow E_{s, l1} > E_{s, l2} > 0.$$

b. For two alternative s vectors $s_1, s_2 \in S$,

$$I(s_1) > I(s_2) > I(l) \Rightarrow E_{s1, l} > E_{s2, l} > 0.$$

E5. Greater disequalization.

a. For two alternative l vectors $l_1, l_2 \in L$,

$$I(l_1) > I(l_2) > I(s) \Rightarrow E_{s, l1} < E_{s, l2} < 0.$$

b. For two alternative s vectors $s_1, s_2 \in S$,

$$I(l) > I(s_1) > I(s_2) \Rightarrow E_{s2, l} > E_{s1, l} > 0.$$

The following result is immediate for these five axioms:

Proposition 1: E1 - E5 $\Rightarrow$ E(I(l), I(s)) is
a) decreasing in I(l),
b) increasing in I(s),
c) equal to zero when I(l) = I(s).

It bears mention that Shorrocks's M index does not satisfy E1- E5.

Now let us add a sixth property to E(.) – that if I(l) and I(s) are increased in the same proportion, then E(.) is unchanged:

E6. Homogeneity of degree zero. For all $\lambda > 0$, E(λI(l), λI(s)) = E(I(l), I(s)).

Given E6, one may choose $\lambda = 1/I(s)$ to obtain E(I(l)/I(s), 1) = E(I(l), I(s)), and thus E(I(l)/λI(s), 1) = φ (I(l)/I(s)). We then have, for these six axioms:

Proposition 2. E1 - E6 $\Rightarrow$ E(.) = φ (I(l)/I(s)) has the properties listed in Proposition 1.

A corollary of Proposition 2 is:

Proposition 3. The class of equalization measures $E \equiv 1 - (I(l) / I(s))$ satisfies E1-E6, henceforth termed the **E** properties.

The class E remains very broad, because it embodies an infinite set of social valuations on the constituent incomes (these valuations are denoted $v_{it}(y_{it})$) and an infinite range of inequality measures (denoted by I(.)). The next step is to specify the particular long-term and short-term social valuation functions l and s. For this, I posit the following simplifying properties for operational use:

V1. Discounted summation. Taken over T periods, the long-term valuation l is the annualized discounted sum of the social valuations of its components: $l_i \equiv \frac{1}{T}\sum_{t=1}^{T} v_{it}(y_{it})\delta^{t-1}$, where δ is a discount factor.

In practice, it will often be the case that the researcher will only have two years of data or will only choose to use the base year and final year incomes, so that in calculating l_i, T = 2.

V2. Homogeneity across individuals. The social valuation function is the same for all individuals: $v_{it}(y_{it}) = v_t(y_{it}) \; \forall$ i.

V3. Homogeneity across time periods. The social valuation function is the same for all time periods: $v_{it}(y_{it}) = v_i(y_{it}) \; \forall$ t.

V4. Income valuations. The common social valuation function is income: $v_{it}(y_{it}) = y_{it} \; \forall$ i, t.

An alternative to V4 is:

V4'. Log-income valuations. The common social valuation function is log-income: $v_{it}(y_{it}) = \ln(y_{it}) \; \forall$ i, t.

V5. Non-discounting. Incomes are not discounted, and therefore $\delta = 1$.

We then have:

<u>Proposition 4</u>. V1-V5 $\Rightarrow l_i \equiv \frac{1}{T}\sum_{t=1}^{T} y_{it} = p_i$ and $s_i = y_{ir}$.

In Proposition 4, p_i may be thought of as i's permanent income and s_i as i's short-term income in some single reference year r. In order to specify <u>which</u> single year is to be used, we need:

V6. Base-year reference period. $y_{ir} = y_{i1}$ $\forall$ i.

We then have:

Proposition 5. V1-V6 $\Rightarrow$ $s_i = y_{i1.}$

Denote the properties V1 through V6 as the **V** properties and define $p \equiv (p_1, \ldots, p_n)$ and $s_i \equiv (s_1, \ldots, s_n)$. Propositions 3 and 5 then together imply

Proposition 6. The class of equalization measures $E \equiv 1 - (I(p) / I(y1))$ satisfies the **E** and **V** properties.

It remains to specify the properties of the inequality function I(.) which enters into the numerator and denominator of the E class of measures. Let I(.) be defined on an n-vector of incomes. Given a set Z of income vectors and A, B $\in$ Z, the binary relations $\succeq$ (read "at least as unequal as"), $\succ$ ("strictly more unequal than"), and ~ ("equally unequal as") provide a basis for comparing their inequalities. We shall assume that I(.) satisfies the Lorenz properties **L**, viz.

L1. Anonymity. If A $\in$ Z is obtained from B $\in$ Z by a permutation of B, A ~ B.

L2. Scale-independence. If A $\in$ Z is obtained from B $\in$ Z by multiplying everyone's income by the same positive scalar multiple λ, then A ~ B.

L3. Population-independence. If A $\in$ Z is obtained from B $\in$ Z by replicating each income an integral number of times, then A ~ B.

L4. Pigou-Dalton condition. If, holding all other incomes the same, A $\in$ Z is obtained from B $\in$ Z by transferring a positive amount of income from a relatively rich person α to a relatively poor person β while keeping α's and β's position in the income distribution the same, then B $\succ$ A.

Let $I_{LC}(.)$ denote the class of Lorenz-consistent inequality measures. Then:

Proposition 7. The class of equalization measures $E \equiv 1 - (I_{LC}(p) / I_{LC}(y1))$ satisfies the **E**, **V**, and **L** properties.

In view of the well-known fact that the Gini coefficient, G(.), is Lorenz-consistent, the following is a corollary to Proposition 7:

Proposition 8. The measure of mobility as an equalizer of longer-term incomes P (for "progressivity"), defined as $P \equiv 1 - (G(p) / G(y1))$, satisfies the **E**, **V**, and **L** properties.

Applications of the New Equalization Measure

Three applications of the new equalization measure $P \equiv 1 - (G(p) / G(y1))$ shall be presented here. The first is the application to the hypothetical situations of "Gates gains" and "Gates loses" presented above. All indices satisfying the **E** properties, including $P = 1 - (G(p)/G(y_1)$, have a threshold value of zero, meaning that positive values signify that longer-term incomes are more equal than base-year incomes, while negative values signify the opposite. For the "Gates gains" mobility process (100, 200, 20000) → (100, 200, 30000), the P index is found to equal -3.9×10^{-3}, while for the "Gates loses" process (100, 200, 20000) → (100, 200, 10000), the index takes on the value of 6.6×10^{-3}. The change in sign clearly shows that the Gates-gains process is disequalizing while the Gates-loses is equalizing.

As a second application, the P index is used to measure the extent to which income mobility has equalized longer-term income in the United States. For each five-year period between1970 and 1995, base-year and final-year earnings (including overtime and bonuses) are drawn from the Panel Study of Income Dynamics. For each panel the sample consists of men aged 25-60 in the base year who were not students, retired, or self-employed, and who had positive earnings in both years. The extent of income mobility may be sensitive to the particular base year and terminal year chosen, so as a robustness check, calculations were made for each period starting and ending a year earlier.

As shown in Table 2, two striking findings emerge: (1) Earnings mobility in the United States is seen to have been equalizing in the 1970s but not in the 1980s and 1990s. This is a brand new finding: no other researcher, to the best of my knowledge, has shown

that income mobility in the United States stopped equalizing longer-term incomes around 1980. (2) Comparing the P index with measures of other mobility concepts using the same data (Gary S. Fields, Jesse B. Leary, and Efe A. Ok, 1999, reproduced here in Table 3), we see that their time paths are entirely different. Time-independence, positional movement, share movement, and income flux all show an inverted-U pattern, while directional income movement exhibits a wiggle which is always positive. Only the P index changes sign from positive to negative.

The third application is to earnings mobility in France. Moshe Buchinsky, Gary S. Fields, Denis Fougère, and Francis Kramarz, (2000) used data from employers' declarations of wages paid to each of their employees (Déclarations Annuelles de Salaires) to calculate the time paths of various indices of earnings mobility of full-time workers for two-year intervals from 1967-69 to 1995-97. Their two principal findings are: (1) The P index for France, shown in Figure 4, is never negative. Thus, in France, unlike the United States, income mobility has equalized longer-term incomes throughout the observation period. (2) The P index shares a U-shape with measures of many other mobility concepts (Figure 5). The similarity observed here for France is unlike the dissimilarity of the time paths of the various mobility concepts for the United States.

These applications show that in practice as well as in theory, mobility-as-an-equalizer-of-longer-term-incomes is fundamentally different from other mobility concepts.

Conclusion

This paper has made six points. First, a well-established concept in the income mobility literature is the notion of mobility as an equalizer of longer-term incomes. Second, equalization of longer-term incomes is a fundamentally different concept from equalization of single-period incomes. Third, standard mobility concepts and measures are in many cases inconsistent with mobility as an equalizer of longer-term incomes.

Fourth, mobility as an equalizer of longer-term incomes is a fundamentally different concept from mobility as an equalizer of opportunity. Fifth, a set of axioms was specified leading to a class of indices of mobility as an equalizer of longer-term incomes, one easily-implementable member of which is the progressivity index $P = 1 - (G(p)/G(y_1)$, where $G(p)$ and $G(y_1)$ are respectively the Gini coefficient of longer-term income and of base-year income. Finally, in empirical work, the P index was shown to make a fundamental qualitative difference. The new findings here are that income mobility equalized longer-term earnings among U.S. men in the 1970s but not in the 1980s or 1990s, whereas in France, income mobility has always been equalizing since first measured in the late 1960s.

Mobility-as-an-equalizer-of-longer-term-incomes and mobility-as-an equalizer of opportunity are new concepts, complementing mobility-as-time-independence, positional movement, share movement, income flux, and directional income movement. Mobility analysts would do well to be careful to specify which of these concepts are of greatest interest to them and to choose the mobility indices they use accordingly.

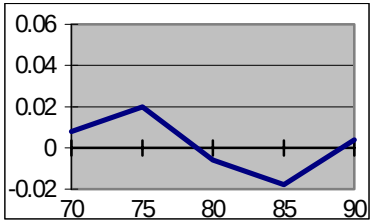
Table 1.
Measures of Five Mobility Concepts When Longer-Term Incomes are Disequalized and When They Are Equalized in Two Alternative Ways.

Measure	**Disequalizing Process: The richest person gains 50% (100, 200, 20000) → (100, 200, 30000) (1)**	**Equalizing Process 1: The richest person loses 50% (100, 200, 20000) → (100, 200, 10000) (2)**	**Equalizing Process 2: The poorest person gains 50% (100, 200, 20000) → (150, 200, 20000) (3)**
(a) Time-independence, as measured by 1-r(y_1, y_2), where r is the Pearson correlation coefficient	1.068×10^{-6}	9.808×10^{-6}	2.373×10^{-6}
(b) Positional-movement, as measured by 1-ρ(y_1, y_2), where ρ is the rank correlation coefficient	0	0	0
(c) Per-capita share movement, as measured by (1/n) Σ $\lvert s(y_{2i}) - s(y_{1i})\rvert$, where s(.) denotes i's share of total income	3.252×10^{-3}	9.565×10^{-3}	1.630×10^{-3}
(d) Per-capita flux, as measured by (1/n) Σ $\lvert y_{2i} - y_{1i}\rvert$	3333.3	3333.3	16.7
(e) Per-capita directional movement, as measured by (1/n) Σ ($\log y_{2i} - \log y_{1i}$)	0.135	-0.231	0.135

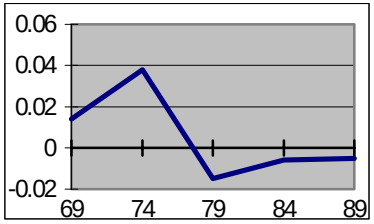
Table 2.
Mobility as Progressivity in the U.S. Panel Study of Income Dynamics,
1970-1975 to 1990-1995 and 1969-1974 to 1989-1994,
Measuring Progressivity as $P = 1 - (G(p)/G(y_1)$.

Period	Value of P	Period	Value of P
1970-1975	.008	1969-1974	.014
1975-1980	.020	1974-1979	.038
1980-1985	-.006	1979-1984	-.015
1985-1990	-.018	1984-1989	-.006
1990-1995	.004	1989-1994	-.005

P-Measure in Each of Five Periods
1970-75 to 1990-95
(Base Year Indicated)

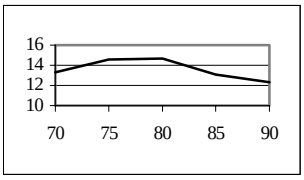
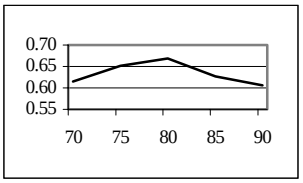
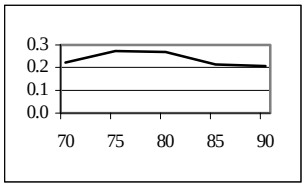
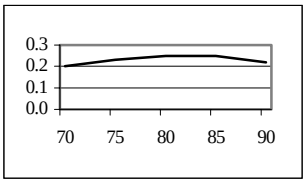
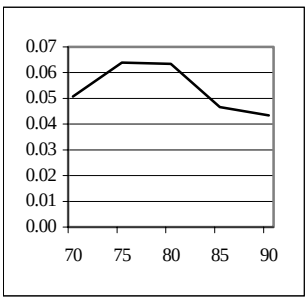


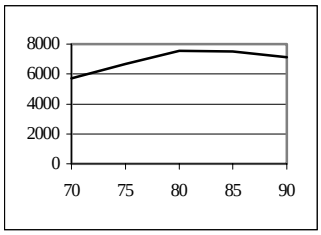
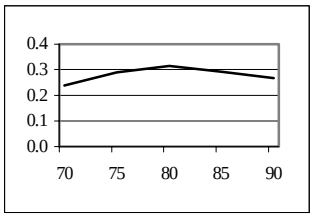
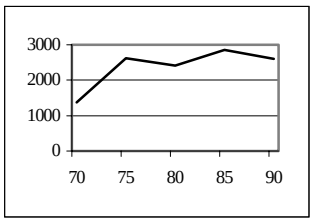
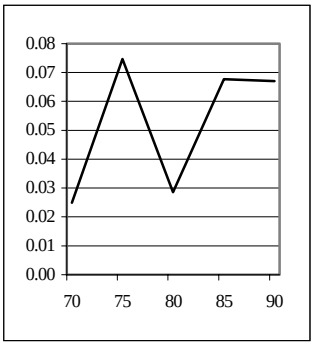
P-Measure in Each of Five Periods
1969-74 to 1989-94
(Base Year Indicated)

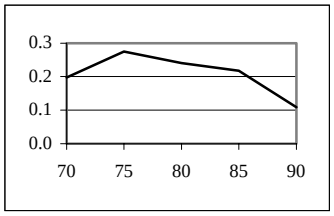
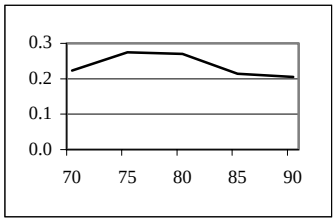
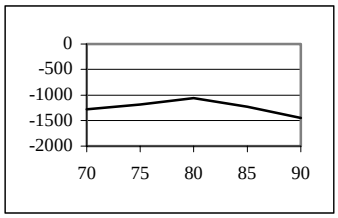


Source: Author's calculations.

Table 3.
Time Paths of Measures of Other Mobility Concepts
in the U.S. Panel Study of Income Dynamics.
1970-1975 to 1990-1995 (Base Year Indicated)

Concept	***Measure***	***Time Path***
I. Relative Movement		
A. Positional movement		
	Mean absolute centile change	
	Centile mobility ratio	
	One minus centile correlation coefficient	
B. Share movement		
	Mean absolute share change	
	Shorrocks's M(Gini)	

Concept	***Measure***	***Time Path***
II. Income Flux		
A. In dollars	F-O 1	
B. In log-dollars	F-O 2	
III. Directional Income Movement		
A. In dollars	Per-capita growth	
B. In log-dollars	F-O 3	

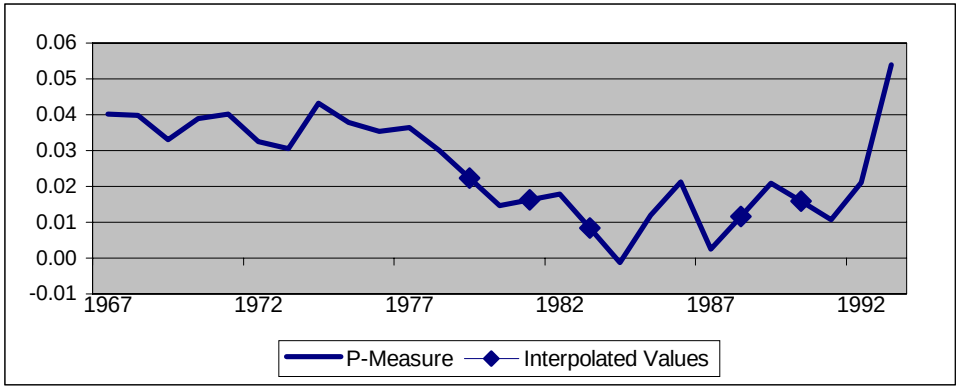
Concept	***Measure***	***Time Path***
IV. Time-Independence		
A. Of income	One minus correlation of earnings	
B. Of ranks	One minus rank correlation coefficient	
	Negative chi-square in deciles	

Source: Fields, Leary, and Ok (2000)

Table 4.
Mobility as Progressivity in the French Déclarations Annuelles de Salaires, 1967-69 to 1995-97,
Measuring Progressivity as $P = 1 - (G(p)/G(y_1)$.

Period	Value of P	Period	Value of P
1968-1970	0.040	1967-1969	0.040
1973-1975	0.031	1972-1974	0.032
1978-1980	0.030	1977-1979	0.036
1983-1985	0.008*	1982-1984	0.018
1988-1990	0.012*	1987-1989	0.002
1993-1995	0.054	1992-1994	0.021

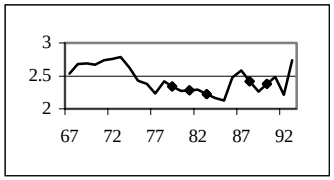
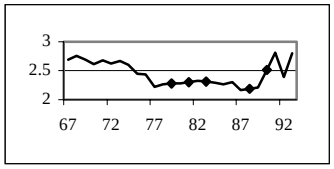
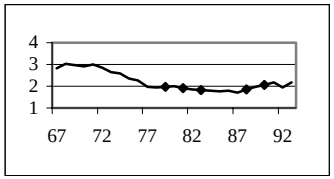
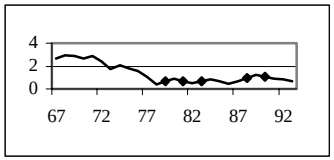
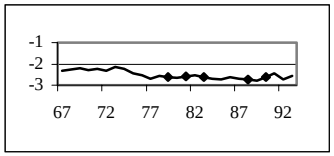
Evolution of P-Measure, 1967-69 to 1995-97
(Base Year Indicated)



Source: Buchinsky, Fields, Fougère, and Kramarz (2000).

* P-Value interpolated from adjacent years due to missing data.

Table 5.
Time Paths of Measures of Other Mobility Concepts in the French Déclarations Annuelles de Salaires, 1967-69 to 1995-97.

Concept	***Measure***	***Time Path***
I. Relative Movement		
A. Positional movement	Mean absolute centile change	
B. Share movement	Mean absolute share change	
II. Non-Directional Income Movement	In log-dollars	
III. Directional Income Movement	In log-dollars	
IV. Time-Independence	Negative chi-square	

Source: Buchinsky, Fields, Fougère, and Kramarz (2000).

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