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But That's Not What Economic Mobility Is!

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Abstract

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"But That Is Not What Economic Mobility Is!"

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I. Introduction

How many times have you attended a talk or read a paper on economic mobility and thought, "What you are talking about is not what I am interested in"? Not only do different people have different ideas about what economic mobility is, but they have different <u>clear</u> ideas about what economic mobility is. The purpose of this paper is to present the essential features of the different economic mobility concepts that are found in the literature.

First, consider the points of agreement. Researchers agree that economic mobility is about the transformation of a vector of incomes x at one point in time to another vector y at another point in time (and possibly to yet other points in time as well). When all we have are cross-sectional data, we can analyze <u>structural change</u> – for example, the existence of more middle-income opportunities and fewer lower-income ones. But when we have panel data, we can also analyze <u>panel mobility</u> – that is, the changes over time for each of the persons in x and y.

But where researchers disagree is what questions are interesting to ask and what methods are appropriate for answering them. Take, for example, the following questions. Does one country have more economic mobility than another? Has economic mobility been rising

or falling over time? Who has more economic mobility: Men or women? The better-educated or the less-educated? Urban or rural residents? Does economic mobility tend to make the distribution of lifetime income more equal?

Ample research has revealed very diverse answers to questions like these; see, for example, Atkinson, Bourguignon, and Morrisson (1992), Organisation for Economic Co-operation and Development (1996, 1997), Checchi and Dardanoni (2003), and Fields (2007). Part of the reason for these different answers is that different indices are used to measure economic mobility. But an even more fundamental reason for finding different answers is that economic mobility researchers are in fact measuring different concepts, often without being aware that the concepts they are looking at are different.

Consider the state of the income distribution literature at present. Researchers in this field are well aware that inequality, poverty, economic mobility, and economic well-being are different concepts from one another. They know too that the Gini coefficient measures one of these (relative inequality), the P_α class another (absolute poverty), the Generalized Lorenz curve yet another (economic well-being), and so on.

A great many economic mobility indices have been used. These include the Pearson correlation coefficient, the rank correlation coefficient, minus chi-squared, the quantile (quintile, decile, . . .) immobility ratio, determinant of the transition matrix, average jump in income rank, per-capita quantile movement, average absolute value of change in income share, average absolute value of change in per-capita incomes in logs or in dollars, average algebraic value of change in per-capita incomes in logs, Hart's mobility index, Maasoumi and Zandvakili's index, Shorrocks's mobility index, and Fields's equalization index, among others.

It is essential for mobility researchers to recognize that more than using different mobility indices, we are also analyzing and measuring different mobility concepts. The balance of the paper proceeds as follows. First, I distinguish several micromobility notions which apply to a given individual. Next, turning to macromobility – which asks the question of how much mobility there is in an economy - I state formally the essences of six mobility concepts and four mobility sub-concepts, distinguishing them from each other and stating measures of each. I then offer observations on a number of aspects of economic mobility including decomposability, relative versus absolute mobility, welfarist approaches, Markov chains, and pseudo-panels. Finally, I relate some of the most important papers in the economic mobility literature to these various concepts and sub-concepts.

II. Terminology and Notation

The following terminology and notation are used. The economic variable of interest is called "income," though everything said here applies equally to consumption, labor market earnings, wealth, or other economically interesting magnitudes. Anything measured in currency units should be adjusted for inflation. The recipient unit is called a "person," but the points made apply equally to households, per capitas, or adult equivalents. Also, the concepts and sub-concepts presented apply equally to the intergenerational and intragenerational contexts.

Assume that the same persons' incomes are observed or reported twice, once in a base year and once in a final year. Let $x = (x^1, \ldots, x^n)$ denote a vector of initial year incomes among n persons, indexed without loss of generality in ascending order of initial incomes. Similarly, let $y = (y^1, \ldots, y^n)$ denote a vector of final year incomes among these same persons, also ordered in ascending order of initial incomes.

For a given individual *i,* we may denote the transformation from x^i to y^i as $x^i \rightarrow y^i$ and the economic mobility associated with this transformation as $m^i(x^i, y^i)$. Similarly, in the economy as a whole, we may denote the transformation from *x* to *y* as $x \rightarrow y$ and the economic mobility associated with this transformation as *m(x, y).*

The main task in the balance of this paper is to help clarify the different concepts underlying $m^i(.)$ and *m(.).* This conceptualization is linked to the axiomatic approaches to income mobility pioneered by Shorrocks (1978), Atkinson (1981), and Cowell (1985); for reviews of the axiomatic literature, see Shorrocks (1993) and Fields and Ok (1999a). Micromobility and macromobility concepts are treated in turn.

III. <u>Micromobility Concepts</u>

Research on the microeconomics of economic mobility research addresses changes that take place for given individuals in an intragenerational context or for a given family (e.g., fathers and sons, mothers and daughters) in an intergenerational context. Among the micro aspects analyzed are changes in incomes in dollars, changes in log-incomes, growth rates of incomes, absolute values of changes in incomes, changes in positions (quintiles, deciles, centiles, or ranks), and changes in income shares. No one of these is obviously the "right" way to gauge how much economic mobility an income recipient has experienced over time.

The various micro aspects do not agree in magnitude and may not agree even in direction. For example, an income recipient may simultaneously experience a rise in real income, a fall in income share, and a positive, negative, or zero change in position. For this reason, researchers need to be careful to specify which aspect(s) of micro-mobility is (are) the object of study.

IV. <u>Macromobility: Six Concepts</u>

Six macromobility concepts are analyzed here. The first, time-independence, asks the question, how dependent is current income on past income? The next four - positional movement, share movement, income flux, directional income movement – ask the question, how much economic movement has taken place? The sixth, mobility as an equalizer, asks to what extent has the mobility that has taken place equalized longer-term incomes relative to initial incomes?

For each concept, I present what is <u>the essence</u> of that concept, state what it means to have <u>no</u> mobility of that type and <u>more</u> mobility of that type, and give an <u>example</u> of an index that measures mobility of that type.

A. Time-independence

The <u>essence</u> of time-independence is to gauge the extent to which final incomes are statistically independent of initial incomes. An economy exhibits <u>zero time-independence</u> if y is perfectly determined by x – that is, if the transition matrix is an identity matrix or a reverse-identity matrix. There is <u>more time-independence</u> if y is determined to a lesser degree by x. There is <u>perfect time-independence</u> if the conditional distribution of y given x is the same as the unconditional distribution of y, i.e., $f(y/x) = f(y)$. One <u>measure of time-independence</u> is obtained by constructing a two-period transition matrix and calculating minus chi-squared – "minus" so that larger values signify greater time-independence.

Note: The ordinary Pearson correlation coefficient is also used as an (inverse) index of time-independence. But because the correlation between two vectors of incomes is the same as the correlation between two vectors of income shares, this same index can also be used to measure share movement.

Note: In the intergenerational mobility context, it is common to regress the logarithm of the child's earnings on the logarithm of the parent's earnings and take the resulting β as an (inverse) index of intergenerational mobility. In the case where parents' and children's earnings have about the same log-variance, β approximates the correlation between child's and parent's log-earnings (Solon, 2002).

B. Positional movement

The <u>essence</u> of positional movement is the extent to which persons change <u>positions</u> (quintile, decile, centile, or rank) within the distribution. Denoting the i'th person's position in the x distribution by $\pi(x^i)$ and in the y distribution by $\pi(y^i)$, <u>zero positional movement</u> arises in an economy if and only if everyone's position in the income distribution remains the same, i.e., $\pi(x^i) = \pi(y^i) \ \forall i, i = 1, \ldots, n.$ <u>More positional movement</u> takes place when the non-directed distances between $\pi(x^i)$ and $\pi(y^i)$, $i = 1, \ldots, n$ increase. One <u>measure of positional movement</u> is the average absolute value of positional changes $m_{pos\ mvmt} = (1/n) \ \Sigma \ |\pi(y^i) - \pi(x^i)|$.

C. Share movement

The <u>essence</u> of share movement is that individuals' shares of total income may change, whether or not their incomes do. There is <u>zero share movement</u> if and only if everybody has the same <u>share</u> of total income in y as in x – that is, letting $s(x^i) \equiv x^i / \Sigma x^i$ and likewise for $s(y^i)$, we have that $s(x^i) = s(y^i) \ \forall i, i = 1, \ldots, n.$ There is <u>more share movement</u> as the non-directed distances between $s(x^i)$ and $s(y^i)$ increase. An example of a <u>measure of share movement</u> is the average absolute value of share changes

$m_{share\ mvmt} = (1/n) \ \Sigma \ |s(y^i) - s(x^i)|$.

D. Income flux (also called non-directional income movement)

The <u>essence</u> of income flux is that it gauges the magnitudes of income fluctuations without regard to their direction. <u>Zero income flux</u> arises if and only if all incomes remain the same: $x^i = y^i \ \forall i, i = 1, \ldots, n$. An economy has <u>more income flux</u> when the non-directed distances between x^i and $y^i, i = 1, \ldots, n$ increase. An <u>example of a measure</u> of income flux is the average of the absolute values of income change

$m_{flux} = (1/n) \ \Sigma \, |y^i - x^i|$.

E. Directional income movement

The <u>essence</u> of directional income movement is that it is concerned with the extent to which incomes are rising or falling. <u>Zero directional income movement</u> takes place if and only if all <u>incomes</u> remain the same: $x^i = y^i \ \forall i, i = 1, \ldots, n$. There is <u>more directional income movement</u> in an economy when the directed distances between x^i and y^i, $i = 1, \ldots, n$, increase. An <u>example of a measure</u> of directional income movement is the average of the income changes $m_{dir \ mvmt} = (1/n) \ \Sigma \, (y^i - x^i)$.

F. Mobility as an equalizer of longer-term incomes relative to initial incomes

The <u>essence</u> of mobility as an equalizer is whether and to what extent the income changes that take place make the distribution of longer-term incomes more equal than the initial distribution of incomes. Letting ℓ be a vector of longer-term incomes and $I(.)$ an inequality measure, <u>zero equalization of longer-term incomes relative to initial incomes</u> arises if and only if $I(\ell) = I(x)$, There is <u>more equalization of longer-term incomes relative to initial incomes</u> if $I(\ell) < I(x)$ and the smaller (i.e.., more negative) is $I(\ell)$ relative to $I(x)$. Analogously, there is <u>more disequalization of longer-term incomes relative to initial incomes</u> if $I(\ell) > I(x)$ and the larger is $I(\ell)$ relative to $I(x)$. An <u>example</u> of a measure of mobility as an equalizer of longer-term incomes relative to initial incomes is

$m_{equalizer} = 1 - (I(\ell)/I(x))$, where ℓ is the average of initial and final year incomes and the inequality measure $I(.)$ used is the Gini coefficient.

V. <u>Macromobility: Four Sub-Concepts</u>

In addition to the six mobility concepts presented in the last section, the literature also offers four mobility sub-concepts. These are sub-concepts in the sense that one of the mobility concepts may be conceived of as being the sum of two sub-concepts plus possibly a residual. For each sub-concept, I present what is <u>the essence</u> of that sub-concept, state what it means to have <u>no</u> mobility of that type and <u>more</u> mobility of that type, and give an <u>example</u> of an index that measures mobility of that type.

A. Structural mobility

The <u>essence</u> of structural mobility is 1) the vector of incomes changes from initial year to final year but 2) income recipients are treated anonymously within the two distributions. As before, let x denote the vector of initial incomes ordered without loss of generality from lowest initial income to highest. Let y' denote the vector of final incomes also ordered from lowest initial income to highest. There is <u>zero structural mobility</u> if and only if the elements of the x and y' vectors are the same, i.e., $x_i = y'^i \, \forall i, \quad i = 1, \ldots, n$. There is <u>more structural mobility</u> the greater are the non-directed distances between x^i and y'^i, $i = 1, \ldots, n$. An <u>example</u> of an index of structural mobility is the average absolute value of the differences between x^i and y'^i: $m_{structural\ mob} = (1/n)\, \Sigma\, |y'^i - x^i|$.

B. Exchange mobility

The <u>essence</u> of exchange mobility is that income recipients exchange places within a structure in which all income amounts are held constant. We have <u>zero exchange mobility</u> if and only if the vector of final incomes arrayed in ascending order of final incomes y' is identical to the vector of final incomes arrayed in ascending order of initial incomes y,

i.e., $y'^i = y^i \; \forall i, \; i = 1, \ldots, n.$ We have <u>more exchange mobility</u> the greater are the non-directed distances between y'^i and y^i, $i = 1, \ldots, n.$ An <u>example</u> of an index of exchange mobility is the average absolute value of the differences between y'^i and y^i:

$m_{exchange\,mob} = (1/n) \, \Sigma \, |y'^i - y^i|.$

C. Growth mobility

The <u>essence</u> of growth mobility is that the incomes of the panel people we are following may change because the economy gets richer (or poorer). <u>Zero growth mobility</u> takes place if and only if total income remains the same (i.e., $\Sigma x^i = \Sigma y^i$). <u>More growth mobility</u> takes place as Σy^i increases relative to Σx^i. An <u>example</u> of an index of growth mobility is the average income gain $m_{growth\,mob} = (1/n)\Sigma(y^i - x^i).$

D. Transfer mobility

The <u>essence</u> of transfer mobility is that after allowing for the economy to have grown or contracted, there may remain income gains or losses due to transfers between winners and losers. <u>Zero transfer mobility</u> arises a) in the case of economic growth when there are only winners, no losers, and b) in the case of economic decline when there are only losers, no winners. <u>More transfer mobility</u> occurs when, among the losers, the directed distances between initial and final incomes increase. An <u>example</u> of a measure of transfer mobility in the case of economic growth is the average amount lost by the losers $m_{transfer\,mob} = (1/n) \, \Sigma_{losers} \, (x^i - y^i),$ while in the case of economic decline, an example is the average amount gained by the winners $m_{transfer\,mob} = (1/n) \, \Sigma_{winners} \, (y^i - x^i).$

VI. <u>Observations</u>

A. Decomposability

An economic mobility concept may be said to be exactly decomposable if it can be expressed as the sum of well-specified components without residuals. Two types of

decompositions will be considered in turn: additive decomposability and decomposability into social scientifically meaningful components.

Intuitively, the four mobility concepts which are movement-based – namely, positional movement, share movement, income flux, and directional income movement – should be additively decomposable. As can be seen from a quick glance at the formulas in Sections IV.B-E, the specific measures presented for each of these four concepts are indeed additively decomposable.

What about decompositions into indices of sub-concepts such as structural and exchange mobility or growth and transfer mobility? Markandya (1984) and Ruiz-Castillo (2004) have presented decompositions in which one component is well-specified while the other component is specified as a residual. This does not mean, however, that an exact decomposition is impossible. To the contrary, Fields and Ok (1996, 1999b) have shown that two indices of income flux, $m_{flux}=(1/n) \: \Sigma \: /y^i – x^i/$ and $m^*_{flux}=(1/n) \: \Sigma \: /log \: y^i – log \: x^i/$, are exactly decomposable into growth mobility and transfer mobility components. Otherwise, exact decompositions without residuals have so far eluded analysts, perhaps because no other exact decompositions are possible.

B. On relative and absolute mobility

The reader may have noticed that the terms "relative mobility" and "absolute mobility" have not been mentioned. This is deliberate, because these terms have many different meanings in the economic mobility literature (Fields and Ok, 1999a; Fields, 2007). Relative mobility has been used to mean any or all of the following: 1) Strongly relative changes have taken place: $m(\lambda x, \alpha y)=m(x, y) \: \forall \: \lambda, \alpha > 0$.   2) Weakly relative changes have taken place: $m(\lambda x, \lambda y)=m(x, y) \: \forall \: \lambda > 0$. 3) Positional movements have taken place: $\pi(x^i) \neq \pi(y^i)$ for some i's. 4) Changes in relative standing have taken place, for example,

in the sense of share movement. "Absolute mobility" has also been used to mean different things: 1) There have been income gains or losses (rather than changes in income shares or positions). 2) The absolute values of income changes are non-zero, and these are an object of interest. 3) Translation invariant changes have taken place: $m(x+\alpha, y+\alpha)=m(x, y) \, \forall \alpha$.

As elsewhere in economics, when a term has more than one meaning within the same literature, the use of that term may well obfuscate more than it clarifies. I think it is best to drop the terms "relative mobility" and "absolute mobility" altogether. We did not need them in the previous pages and neither do we need them moving ahead.

C. Welfarist approaches, Markov chains, and pseudo-panels

Three strands of the economic mobility literature have not been mentioned in this paper, because they were not needed.

The first is the welfarist approach, also called the ethical approach (Atkinson, 1981). In this approach, mobility is first conceptualized in social welfare terms. Based on the specified social welfare properties, the analyst then derives a mobility functional, class of indices, or single index. As Atkinson put it, "mobility is seen in terms of its implications rather than from a direct consideration of what is meant by mobility." In this paper, a different approach has been taken, namely, descriptive measurement, which is also called objective measurement. In the words of Dardanoni (1993, p. 374), the descriptive approach aims to "construct summary immobility measures to capture the intuitive descriptive content of the notion [of mobility]." This distinction in the mobility literature parallels the distinction made by Sen (1973, p. 2) between (a) 'seeing' more or less inequality and (b) 'valuing' inequality more or less in ethical terms. In both the welfarist and the descriptive approaches, the amount of economic mobility recorded presumably

has welfare significance. What differentiates the two approaches is whether a social welfare function is required in order to determine how much economic mobility has taken place.

The second approach not taken in this paper is the use of Markov chains; see Fields and Ok (1999a) for references to this literature. To measure the mobility concepts and sub-concepts presented above, the researcher can make the appropriate calculations using the panel data directly. By contrast, the Markov chain approach multiplies an initial income vector by a transition matrix a large number of times in order to derive a steady-state vector, and it is the steady-state vector that is then the object of investigation. Such an indirect approach is simply not required for the purposes at hand.

The third approach not taken is the use of pseudo-panels (e.g., Antman and McKenzie, 2007). Pseudo-panels attempt to fix measurement error in each year's income. However, in so doing, they lose whatever actual mobility takes place within cells. It is a judgment call, but for economic mobility analysis, I prefer to work with panels than pseudo-panels despite their respective limitations.

VII. Mobility Concepts and Sub-Concepts in the Existing Literature

Among the most important papers in the economic mobility literature, one finds that a wide variety of concepts and sub-concepts have been analyzed.

Shorrocks (1978) proposed a mobility index, which in the two-period context is $m_{Shorrocks} = 1 - (I(\ell)/(w_x I(x) + w_y I(y)))$, where as above ℓ (long-term income) is calculated as the average of initial and final year income and $I(.)$ is an inequality index such as the Gini coefficient. As can be seen from the formula, Shorrocks' index measures the inequality of longer-term incomes relative to a weighted average of initial and final

incomes. This is a different concept from the six presented above; it is closest to mobility as an equalizer of longer-term incomes relative to initial incomes.

Atkinson (1981) and Atkinson and Bourguignon (1982) analyzed diagonalizing switches in the domain of bistochastic transition matrices. By construction, a bistochastic transition matrix keeps the initial and final year distributions equal to one another, as would be the case when analyzing movements among, for example, income quintiles, which requires that 20% of the income recipients be in each quintile in both the initial and final year distributions. By construction, no structural change is permitted. It follows that their analysis is applicable to the positional movement concept and the transfer mobility sub-concept but not to any of the others – in particular, directional income movement.

Chakravarty, Dutta, and Weymark (1985) proposed an ethical mobility index $m_{CDW} = (E(y_{agg})/E(x)) – 1$, where x is the initial income vector, y_{agg} is the vector of aggregate incomes over two or more periods, and $E(.)$ is an equality index. The CDW index takes on positive (negative) values when aggregate income is distributed more (less) equally than initial incomes. In welfare terms, they write: "Socially desirable mobility is associated with income structures having positive index values while socially undesirable mobility is associated with income structures having negative index values." In my view, this judgment is a reasonable way of passing judgment on the transfer mobility sub-concept. On the other hand, the CDW approach entirely ignores whether incomes have grown or contracted, and so I see it is too restrictive for general application.

To take one more example, Cowell (1985) develops measures of "distributional change," a concept broad enough to include both income mobility and horizontal inequity but not specific to any particular income movement concept.

Turning from the more classic papers to some of the more recent papers in the literature, we also find many different concepts and sub-concepts being analyzed, all under the rubric of "income mobility." Ruiz-Castillo (2004) decomposes the Chakravarty-Dutta-Weymark index into structural mobility and exchange mobility components but does not state what concept the CDW index is measuring. Jenkins and Van Kerm (2006) work with the positional movement aspect of income mobility. Grimm (2007) and Van Kerm (2009) analyze directional income movement in percentages. Deutsch, Labeaga, and Silber (2007) discuss share movement. In some of these cases, it was not easy for me as a reader to discern which aspect of economic mobility was under examination.

But I should not spare myself here, because I too am guilty of writing and talking about income mobility without being precise about the aspect of mobility under consideration. When seminar participants would sometimes say to me "But that is not what economic mobility is," the reason they did is that my earliest work on this topic, joint with Efe Ok and published as Fields and Ok (1996), did not state clearly enough that the concept of mobility that we were characterizing at that time was income flux. Happily, we learned our lesson, so that in Fields and Ok (1999b) we distinguished flux from directional income movement, and in Fields, Leary, and Ok (2002), we distinguished these from positional movement, share movement, and time-independence.

VIII. A Concluding Word

Audiences should not have to work so hard to be able to figure out which mobility concept or sub-concept an author or speaker is talking about. The remedy is simple to

state, though it may be hard to carry out in practice: it is for us to replace the vague term "income mobility" by a more precise one such as "directional income movement" or "positional movement" or whichever other concept or sub-concept we are working with at a given time. If we steadfastly make clear which economic mobility concept we are conceptualizing and measuring, our readers and listeners will have a better idea of what it is we are talking about. It can only be good for the advancement of social science for us to stop talking past one another.

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