

Fields, Gary S.

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WIDER Working Paper 2019/106

## Concepts of social mobility

Gary S. Fields\*

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**Abstract:** This paper has two purposes. The first is to define clearly different social mobility concepts and components. The second is to embed these concepts and components into a larger context of social mobility research. The core of the paper develops six mobility concepts and their measures as well as six macromobility components and their measures. The next section relates these concepts and components to issues in the mobility literature. The paper concludes with a checklist of suggestions for conducting and presenting social mobility research: being explicit about several preliminaries—outcome of interest, context, and level of analysis—and then four steps—question, mobility concept(s), mobility measure(s), and empirical findings.

**Key words:** social mobility, economic mobility, macromobility, mobility components, micromobility, decomposability, relative and absolute mobility

**JEL classification:** D3, D6, J3, J6

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\* Cornell University, IZA, and UNU-WIDER; email: [gsf2@cornell.edu](mailto:gsf2@cornell.edu).

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Katajanokanlaituri 6 B, 00160 Helsinki, Finland

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## 1 Introduction

Social mobility remains a topic of great interest—see, for example, the Opportunity Insights Project (e.g. Chetty et al. 2017), the OECD (2018), and the World Bank (2018). For purposes of the UNU-WIDER project, ‘social mobility’ is defined as ‘the ability to move from a lower to a higher level of education or occupational status, or from a lower to a higher social class or income group’. Social mobility thus subsumes economic mobility in general and income mobility in particular as well as many other notions of status. For the project, ‘social mobility ... is the hope of economic development and the mantra of a good society’. I agree wholeheartedly.

The preceding paragraph talked about social mobility, economic mobility, income mobility, educational mobility, occupational mobility, and class mobility. To collect all of these ideas under a single term, I will simply refer to the variable of interest as income without quotation marks; when analysing something else such as education, occupation, labour market earnings, or wealth, we should feel free to use that terminology instead. Notationally, let us suppose that we have two values for the same individual; the initial value for individual  $i$  is denoted  $x^i$  and the final value  $y^i$ . The corresponding vectors for the economy/society as a whole are  $\mathbf{x}$  and  $\mathbf{y}$  in bold letters.

This paper has two principal purposes. One is to define clearly different social mobility concepts and components. The concepts are origin-independence, positional movement, share movement, non-directional income movement, directional income movement, and mobility as an equalizer of longer-term incomes. The mobility components are upward and downward mobility, exchange mobility, growth mobility, transfer mobility, and dispersion change. For earlier work on these concepts, see, for example, Fields and Ok (1999a), Fields (2008) and Jäntti and Jenkins (2015). It is beyond the scope of this paper to review all of the different measures of social mobility and their suitability for the various concepts and components.

The second main purpose of this paper is to embed these concepts of social mobility and their components into a larger context of social mobility research. A typical social/economic mobility paper proceeds roughly like this:

1. ‘Here is what I am calculating.’
2. ‘When I calculate it, here is what I find.’
3. It often is left to the reader to infer what mobility concept the author had in mind.

An example goes like this: ‘Here is my estimating equation, in which beta is the intergenerational elasticity. My empirical findings show that the intergenerational elasticity has been rising over time. Because the intergenerational elasticity is an inverse measure of social mobility, I conclude that social mobility has been falling.’

In such a statement, for the author and therefore for the reader, ‘social mobility’ is that which the intergenerational elasticity measures. This is unsatisfactory; authors have the responsibility of telling their readers what mobility concept they are studying. It is bad enough when an author has in mind the concept of origin-independence but fails to use that term. It is even worse when the author has in mind a different mobility concept—for example, the extent of upward income movements—but measures the intergenerational elasticity.

This paper suggests a better way for analysts to address social and economic mobility. In essence, we need to proceed through several preliminaries—outcome of interest, context, and level of

analysis—and then four steps—question, mobility concept(s), mobility measure(s), and empirical findings.<sup>1</sup>

My book *Distribution and Development* (Fields 2001) is laid out precisely according to these four steps: Chapter 1 gives the preliminaries, and then the next eight chapters examine four distributional variables of interest: inequality (Chapters 2 and 3), poverty (Chapters 4 and 5), income mobility (Chapters 6 and 7), and economic well-being (Chapters 8 and 9). Upon reading any pair of chapters, the reader learns what the concept is, how it is measured, and what we knew empirically at that time about how that variable changed in the course of the economic growth of developing countries for which we had data.

Moving from distributional analysis to mobility analysis, I freely admit that I have not always followed the preceding steps. I too am guilty of having written and talked about income mobility without being precise about which concept of mobility was being considered. 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 (see Fields and Ok 1996), did not state clearly enough that the concept of mobility that we were characterizing at that time was non-directional income movement, also known as income flux. Happily, we learned our lesson, so that in Fields and Ok (1999b) we distinguished flux from directional income movement, and in Fields et al. (2002) we distinguished these from positional movement, share movement, and origin-independence.

Before moving on, I would like to answer a question that has often been asked of me: Given all the options that follow in this paper, which concept(s) is(are) most important? If I had to choose one concept to emphasize above all else, it would be directional income (or educational or occupational) mobility. And when analysing directional mobility, I would measure both the *rates* of upward and downward mobility and the *magnitudes* of the upward and downward movements. Moreover, if I were to add a second concept to highlight, it would be mobility as an equalizer or disequalizer of longer-term incomes relative to initial incomes. This is not to say that I would exclude all other concepts or measures of them, but these are the ones with which I would start.

Let us proceed.

## **2 Getting started: Preliminaries, points of agreement and disagreement, and terminology and notation**

### **2.1 Preliminaries**

Before we can analyse social mobility, we have a number of initial matters to address.

*The social/economic variable(s) of interest*

Variables of interest include total income, consumption, labour earnings, wealth, occupation, educational attainment, social class, and many others. As noted in the Introduction, we need a name for whichever variable or variables is under examination, or indeed the entire collection of them. I shall use ‘outcomes’ for the collection of such variables and ‘income’ for one of them.

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<sup>1</sup> The terms of reference for this chapter is to discuss *concepts* of mobility. For thorough reviews of empirical findings, see Jäntti and Jenkins (2015) and Iversen et al. (2019).

*Context: Intragenerational or intergenerational?*

The same concepts and methods apply in both the intragenerational and intergenerational contexts. All that is required here is for the author to insert a modifier: ‘intragenerational mobility’ or ‘intergenerational mobility’. In the literature, this is often done.

*Level of analysis: Macromobility, macromobility components, or micromobility?*

Macromobility analysis investigates the extent of *total* mobility in an economy—for example, how much directional income movement has taken place? The analysis of macromobility components, on the other hand, looks at *components* of the total, such as upward mobility and downward mobility or structural mobility and exchange mobility.

Micromobility analysis is concerned with *which* people in the economy have experienced changes of what magnitude. For this purpose, people may be classified by initial income group, geographic location, gender, or anything else.

Note that a given mobility concept can be analysed at all three levels. For example: How much directional income mobility has there been in the economy as a whole? How does total directional income mobility break down into structural mobility components and exchange mobility components? Which individuals experienced more positive directional income changes than others—for example, those living in large cities (and which ones) or those living in small towns?

## **2.2 Points of agreement and disagreement**

Mobility researchers actually agree on many things. We agree that social mobility is about the transformation of a vector of outcomes (denoted  $\mathbf{x}$ ) at one point in time to another vector (denoted  $\mathbf{y}$ ) at a later point in time (and possibly to yet other points in time as well). When all we have are cross-sectional data, we can analyse *structural change*—for example, the existence of more middle-income opportunities and fewer lower-income ones. But when we have panel data, we can also analyse *panel changes*—that is, the changes over time for each of the persons in  $\mathbf{x}$  and  $\mathbf{y}$ .

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 social mobility than another? Has social mobility been rising or falling over time? Who has more social mobility: men or women? The better-educated or the less-educated? Urban or rural residents? In which parts of the income distribution is social mobility the greatest? Does social mobility tend to make the distribution of lifetime income more equal?

The answers to these questions have been shown empirically to depend on how social mobility is conceptualized and measured; this literature includes works by Atkinson et al. (1992), OECD (1996, 1997), Checchi and Dardanoni (2003), Sologon (2010), Chetty et al (2014a, 2014b, 2017), Jäntti and Jenkins (2015), and Bishop et al. (2019), just to name a few. To take the most recent example from this list, Bishop et al. (2019) found that the United States is more mobile than western Germany in terms of positional mobility but less mobile in terms of mobility as an equalizer of longer-term earnings relative to initial incomes, and that neither country always exhibits more directional mobility and income flux than the other. Such flips pervade the literature; they are the rule rather than the exception.

Part of the reason for these different answers is that different *indices* are being used to measure social mobility. These include the Pearson correlation coefficient, the rank correlation coefficient, minus chi-squared, the quantile (quintile, decile, etc.) 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.

However, an even more fundamental reason for finding different empirical answers is that researchers are in fact measuring different social mobility *concepts*, often without being aware of it. Clarifying these concepts is what the rest of this paper is about.

### 2.3 Terminology and notation

The social variable of interest is called income, which is a shorthand for any social/economic variable that can be measured. When a variable is measured in currency units (dollars, euros, etc.), it is assumed to be adjusted for inflation. The recipient unit is called a ‘person’ or an ‘individual’, but the points made apply equally to households, per capita, adult equivalents, earners, or dynasties. Also, the concepts and components presented apply equally to the intergenerational and intragenerational contexts.

Assume that we are working with panel data such that the same persons’ incomes are observed or reported twice, once in a base year and once in a final year. Let  $\mathbf{x}=(x^1, \dots, x^n)$  denote a vector of initial year incomes among  $n$  persons, indexed without loss of generality in ascending order of initial incomes. Similarly, let  $\mathbf{y}=(y^1, \dots, y^n)$  denote a vector of final-year incomes among these same persons, also in ascending order of initial incomes. We may picture  $\mathbf{x}$  and  $\mathbf{y}$  as being arrayed in an  $n \times 2$  panel data matrix (or synonymously, a longitudinal data matrix)  $\mathbf{D}=(\mathbf{x}', \mathbf{y}')$ .

For a given individual  $i$ , we may denote the transformation from  $x^i$  to  $y^i$  (equivalently, the  $i$ th row of  $\mathbf{D}$ ) as  $x^i \rightarrow y^i$  and the social mobility associated with that particular person’s transformation as  $m^i(x^i, y^i)$ . Similarly, for the economy as a whole, we may denote the transformation from  $\mathbf{x}$  to  $\mathbf{y}$  as  $\mathbf{x} \rightarrow \mathbf{y}$  (equivalently, the entire  $\mathbf{D}$  matrix) and the aggregate social mobility associated with this transformation as  $m(\mathbf{x}, \mathbf{y})$ .<sup>2</sup>

Sticking with analyses based on panel data  $\mathbf{D}$ , research on the microeconomics of social mobility addresses changes that take place for given individuals in an intragenerational context or for a given family or dynasty (e.g. fathers and sons, mothers and daughters, parents and children) in an intergenerational context. Among the micro aspects analysed are changes in incomes in dollars or log-dollars, growth rates of incomes measured as exact percentage changes, absolute values of changes in incomes, changes in positions (quintiles, deciles, centiles, or ranks), and changes in income shares. None of these is obviously the right way to gauge how much social mobility an income recipient has experienced over time. All are relevant.

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<sup>2</sup> It bears mention that an entire parallel literature uses a different kind of data: comparisons of anonymous cross-sections in an initial year and a final year. Suppose, for example, that the anonymous cross-sectional data (denoted superscript  $a$ ) are arrayed into comparable groupings such as the mean incomes in each of ten income deciles in the initial year  $\mathbf{x}^a$  and in the final year  $\mathbf{y}^a$ . Denote the resultant anonymous data matrix by  $\mathbf{D}^a=(\mathbf{x}^a', \mathbf{y}^a')$ . Most of what we read in scholarly works or hear in political campaigns about income changes for, say, the top 1 per cent or the bottom 40 per cent is based on anonymous data  $\mathbf{D}^a$  and not panel data  $\mathbf{D}$ . And standard growth incidence curves (GICs) (e.g. Ravallion and Chen 2003) are based on anonymous data  $\mathbf{D}^a$ . Others (e.g. Bourguignon 2011; Grimm 2007), however, work with panel data  $\mathbf{D}$ , dubbing their GICs ‘non-anonymous’. I prefer to call them what they are (panel GICs) in preference to what they are not (non-anonymous GICs).

The various micro aspects do not agree in magnitude and may not agree even in direction. For example, a given individual may simultaneously experience a rise in real income and log-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 micromobility is (are) the object of study. Accordingly, the different micromobility aspects are distinguished at the micro level as follows: dollar changes by  $x^i \rightarrow y^i$ , log-income changes by  $\ln(x^i) \rightarrow \ln(y^i)$ , positional changes by  $\pi(x^i) \rightarrow \pi(y^i)$ , share changes by  $s(x^i) \rightarrow s(y^i)$ , and exact percentage changes by  $\% \Delta^i = (y^i - x^i) / x^i$ . The macro changes in these outcomes are defined analogously on  $\mathbf{x}$  and  $\mathbf{y}$ , respectively, and are denoted  $m_{dir}^{mvmt}$ ,  $m_{pos}^{mvmt}$ ,  $m_{share}^{mvmt}$ , and  $m_{flux}$ .

The main task in the balance of this paper is to help clarify the different concepts underlying  $m^i(\cdot)$  and  $m(\cdot)$ . This conceptualization is linked to the axiomatic approaches to income mobility pioneered by Shorrocks (1978), Atkinson (1981), and Cowell (1985); for subsequent reviews of the axiomatic literature, see Shorrocks (1993), Fields and Ok (1999a), Jäntti and Jenkins (2015), and Cowell and Flachaire (2018). Mobility concepts and mobility components are treated in turn in the next two sections.

### 3 Six mobility concepts and their measures

Six mobility concepts are analysed here. The first, origin-independence, is one macromobility concept in common use. It asks the question, in the economy as a whole, how dependent is current income on past income? The next four—positional movement, share movement, income flux, and directional income movement—ask the question, how much economic movement has taken place, either for a single individual or for the entire economy? The sixth—mobility as an equalizer—asks, to what extent has the mobility that has taken place equalized longer-term incomes in the economy as a whole relative to initial incomes?<sup>3</sup>

For each concept, I present what is the *essence* of that concept, state what it means to have *no* mobility of that type and *more* mobility of that type, and give an *example* of an *index* that measures mobility of that type. (Note that researchers sometimes disagree about whether a particular index used to measure a particular mobility concept is or is not a good measure of that concept.)

#### 3.1 Origin-independence

The *essence* of origin-independence is the extent to which final incomes are statistically independent of initial incomes. An economy exhibits *zero* origin-independence (equivalently, perfect *origin-dependence*) if  $y$  is perfectly determined by  $x$ —that is, if the transition matrix is an identity matrix or a reverse-identity matrix. There is *more* origin-independence (equivalently, *less* origin-independence) if  $y$  is determined to a lesser degree by  $x$ . There is *perfect* origin-independence if the conditional distribution of  $y$  given  $x$  is the same as the unconditional distribution of  $y$ , that is,  $f(y|x) = f(y)$ . One *measure of origin-independence* is obtained by constructing a two-period transition matrix and calculating chi-squared. Denoting the expected frequencies under origin-independence by  $EXP_{ij}$  and the observed frequencies by  $OBS_{ij}$ , the standard (Pearson) chi-squared statistic is calculated as

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<sup>3</sup> The four aggregate movement concepts  $m_{dir}^{mvmt}$ ,  $m_{pos}^{mvmt}$ ,  $m_{share}^{mvmt}$ , and  $m_{flux}$  are individual movements based in the sense that  $m^i(\cdot)$  is a perfectly sensible notion for those concepts. The other two, though, are not: individual  $i$  does not have his/her own origin-independence or mobility as an equalizer.



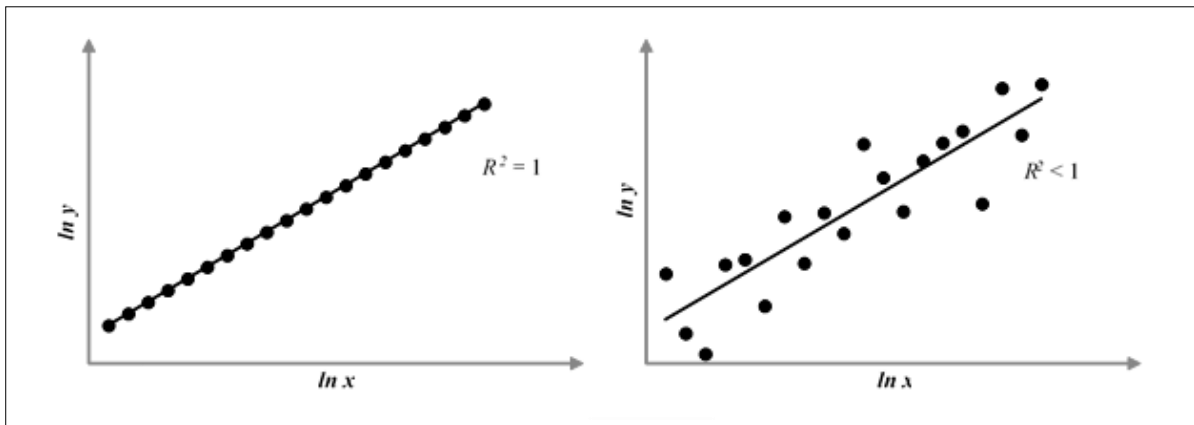
$$\chi^2 = \sum_i \sum_j \frac{(OBS_{ij} - EXP_{ij})^2}{EXP_{ij}}$$

The chi-squared statistic is highest the further the economy is from origin-independence, and in this sense chi-squared measures *immobility*; to make it a measure of *mobility*, minus chi-squared is used.

Note that the ordinary Pearson correlation coefficient is also used as an (inverse) index of origin-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 the origin-independence of shares.

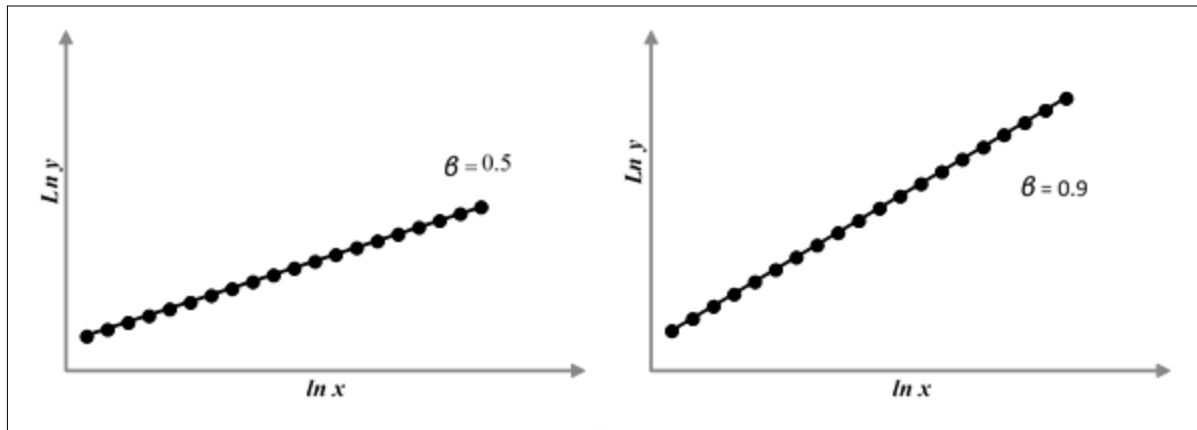
In the intergenerational mobility context, it is common to regress the logarithm of the child's income on the logarithm of the parent's income and take the resulting  $\beta$  as an (inverse) index of intergenerational mobility. In the case where parents' and children's incomes have about the same variance of logarithms,  $\beta$  approximates the correlation between children's and parents' log-incomes. Otherwise,  $\beta$  and  $R^2$  can give very different impressions (Solon 2002), because they actually measure different things. Introductory econometrics teaches us that  $\beta$  measures how much higher is the dependent variable (in this case, the income for the child) for each one unit increase in the independent variable (in this case, the income of the parent) across the individuals in the sample, while  $R^2$  measures the extent to which information on the independent variable (the income of the parent) enables us to determine the value of the dependent variable (the income of the child). The differences are depicted in Figures 1 and 2. In our writings and presentations, we would do well to use their proper names: regression coefficient and coefficient of determination, respectively.

Figure 1: Same  $\beta$ s, different  $R^2$ s



Source: Author's illustration.

Figure 2: Same  $R^2$ s, different  $\beta$ s



Source: Author's illustration.

### 3.2 Positional movement

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

### 3.3 Share movement

The *essence* of share movement is that individuals' shares of total income may change, whether or not their incomes do. There is *zero* share movement in the economy if and only if everybody has the same *share* of total income in  $y$  as in  $x$ —that is, letting  $s(x^i) \equiv x^i / \sum x^i$  and likewise for  $s(y^i)$ , we have zero economy-wide share movement if and only if  $s(x^i) = s(y^i) \forall i, i=1, \dots, n$ . There is *more* share movement as the non-directed distances between  $s(x^i)$  and  $s(y^i)$  increase. An example of a *measure of total share movement* in an economy is the average absolute value of share changes:  $m_{share\ movt} = (1/n) \sum |s(y^i) - s(x^i)|$ .

### 3.4 Income flux (also called non-directional income movement)

The *essence* of income flux is that it gauges the magnitudes of income fluctuations without regard to their direction. *Zero* income flux arises if and only if all incomes remain the same:  $x^i = y^i \forall i, i=1, \dots, n$ . An economy has *more* income flux when the non-directed distances between  $x^i$  and  $y^i$ ,  $i=1, \dots, n$ , increase. An example of a *measure of total income flux* in an economy is the average of the absolute values of income changes:  $m_{flux} = (1/n) \sum |y^i - x^i|$ .

### 3.5 Directional income movement

The *essence* of directional income movement is that it is concerned with the extent to which incomes are rising or falling.<sup>4</sup> An economy has *zero* directional income movement if and only if all incomes remain the same:  $x^i = y^i \forall i, i=1, \dots, n$ . There is *more* directional income movement in an economy when the directed distances between  $x^i$  and  $y^i, i=1, \dots, n$ , increase. Examples of *measures of total directional income movement* in an economy are the average of the income changes in dollars,  $m_{dir\ movt} = (1/n)\Sigma(y^i - x^i)$ , and in log-dollars,  $m'_{dir\ movt} = (1/n)\Sigma(\ln(y^i) - \ln(x^i))$ .<sup>5</sup>

### 3.6 Mobility as an equalizer of longer-term incomes relative to single-year incomes

The *essence* of mobility as an equalizer is whether and to what extent the income changes that take place makes the distribution of longer-term incomes more equal relative to a reference distribution or to reference distributions of income. For Shorrocks (1978), the reference is a *weighted average* of the inequalities of single-year incomes in the several periods for which incomes are observed for panel individuals. For Fields (2010), on the other hand, the reference is inequality in the distribution of initial incomes, as is the usual reference distribution for changes in economic magnitudes over time. For the Fields case, letting  $\ell$  be a vector of longer-term incomes and  $I(\cdot)$  an inequality measure, *zero equalization* of longer-term incomes relative to initial incomes arises if and only if  $I(\ell) = I(\mathbf{x})$ . There is *more equalization* of longer-term incomes relative to initial incomes if  $I(\ell) < I(\mathbf{x})$  and the smaller (i.e. more negative) is  $I(\ell)$  relative to  $I(\mathbf{x})$ . Analogously, there is *more disequalization* of longer-term incomes relative to initial incomes if  $I(\ell) > I(\mathbf{x})$  and the larger is  $I(\ell)$  relative to  $I(\mathbf{x})$ . An example of a *measure of mobility as an equalizer of longer-term incomes relative to initial incomes* is  $m_{equalizer} = 1 - (I(\ell)/I(\mathbf{x}))$ , and the inequality measure  $I(\cdot)$  used is the Gini coefficient.

## 4 Macromobility components and their measures

In addition to the six mobility concepts presented in the last section, the literature also distinguishes a similar number of mobility components. These are components in the sense that a mobility concept can be conceived of as being the combination of two or more components plus possibly a residual—for example, directional income movement as comprising upward mobility and downward mobility. For each component, I present what is the *essence* of that component, state what it means to have *no* mobility of that type and *more* mobility of that type, and give an *example* of an *index* that measures mobility of that type.

### 4.1 Upward, downward, and zero mobility

The *essence* of upward, downward, and zero mobility is that each recipient experiences a change in one of these directions for each mobility concept. These changes need not be in the same direction for the different concepts—for example, a given recipient may have upward income movement, downward share movement, and zero positional change. There is *zero* upward and downward mobility if all incomes are unchanged, that is,  $x^i = y^i \forall i, i=1, \dots, n$ . There is *more upward mobility* if more people move up and/or if they move up by more, and analogously for downward mobility

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<sup>4</sup> It is worth noting that poverty dynamics—moving into or out of poverty or both—is a particular kind of directional income movement.

<sup>5</sup> Of the various measures presented in this section, these are perhaps the most problematical.

and zero mobility. An example of a *measure of total upward mobility* is  $m_{\text{upward mob}} = (1/n) \sum_{\text{winners}} (y^i - x^i)$ ; the corresponding *measure of total downward mobility* is  $m_{\text{downward mob}} = (1/n) \sum_{\text{losers}} (x^i - y^i)$ .

## 4.2 Structural mobility

The *essence* of structural mobility is that the income vectors change from initial year to final year but the income recipients are treated anonymously within the two distributions. As before, let  $\mathbf{x}$  denote the vector of initial incomes ordered without loss of generality from lowest to highest initial income, and let  $\mathbf{y}^c$  denote the vector of final incomes ordered from lowest to highest final income. This is a counterfactual, hence the superscript  $c$ , in the sense that the rows of the  $\mathbf{D} = (\mathbf{x}, \mathbf{y}^c)$  data matrix are not the initial and final incomes of the individuals in question, but rather the *positions* in question. There is *zero* structural mobility if and only if the elements of the  $\mathbf{x}$  and  $\mathbf{y}^c$  vectors are the same, that is,  $x^i = y^i \forall i, i=1, \dots, n$ . There is *more* structural mobility the greater the non-directed distances are between  $x^i$  and  $y^i, i=1, \dots, n$ . An example of an *index of total structural mobility* is the average absolute value of the differences between  $x^i$  and  $y^i$ :  $m_{\text{structural mob}} = (1/n) \sum |y^i - x^i|$ .

## 4.3 Exchange mobility

The *essence* of exchange mobility is that income recipients change places within a structure in which all income amounts are held constant but the final distribution is permuted to preserve the initial order. We have *zero* exchange mobility if and only if the vector of final incomes arrayed in ascending order of initial incomes  $\mathbf{y}^c$  is identical to the vector of final incomes arrayed in ascending order of final incomes  $\mathbf{y}$ , that is,  $y^i = y^j \forall i, i=1, \dots, n$ . We have *more* exchange mobility the greater the non-directed distances are between  $y^i$  and  $y^j, i=1, \dots, n$ . An example of an *index of total exchange mobility* is the average absolute value of the differences between  $y^i$  and  $y^j$ :  $m_{\text{exchange mob}} = (1/n) \sum |y^i - y^j|$ .

## 4.4 Growth mobility

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

## 4.5 Transfer mobility

The *essence* 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. *Zero* transfer mobility arises (i) in the case of economic growth when there are only winners, no losers, and (ii) in the case of economic decline when there are only losers, no winners. *More* transfer mobility occurs in times of economic growth (decline) when, among the losers (winners), the directed distances between initial and final incomes increase. An example of a *measure of total transfer mobility in the case of economic growth* is the average amount lost by the losers:  $m_{\text{transfer mob}} = (1/n) \sum_{\text{losers}} (x^i - y^i)$ , while in the case of economic decline, the corresponding index is the average amount gained by the winners:  $m_{\text{transfer mob}} = (1/n) \sum_{\text{winners}} (y^i - x^i)$ .

## 4.6 Dispersion change

A last component is, strictly speaking, not a mobility measure, but because it is sometimes used in decompositions, I include it here. The component is dispersion change. The *essence* of dispersion change is that the distribution of income among anonymous individuals may become more or less

equal. Letting  $s(x^\pi)$  and  $s(y^\pi)$  denote the income share of the anonymous person in the  $\pi$ th position of the income distribution, *zero* dispersion change takes place if and only if all anonymous income shares stay the same—that is, the Lorenz curve remains unchanged. *More* dispersion change takes place the larger the change in anonymous shares. An example of an *index of total dispersion change* is the anonymous analogue of the panel measure of share movement:

$$m_{\text{dispersion change}} = (1/n) \sum |s(y^\pi) - s(x^\pi)|.$$

## 5 Remarks on mobility concepts

### 5.1 Social mobility and economic growth

As used in this paper, ‘social mobility’ entails the total change in an outcome variable. Occasionally, an analyst will say that social mobility is that which is left after economic growth is taken out.<sup>6</sup> Such usage seems to be more common among sociologists than among economists, it differs from what I just presented (I am an economist), and I disagree with it precisely because economic growth may be an important factor leading to upward social mobility. I have brought it up here for the sake of completeness.

### 5.2 On decomposability

The previous sections distinguished between movement-based mobility concepts and others. For the four movement-based concepts—positional mobility, share mobility, income flux, and directional income movement—it makes sense to think in terms of the amount of movement experienced by an individual income recipient. But the other two concepts—mobility as origin-independence and mobility as an equalizer of longer-term incomes relative to initial incomes—are not defined on individuals; instead, they are defined on all individuals or groups of individuals.

As can be seen from a quick glance at the formulas in Sections 3.2–3.4, the specific measures presented for each of these four concepts are in fact subgroup decomposable, indeed additively decomposable. For a review of such measures, see Bárcena-Martín and Cantó (2019).

What about the components defined in Section 4? Of course, many mobility concepts are exactly decomposable into upward mobility and downward mobility components. As for structural and exchange components, some studies present decompositions of a particular index into these two components (e.g. Van Kerm 2004). There are other decompositions as well; see Jäntti and Jenkins (2015) for a review. However, for decompositions other than breaking down the total into upward and downward components, (i) one component is well-specified while the other component is a residual, and (ii) the contribution of each component to total mobility depends on the order in which the components are introduced.

This does not mean, however, that an exact decomposition of a mobility measure is impossible. To the contrary, Fields and Ok (1996, 1999b) have shown that two indices of income flux,  $m_{\text{flux}} = (1/n) \sum |y^j - x^j|$  and  $m_{\text{flux}}^* = (1/n) \sum |\log y^j - \log x^j|$ , are exactly decomposable into growth mobility and transfer mobility components: in a growing economy,  $m_{\text{flux}} = \frac{1}{n} \sum |y_i - x_i| +$

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<sup>6</sup> See, for example, Torche (forthcoming). Writing in the context of educational mobility, Torche states: ‘Two types of mobility provide complementary information: Absolute mobility captures total observed change in educational attainment across generations. ... Relative mobility, in turn, captures the association between parents’ and children’s education net of any change in distribution of schooling across generations.’

$\frac{2}{n} \sum_{losers} (x^i - y^i)$  and analogously for  $m^*_{flux}$ , with equivalent expressions for a shrinking economy.

Do there exist decompositions other than the upward–downward decomposition and the Fields–Ok decomposition of  $m_{flux}$  and  $m^*_{flux}$  without residuals and without order mattering? This is a frontier question, the answer to which remains to be discovered.

### 5.3 Comparison with some of the major papers in the mobility literature

Among the most important papers in the social and economic mobility literature, one finds that a wide variety of concepts and components have been analysed.

Shorrocks (1978) proposed a mobility index, which in the two-period context is  $m_{Shorrocks} = 1 - (I(\ell) / (w_x I(\mathbf{x}) + w_y I(\mathbf{y})))$ , where, as above,  $\ell$  (long-term income) is calculated as the average of initial and final year income and  $I(\cdot)$  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*, a different concept from Fields' notion of mobility as an equalizer of longer-term incomes relative to initial incomes.

Atkinson (1981) and Atkinson and Bourguignon (1982) analysed 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 analysing movements among, for example, income quintiles, which requires that 20 per cent 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 component but not to any of the others—in particular, directional income movement and income flux.

Chakravarty et al. (1985) proposed an ethical mobility index  $m_{CDW} = (E(\mathbf{y}_{agg}) / E(\mathbf{x})) - 1$ , where  $\mathbf{x}$  is the initial income vector,  $\mathbf{y}_{agg}$  is the vector of aggregate incomes over two or more periods, and  $E(\cdot)$  is an equality index. The Chakravarty–Dutta–Weymark (CDW) index takes on positive (negative) values when aggregate incomes are 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’ (Chakravarty et al. 1985: 8). In my view, this is a reasonable way of passing judgement on the transfer mobility component. On the other hand, the CDW approach entirely ignores whether incomes have grown or contracted, and so I see it as 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 mobility concept. More recently, Cowell and Flachaire (2018) offer a careful presentation on ‘measuring mobility’.

### 5.4 On relative and absolute mobility

The reader may have noticed that the terms ‘relative mobility’ and ‘absolute mobility’ have not been mentioned in this paper. This omission is deliberate because these terms have many different meanings in the economic mobility literature.

The term relative mobility has been used to mean any or all of the following:

- Strongly relative changes have taken place:  $m(\lambda x, \alpha y) = m(x, y) \forall \lambda, \alpha > 0$ .
- Weakly relative changes have taken place (also called scale invariance):  $m(\lambda x, \lambda y) = m(x, y) \forall \lambda > 0$ .
- Positional movements have taken place:  $\pi(x_i) \neq \pi(y_i)$  for some  $i$ 's.
- Changes in relative standing have taken place, for example, in the sense of share movements.
- An individual's mobility is a function of his/her growth rate of income as opposed to dollar changes.
- The object of interest is a comparison of the relative outcomes of children from different parental backgrounds (in an intergenerational context).

The term absolute mobility has also been used to mean many different things:

- There have been gains or losses in incomes measured in dollars (or euros or pounds) rather than measured in log-dollars or exact proportional changes.
- There have been gains or losses in dollars or growth rates rather than in income shares or positions.
- The absolute values of income changes are non-zero, and the absolute values of the changes are an object of interest.
- Translation invariant changes have taken place:  $m(x + \alpha, y + \alpha) = m(x, y) \forall \alpha$ .
- Children are found to do better (say, earning more) than their parents (in an intergenerational context).
- Upward income changes are to be valued positively and downward income changes negatively in and of themselves.

I confess to having used these terms in work in the 1990s with Efe Ok; I now wish we had not. As elsewhere in social science, when a term has more than one meaning within the same literature, the use of that term obfuscates more than it clarifies. Moving forward, I think it is best to drop the terms relative mobility and absolute mobility altogether.

## 5.5 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 to deriving mobility measures, 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, a mobility functional, class of indices, or single index is derived. As Atkinson (1981: 71) 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: 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 in the inequality literature made by Sen (1973: 2) between (i) 'seeing' more or less inequality and (ii) '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 the measure of how much economic mobility has occurred in the first place.

A second approach not taken in this paper is the use of Markov chains. To measure the mobility concepts and components presented above, appropriate calculations can be made 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.<sup>7</sup>

A third approach not taken here is the use of pseudo-panels, which are also called synthetic panels (e.g. Antman and McKenzie 2007; Bourguignon and Moreno 2018; Dang and Lanjouw 2018). Pseudo-panels attempt to fix measurement error in each year's income (cf. Deaton 1997; Bound et al. 2001) and/or to make dynamic statements in the absence of true panel data. However, in so doing, they lose whatever actual mobility takes place within cells. It is a judgement call, but for the analysis of economic and social mobility, I prefer to work with panels rather than pseudo-panels despite their respective limitations.

## 6 Conclusion

In this paper, I have tried to clarify concepts of social mobility, their constituent components, and measures of each. I have tried as well to be prescriptive about how to embed these ideas in our research and writing.

In the literature, we find many concepts and components being analysed, all under the rubric of 'social and economic mobility'. A great many of these papers are insufficiently specific about which one or ones is under examination.

However, as I said at the beginning of this paper, I myself used to do the same thing: talk about economic mobility without adding a modifier like directional income movement or whatever was being examined. The solution is straightforward: for authors *always* to use as many modifiers as are needed to clarify what is being studied and for readers and listeners (and editors) *always* to insist on such clarification.

Following these precepts, an abstract of one of my current papers might read something like this:

This is a study of intragenerational income mobility, using panel data from countries around the world to ask which income groups experienced the largest directional changes in dollars and in percentages. We find in the panel data that in the great majority of countries, those individuals who gained the most in dollars and in percentages were those who started *lowest* in the initial year's income distribution; those who started highest in the distribution had the largest *losses* in dollars and in percentages.

Does this abstract make sufficiently clear which mobility concept is being examined and what the empirical work is about? And parenthetically, did it pique your interest in reading about it?

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<sup>7</sup> Shorrocks (1976) and Atkinson et al. (1992) are among those who reported data showing that a first-order Markov chain is rejected empirically in empirical data.



To summarize the main points, I offer a checklist of things for all of us to do:

- Specify the social/economic outcome(s) of interest; examples are total income, labour earnings, consumption, wealth, occupation, social class, etc.
- Specify the context: intergenerational or intragenerational.
- Specify the level of analysis; these include macromobility concepts, macromobility components, and micromobility patterns.
- Specify the question(s) under investigation; for example: ‘What is the time path of various measures of economy-wide income mobility in country X?’
- Specify the mobility concept(s) being examined: origin-independence, directional income movement, income flux, share movement, positional movement, and/or mobility as an equalizer of longer-term incomes.
- Specify the sub-components, if any, being examined: upward and downward movement, structural mobility, exchange mobility, growth mobility, transfer mobility, and dispersion change.
- Specify one or more indices of the chosen mobility concept(s).
- Choose a dataset that measures the variables of interest.
- Combine all of the preceding to answer a question such as: ‘What has been happening to economy-wide intragenerational upward income movement and downward income movement over time in country X?’
- Be as rhetorically precise as possible in stating conclusions; for example: ‘More people are moving up more dollars and fewer people are moving down now in country X than was the case before.’
- And finally, avoid using the terms mobility, absolute mobility, and relative mobility without modifiers or definitions.

Readers and listeners should not have to work so hard to be able to figure out which mobility concept or component an author or speaker is 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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