Title: Measuring the “American Dream”

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**Abstract**/**One Sentence Summary:** Canonical measures of economic intergenerational mobility are mutually inconsistent and may be misleading.

**Main Text:** The “growing public perception that intergenerational income mobility […] is declining in the United States” *(1)* has led scholars to seek quantifiable measures of it. Typically such measures are divided into two categories, relative and absolute: relative measures gauge children’s propensity to occupy a higher position in the income distribution than their parents; absolute measures gauge their propensity to have higher income than their parents in money terms. A hypothetical economy in which all children have exactly twice the real incomes of their parents would exhibit minimal relative mobility and maximal absolute mobility. Therefore, the definitions of quoted mobility measures are important. The canonical measures in each category yield different and contradictory interpretations of ostensibly the same concept, which may mislead the unaware.

While relative intergenerational mobility has been studied for decades, investigations of absolute intergenerational mobility remain “scarce, mainly because of the lack of large, high-quality panel data sets linking children to their parents” *(2)*. Recently in *Science*, Chetty *et al*. *(2)* considered trends in absolute mobility in income in the United States since 1940. They define the rate of absolute mobility as the fraction of children earning more than their parents, denoted by *A*. Their analysis uses census and survey data of inflation-adjusted pre-tax income at age 30. Fig. 1A illustrates the historical trend of the rate of absolute mobility, showing it falling from around 90% for children born in 1940 to 50% for children born in 1980.

The canonical measure of relative intergenerational mobility is the elasticity of child income with respect to parent income, known as the intergenerational earnings elasticity (IGE) and denoted by *β* *(3,4)*. IGE is a measure of immobility rather than of mobility: the larger it is, the stronger the relationship between parent and child income. Therefore, *1-β* is used as a measure of mobility. Unlike absolute mobility, empirical studies of IGE and other relative mobility measures in the United States show them holding stable over recent decades *(1,2,4,5)*.

Co-observations of declining absolute mobility and stable relative mobility are seemingly contradictory and require careful interpretation. Chetty *et al.*’s *(2)* explanation for the contrast is that income growth has been unequally distributed – positive for high earners and stagnant for the rest – meaning that aggregate income growth has contributed little to absolute mobility*.* This finding is consistent with their data but may not describe the only mechanism at work. Here we note a simple theoretical relationship between relative and absolute mobility, which suggests that their co-movement should not, in general, be anticipated.

Income distributions are known to be well approximated by the log-normal distribution *(6)*. Therefore, a simple plausible model for the joint distribution of parent and child log-incomes is the bivariate normal distribution, in which both marginal income distributions for parents and children are log-normal. The correlation between parent and child incomes is characterized by a single parameter. Fig. 1A shows that fitting this model’s parameters to data reproduces Chetty *et al*.’s *(2)* evolution of absolute mobility faithfully, despite its comparative methodological naivety.

Having established its empirical soundness, this simple model’s properties are studied theoretically. Importantly, *A* and *1-β* can be derived from the model and expressed analytically as functions of each other. Fig. 1B plots *A* as a function of *1-β* for different birth cohorts in the United States. It shows that a null model – with positive income growth and inequality changes consistent with data, but absent other effects – predicts an *inverse* relationship between absolute and relative mobility.

This counterintuitive finding stems from a fundamental conceptual difference between relative and absolute mobility. It exposes the problems that can arise if both are treated as measuring similarly the same phenomenon. In particular, absolute mobility is very sensitive to across-the-board economic growth. For example, during the Middle Ages – when relative mobility rates were low because social class and profession were predominantly inherited *(8,9)* – even the slightest positive or negative income growth would result in very high or low absolute mobility. A misleading picture of intergenerational mobility may arise if the basic properties of these measures are overlooked. Therefore, empirically addressing concepts like the “American Dream”, inclusive growth, and equality of opportunity requires careful delineation of the phenomena of interest and the manner in which quoted measures reflect them.

**References and Notes:**

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**Fig. 1**. Absolute mobility declines as relative mobility increases. **A**) A bivariate normal distribution reproduces the historical declining trend of the rate of absolute mobility. Calculations are based on the pretax income per capita and pretax income inequality reported in *(10,11)*. **B**) The theoretical relationship between the rate of absolute mobility and the complement of the intergenerational earnings elasticity, assuming the bivariate normal approximation for the log-incomes, for different birth cohorts in the United States This demonstrates the counterintuitive result that the two mobility measures are inversely related.