Title: Measuring the “American Dream”

**Authors:** Yonatan Berman1\*

**Affiliations:**

1School of Physics and Astronomy, Tel Aviv University, Tel Aviv, 6997801, Israel

\*Correspondence to: yonatanb@post.tau.ac.il

**Abstract**/**One Sentence Summary:** Canonical measures of economic intergenerational mobility may paint an inconsistent and misleading picture.

**Main Text:** The “growing public perception that intergenerational income mobility […] is declining in the United States” *(1)* have led scholars to look for quantifiable and accessible measures of mobility. Such measures are generally categorized as either absolute or relative. This distinction and the exact definitions of intergenerational mobility measures are highly important, since the interpretation of the two distinct measure types of a seemingly single concept, may be misleading and contradictory.

While relative mobility measures were studied in-depth for the past few decades, studies of absolute mobility remain “scarce, mainly because of the lack of large, high-quality panel data sets linking children to their parents in the United States” *(2)*. In a recent issue of *Science* *(2)*, Chetty *et al*. provide a detailed study of the trends in the rate of absolute income mobility in the United States since 1940. They define the rate of absolute mobility as the fraction of children who earn more than their parents, denoted as *A*. Their analysis is based on census and survey data and considers inflation-adjusted pretax income at the age of 30 for both parents and children.

Figure 1A illustrates the historical trend of the rate of absolute mobility, showing that it has fallen from approximately 90% for children born in 1940 to 50% for children born in the 1980s.

The canonical measure of relative mobility is the elasticity of child income with respect to parent income, or the intergenerational earnings elasticity (IGE), usually denoted as *β* *(3,4)*. The IGE is a measure of immobility rather than of mobility – the larger it is, the stronger is the relationship between the incomes of parents and the incomes of their children. Therefore, *1-β* is sometimes used as a measure of mobility. Unlike the trend of the rate of absolute mobility, several empirical studies of the IGE and additional relative mobility measures show that the relative mobility in the United States has largely remained stable during the past several decades *(1,2,4,5)*.

The observation that the rate of absolute mobility in the United States has declined while relative mobility remained stable requires careful interpretation, also due to the strong theoretical relationship between absolute and relative mobility, which is often overlooked.

Income distributions are known to be well approximated by the log-normal distribution *(6)*. Therefore, the minimal conceivable model for the joint distribution of the log-incomes of parents and their children would be a bivariate normal distribution, in which the marginal income distributions are log-normal. The parents’ incomes and the children’s incomes are correlated, and in the bivariate distribution this correlation is characterized by a single parameter. Fig. 1A demonstrates that assuming the bivariate normal approximation for the joint distribution of the log-incomes, with fixed correlation, reproduces the rate of absolute mobility reported by Chetty *et al*. *(2)*, without using a detailed data analysis.

Following the observation that the bivariate normal distribution is a satisfactory model for the joint parents-children log-income distribution, its properties can be theoretically studied. Notably, both measures of mobility – *A* and *1-β* can be directly derived from this distribution. Moreover, the rate of absolute mobility can be explicitly described as a function of the relative mobility. Fig. 1B depicts the theoretical dependence of *A* on *1-β* for different birth cohorts in the United States. It shows that as the relative mobility increases, the rate of absolute mobility decreases.

This seemingly counter-intuitive observation is merely the result of a fundamental difference between the definitions of the absolute and relative mobility measures. It also reveals the problematic aspects of those definitions, particularly of the rate of absolute mobility. For example, during the middle ages, when relative mobility rates were low, as social class, trade and profession were largely inherited *(7,8)*, even the slightest income growth would have led to a very high rate of absolute mobility. This illustrates how the mobility measures may paint a misleading picture of intergenerational mobility if not understood and interpreted correctly.

Therefore, empirically addressing concepts like the “American Dream”, inclusive growth and equality of opportunity and interpreting the empirical results, requires a deep understanding of the presented nuanced subtleties, in order to avoid misinterpretation, inconsistency and flawed policy recommendations.

References and Notes:

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**Fig. 1**. Absolute mobility declines as relative mobility increases. **A**) A bivariate normal distribution reproduces the historical trend of the rate of absolute mobility (calculations are based on the pretax income per capita and pretax income inequality reported in *(9,10)*); **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. This produces a seemingly counter-intuitive result – the two types of mobility are inversely related, considering different birth cohorts in the United States.