

Chicago Fed Letter

Inequality in skills and the Great Gatsby curve

by Bhashkar Mazumder, senior economist and research advisor

This article presents evidence relating cross-country differences in intergenerational mobility to differences in inequality of skills.

In recent years, concerns about inequality of opportunity have risen to the forefront of policy discussions in the United States. This is due in part to a growing body of evidence showing that intergenerational economic mobility is lower in the U.S. than

in most other advanced economies. In the U.S. more than elsewhere, where you are in the income distribution reflects where your parents were in the previous generation. What is it about the U.S. that makes it less economically mobile? One prominent hypothesis is that low mobility is related to the especially high level of inequality. Indeed, there appears to be a striking correlation between the levels of inequality across countries and rates of intergenerational mobility. In 2012,

Alan Krueger, then the chair of the President's Council of Economic Advisers, referred to this relationship as the "Great Gatsby curve" and warned that rising inequality could lead to reduced intergenerational mobility in the future.

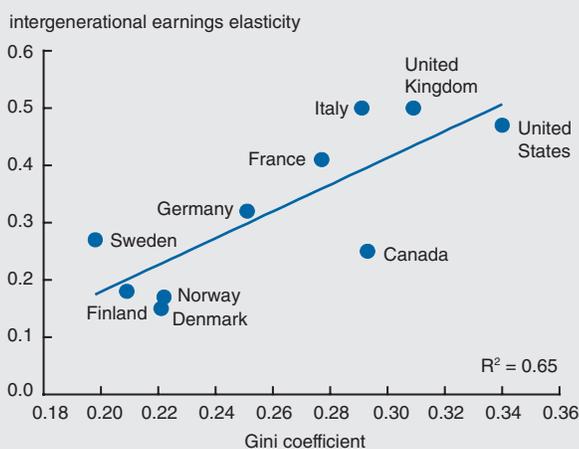
In this *Chicago Fed Letter*, I examine one particular aspect of the cross-country inequality–mobility relationship, namely whether it may reflect underlying differences in inequality of skills. I use data from the Programme for the International Assessment

of Adult Competencies (PIAAC) survey, conducted by the Organisation for Economic Co-operation and Development (OECD), and show that there is a strong cross-country relationship between intergenerational mobility and inequality in skills. In particular, I find that inequality in an index of "non-cognitive skills" explains as much or more of the variation in intergenerational mobility than inequality in traditional measures of cognitive skills such as numeracy, literacy, and problem solving. An emerging line of research has argued that personality traits such as perseverance and grit play an important role in socioeconomic success. These results are consistent with the idea that the large gaps in skills in the U.S. population are part of what is driving both higher inequality and lower intergenerational mobility. At a minimum, these new descriptive findings should help inform the ongoing policy debate about what, if anything, should be done to improve equality of opportunity.

The Great Gatsby curve

Figure 1 shows the relationship between inequality and intergenerational mobility based on a chart from a recent paper by Miles Corak.¹ The x-axis plots the Gini coefficient, which is one commonly used measure of inequality. The y-axis plots what is known as the intergenerational elasticity or IGE. The IGE is an estimate of intergenerational persistence that describes the degree to which an increase in parental income is associated with an increase in a child's income. For example, an IGE of 0.4 implies that a 10% increase in parental income is associated with a 4% increase

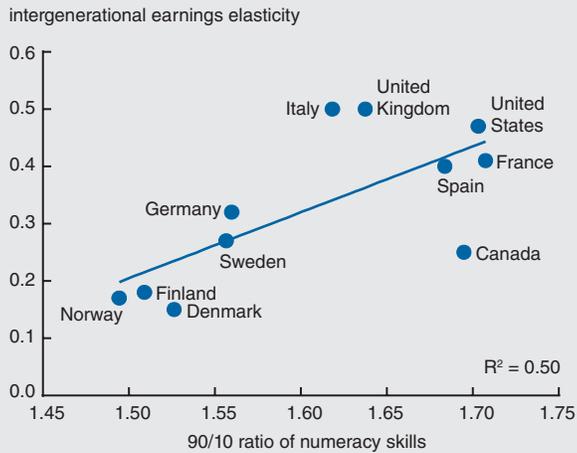
1. Inequality and intergenerational mobility



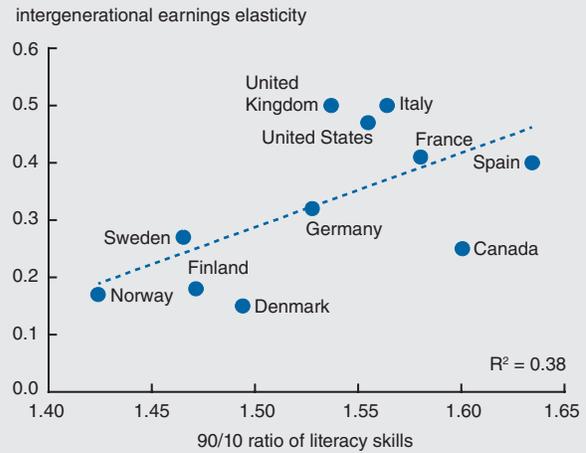
SOURCE: Corak (2013).

2. Inequality in skills and intergenerational mobility

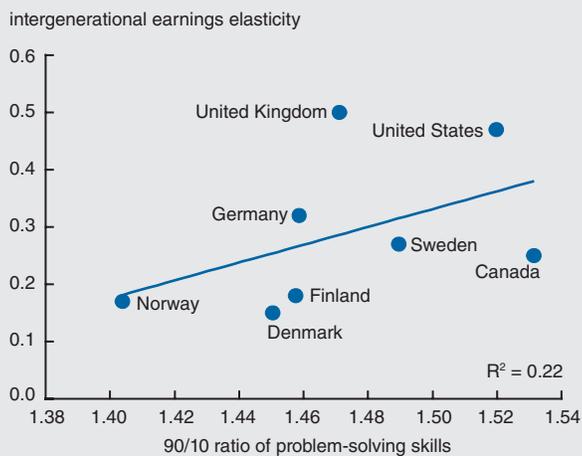
A. Numeracy



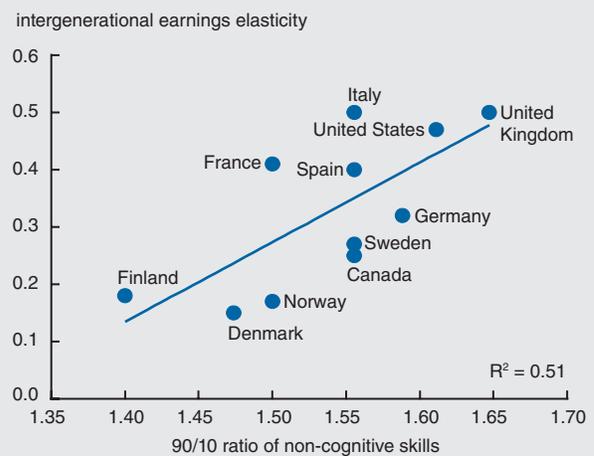
B. Literacy



C. Problem solving



D. Index of non-cognitive skills



Source: Author's calculations using PIAAC and Corak (2013).

in child's income. A higher IGE suggests a closer association across generations and less mobility. Therefore, the positive relationship between income inequality and the IGE shown in figure 1 implies that higher income inequality is associated with less intergenerational mobility. What is striking is that the explanatory power is quite high, as income inequality differences explain about 65% of the variation in intergenerational mobility.

Of course, the relationship is an association and may or may not reflect a true causal relationship. One could imagine that there might be some third factor (or set of factors) that leads countries to exhibit both high income inequality and low intergenerational mobility. Indeed, if income inequality rose for reasons unrelated to this third factor, it

might have no effect at all on intergenerational mobility. There are also many different issues concerning measurement, methodology, and data quality that could affect the data points shown in figure 1; and one might be skeptical about whether the relationship is robust to all of the issues. In this article, I do not explore these questions and simply take the data as given and assume it is reasonably accurate. In recent work, Chetty et al. (2014) and Bradbury and Triest (2014)² have also shown that this relationship between inequality and intergenerational mobility holds *within* the U.S. across commuting zones. In any event, at a minimum one can simply view the figure as an interesting descriptive device that ought to motivate further exploration and research.

In that spirit, one might begin by asking what possible mechanisms could lead to such a strong cross-country association between inequality and intergenerational mobility. Economic studies of inequality and intergenerational mobility often emphasize human capital as a key driver of both outcomes. One simple story could be that countries that do a good job of equalizing educational opportunities will exhibit greater income equality. This could arise, for example, if the quality of schools is uniformly high throughout a country. Such countries might also be expected to be successful in weakening the connection between parental economic success and children's future economic status leading to a lower intergenerational elasticity. This would be one plausible scenario under

which we could observe the relationship in figure 1. In this case, we would also expect to see a strong relationship between intergenerational mobility and inequality in measures of human capital.

Measuring inequality in skills

The PIAAC survey took place between 2011 and 2012 and collected data on approximately 166,000 adults between the ages of 16 and 65 in 24 OECD countries. The survey included about 5,000 U.S. adults. The purpose of the PIAAC is to understand how countries compare in their skill levels, given the rapid acceleration of the use of technology in the modern economy. The three primary domains of skill that are measured by the PIAAC are numeracy, literacy, and problem solving. On all three domains, the U.S. is below the OECD average; and in numeracy, the U.S. scores close to the bottom. One striking pattern across all three measures is the greater inequality in skills in the U.S. While the percentage of U.S. adults who score at the highest proficiency is similar to or only somewhat lower than average, the percentage of U.S. adults who score at the lowest levels of proficiency is significantly higher than average—among the highest of all the countries surveyed.

In order to argue that high inequality leads to low intergenerational mobility, we need to consider the timing of when each is measured. Ideally, one would prefer to use a measure of inequality that covers a time period before children's income is measured. Since the PIAAC is a recent survey, I only measure inequality in skills for those between the ages of 40 and 65, thereby capturing the inequality in skills for cohorts born between 1946 and 1971. The income of adult children used in the intergenerational elasticity estimates is typically measured in the 1990s, although this varies somewhat across countries.

Intergenerational mobility and skill inequality

In order to measure inequality in skills, I use the ratio of the 90th percentile of the skill distribution to the 10th percentile in each country. Figure 2 plots the 90–10 ratios for various skill measures against the intergenerational elasticity for a similar set of countries as that in figure 1.³ Panel A of

figure 2 shows the relationship between the intergenerational elasticity and the 90–10 ratio in numeracy. Similar to the results in figure 1, there is a striking positive relationship and the R-squared of the regression line is reasonably high at 0.50. As with figure 1, not all countries are close to the regression line. For example, Canada has a relatively low intergenerational elasticity despite having a high degree of inequality in numeracy. Panel B shows the relationship when using inequality in literacy on the x-axis. The relationship remains positive but the R-squared falls to 0.38. The difference in explanatory power between numeracy and literacy might not be so surprising. For example, Arcidiacono (2004)⁴ found that in the U.S., math scores on the SAT can help explain earnings differences but verbal scores cannot. Panel C plots the relationship using inequality in problem-solving skills for a slightly smaller sample of countries. In this case, the explanatory power falls considerably as the R-squared is reduced to 0.22.

A growing literature in developmental psychology and economics has highlighted the role of certain personality traits, such as openness to experience and conscientiousness, as playing an important role in determining socioeconomic success. Economists refer to such traits as non-cognitive skills. An underutilized feature of the PIAAC is that it asks several questions concerning the ability to learn that correspond to some of these personality traits. I construct an index of non-cognitive skills by averaging the responses to six questions that assess capabilities related to learning.⁵ Panel D of figure 2 shows the relationship between the 90–10 ratio in this index and the intergenerational elasticity. The figure demonstrates that inequality in non-cognitive skills explains even more of the cross-country variation in intergenerational mobility than numeracy, with an R-squared of 0.51.

Explanations

One straightforward explanation for these findings is that societies in which opportunities for human capital development are unequal will exhibit a high degree of skill inequality and experience less intergenerational economic mobility. This could arise for a number of reasons, including

differences in access to health care early in life (including the prenatal period), unequal access to preschool, disparities in the quality of elementary or secondary school education, or lack of affordability of higher education. It could be that lack of opportunity for human capital development also leads to greater income inequality, explaining some of the pattern shown in the Great Gatsby curve. However, there could be a bi-directional relationship as well, whereby greater inequality leads to disparities in skill formation due to inequality in opportunity.

Of course, the relationships shown in these figures could also be consistent with other hypotheses. It is conceivable that other factors—such as demographics, neighborhood characteristics, or the presence of national institutions—may combine to lead countries with high degrees of inequality of skill to also exhibit low intergenerational mobility. Much more detailed research, using many other sources of variation and more sophisticated research designs, is probably needed to arrive at fully convincing explanations for these findings. Still, it appears that health and education policies that may improve equality of opportunity are a natural starting place for U.S. policymakers seeking to address this issue.

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¹ Miles Corak, 2013, “Income inequality, equality of opportunity, and intergenerational mobility,” *Journal of Economic Perspectives*, Vol. 27, No. 3, Summer, pp. 79–102.

² Raj Chetty, Nathaniel Hendren, Patrick Kline, and Emmanuel Saez, 2014, “Where is the land of opportunity? The geography of intergenerational mobility in the United States,” available at http://obs.rc.fas.harvard.edu/chetty/mobility_geo.pdf;

and Katharine Bradbury and Robert K. Triest, 2014, “Inequality of opportunity and aggregate economic performance,” available at www.bostonfed.org/inequality2014/papers/bradbury-triest.pdf.

³ Compared to figure 1, figure 2 adds Spain in panels A, B, and D and drops France and Italy from panel C.

⁴ Peter Arcidiacono, 2004, “Ability sorting and the returns to college major,” *Journal*

of Econometrics, Vol. 121, Nos. 1–2, July–August, pp. 343–375.

⁵ For example, respondents are shown a statement such as: “If I don’t understand something, I look for additional information to make it clearer,” and are asked to select from the following responses: not at all, very little, to some extent, to a high extent, or to a very high extent.