News & views

Economics

The social links that shape economic prospects

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Data on 21 billion Facebook connections reveal that a new measure of social capital — childhood friendships between people of high and low socio-economic status — is linked to economic mobility later in life. **See p.108 & p.122**

The strength of a person's social network is thought to be one of the main forces in shaping that individual's education, health and economic outcomes[1]. However, measuring this social capital has proved difficult, with most attempts so far involving only small surveys or just a few settings. Designing experiments to measure the effects of social connections is even harder[2]. In two papers in *Nature*, Chetty *et al.*[3,4] introduce detailed measures of social capital using 21 billion friendships from Facebook — the world's largest data set on social connections. The scope of the data set enables them to quantify various types of social capital and explore the effects of these social networks.

In the first of the papers (page 108), the authors constructed measures of social capital using data on the social networks of 72.2 million US Facebook users between the ages of 25 and 44 — an age bracket within which more than 80% of adults have used Facebook (see go.nature.com/3u94pjb). They analysed individual-level data to construct measures of social capital nationally, and at county and zip-code level.

Chetty and colleagues demonstrated that their data are broadly representative of many national characteristics of the United States. For example, comparisons with a nationally representative demographic survey called the American Community Survey showed that, on the county level, median yearly incomes differ by only US$193 on average between the two data sets — equivalent to less than 1% of median income.

The authors explored various indicators of social capital, including network cohesiveness (a measure of the degree to which a person's friends are friends with one another) and civic engagement (a measure of a person's participation in community groups). They also introduce a new measure of social capital, economic connectedness, which captures the extent to which individuals of high socio-economic status (SES) are friends with people of low SES (with SES being predicted by an algorithm that combines various proxies for SES). The group defines economic connectedness as the fraction of a person's friends who earn above the median income, divided by 0.5 (the expected fraction if social connections were random). For example, if 40% of the connections of a person who earns below the median income are with people who earn above the median income, then economic connectedness equals 0.8; in other words, high-income friends are under-represented by 20% in that person's friendship group.

Chetty and colleagues investigated the relationship between the various measures of social capital and economic mobility (the average income in adulthood of children growing up in low-income families) using anonymized economic-mobility data from a database called the Opportunity Atlas[5]. They made certain assumptions — for instance, that connections with people who went to the same school were probably formed in childhood — and estimated parental income on the basis of users' zip codes and other characteristics, where available. They found that their economic-connectedness measure of social capital is the one that's most strongly associated with income mobility and improved outcomes for people who grew up with parents on low or moderate income (Fig. 1). For example, the authors show that if low-SES children were to grow up in counties with similar economic connectedness to that experienced by the average high-SES child, their future incomes would increase by 20% on average.

These data reveal the importance of social capital for climbing out of poverty. Connections between low- and high-SES individuals can affect aspirations, access to information and job opportunities[6]. Because friendships made in childhood are realized before individuals' incomes in adulthood, it is likely that economic connectedness leads to economic mobility, rather than the other way around.
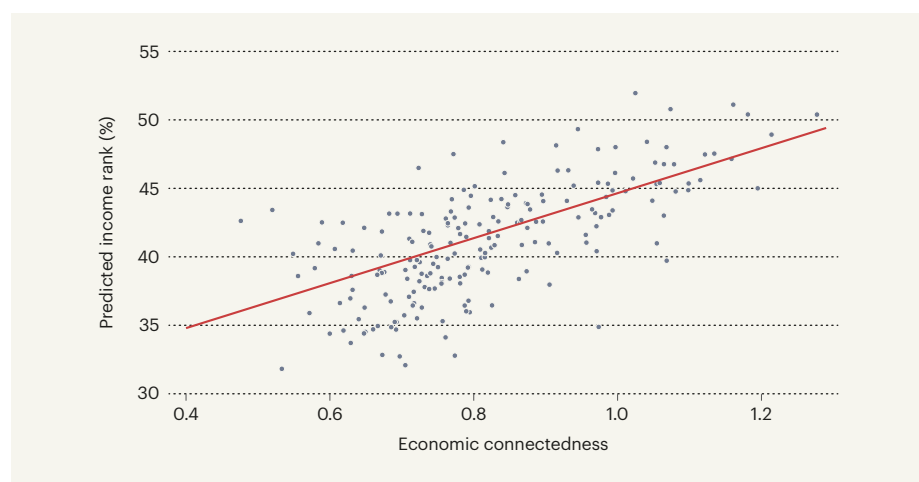

Figure 1 | Economic connectedness affects future earnings. Chetty *et al.*[3,4] analysed the friendships of US Facebook users to investigate how various measures of social capital are linked to economic mobility (the average income in adulthood of children growing up in low-income families). They found that one measure — economic connectedness, or the degree to which people of low socio-economic status are friends with people of high socio-economic status in a given area — has a particularly strong association with predicted future income rank. This graph shows the association at county level. (Figure adapted from Fig. 4 of ref. 3.)

Chetty *et al.* went on to provide evidence that economic connectedness might underlie and explain many social phenomena. For instance, a landmark 1997 study showed that Black people living in predominantly Black neighbourhoods have poorer educational and economic outcomes than do those living in neighbourhoods with low proportions of Black people[7]. Chetty and colleagues demonstrated that this relationship can be largely accounted for (in a statistical sense) by the presence or absence of economic connectedness to higher-income individuals. They also show that, across counties, economic connectedness is much more highly correlated with economic mobility than are median incomes, racial segregation or income inequality.

In the second of the papers (page 122), the authors consider the factors that foster connections between people with high and people with low SES. Many policy efforts focus on integrating people of different SES through increased exposure; for example, by bussing children from different neighbourhoods to the same school. The researchers found that half the difference in the rate at which high-SES individuals befriended low-SES individuals could be attributed to differences in exposure to economically diverse peers. The other half was due to differences in 'friending bias' — the likelihood that a person will interact with a high-SES individual, given the opportunity.

That both these factors play an equal part is surprising, given how much attention is focused on exposure policies rather than on those aimed at reducing friending bias. Chetty and colleagues' analysis suggests that both types of policy should be addressed. Moreover, the authors show that increasing the level to which high- and low-SES students are exposed to each other in schools increases economic connectedness only in schools in which friending bias is low. In future, policymakers could use data from the current studies to maximize the effectiveness of their interventions. For example, if bussing is used as an exposure policy, it is most likely to result in economic connectedness in schools in which friending bias is low. In schools where this bias is high, policy should focus on fostering interactions — for example, through smaller classes or curriculum reform.

In addition to Chetty and colleagues' analyses, anonymized and aggregated subsets of the data have been publicly released (www.socialcapital.org). In particular, the data release includes privacy-protected measures of social capital for most zip codes, counties, colleges and secondary schools in the United States. This is an important contribution to research that will enable a deeper understanding of social capital. The resource will also help policymakers to target particular zip codes or counties with policies and interventions that enhance social capital, and to monitor their effects.

Much of the work on social capital up to now has centred on establishing its relevance, rather than on identifying approaches to create it[2]. Chetty *et al.* have taken steps to do both, by building a large-scale database, exploring links to long-term outcomes and investigating the effects of policies on fostering social capital. In the past two years, a wave of experimental work has also begun to explore approaches to fostering social capital[8–10] — an exciting direction for further research.

A sensible next step is to extend Chetty and colleagues' monumental data creation and analysis to countries beyond the United States. With global data, questions can be explored such as whether economic connectedness is more or less crucial to mobility in more-equal societies. Moreover, time-series data would be valuable for tracking the formation or depreciation of social capital and economic connectedness over time. And data similar to those collected by Chetty *et al.* could be used to explore how specific changes to the availability of high-income peers (such as school-integration orders, housing-mobility programmes or natural disasters) alter friendship networks and ultimately economic outcomes. These types of analysis are natural extensions of the road map laid out by Chetty and colleagues.

Finally, the current studies highlight the value of collecting large-scale data on social capital. Although some forms of capital, such as gross domestic product, are now routinely collected by governments and reported annually, measurement of other forms of capital — such as human[11] and social capital — is still much too infrequent. As Chetty and colleagues' work makes clear, it is worth making the same effort for social capital.

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Biochemistry

Escort proteins for cellular zinc ions

Wolfgang Maret

A metallochaperone protein that ensures that zinc ions are delivered to a crucial cellular enzyme has now been discovered. The finding underscores the subtleties of controlling cellular zinc allocation when the metal is scarce.

Metal ions such as zinc are essential for proper cell function. At least 10% of human proteins contain zinc as a cofactor[1], and zinc(II) ions need to be correctly allocated to these proteins to prevent mismetallation of other proteins. However, the identity of proteins that could allocate zinc ions to the appropriate targets has been a mystery. Two groups — one writing in *Cell*[2] and the other in *Cell Reports*[3] — now identify one such protein.

Zinc is ingested as a key micronutrient in human diets. Given that about 20% of people globally are at risk of not receiving enough zinc[4], a key question in the field of metallobiology has been how zinc ions are allocated when the micronutrient is scarce. Are the proteins that most need zinc ions served first — and, if so, do zinc-chaperone molecules exist for the purpose of prioritizing these proteins? Levels of copper(I) ions are generally low in cells, and metallochaperones have been shown[5] to acquire enough copper ions to