Special Address: What the Collective Brain Teaches Us about Economic Policy

Nathan Nunn Frederic E. Abbe Professor of Economics Harvard University

October 8, 2019

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A reduced-form model of the collective brain (maybe more familiar to economists)

- The society has a population of size *L*.
- Assume that a fraction γ of the population L is exposed to a role model and thus has the opportunity to innovate.
- For those with this opportunity, innovation occurs with probability μ .
- The extent to which an innovation diffuses into the aggregate economy, increasing the rate of aggregate knowledge growth \dot{A}/A , is increasing in the cohesiveness of the population θ .
- Thus, knowledge growth is given by:

$$\frac{\dot{A}}{A} = \gamma \mu \theta L$$

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How do we increase innovation?

$$\frac{\dot{A}}{A} = \gamma \mu \theta L$$

Traditional economic determinants:

- **1.** A larger population, *L*.
 - Scale effects (Kremer, 1993; Henrich, 2004)
- **2.** A more innovative population, μ .
 - An important determinant is education and human capital.

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How do we increase innovation?

$$\frac{\dot{A}}{A} = \gamma \mu \theta L$$

Collective brain determinants:

- **1.** A more inclusive population, γ .
 - A more inclusive system creates more people who can innovate.
 - Inclusiveness can be along the lines of gender, socioeconomic status, race, ethnicity, or place of birth.
- **2.** A more cohesive/connected population, θ .
 - Increases the diffusion of existing knowledge and new innovations.
 - "If you want to have cool technology, it's better to be social than smart" (Henrich, 2016, p. 214).

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Building a more inclusive society, γ



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Inclusion can be imperfect along many dimensions:

- Socioeconomic status
- Gender
- Ethnicity
- Immigration status / country of birth

Evidence from 1.2 million inventors Source: Chetty et al (2018)

Inventors per 1000 Children > 3.12 2.62 - 3.122.16 - 2.621.80 - 2.161.48 - 1.801.25 - 1.480.92 - 1.25 0.69 - 0.920.44 - 0.69< 0.44 Insufficient Data

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Inclusion by socioeconomic class Source: Chetty et al (2018)



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An economic determinant: Education, μ Source: Chetty et al (2018)



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But, education does not explain everything Source: Chetty et al (2018)



Lack of inclusion by race

Source: Chetty et al (2018)



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Lack of inclusion by gender

Source: Chetty et al (2018)



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Gender inclusion and stereotypes Source: Chetty et al (2018)



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Evidence for role model effects I Source: Chetty et al (2018)



- The children of inventors are more likely to invent themselves.
- Innovation occurs within the same fine-grained technology class.

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Evidence for role model effects II Source: Chetty et al (2018)



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• Similar patterns are also found at the county level.

The costs of exclusion: A historical example Source: Nunn (2008)

- Are there really economic costs associated with exclusion?
- Unfortunately, history provides many examples of exclusion that can be studied.



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The costs of exclusion: A historical example Source: Nunn (2008)



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The costs of exclusion: A historical example Source: Nunn (2008)



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Increased connection and cohesion, θ



- One measure of a society's cohesion is the extent to which individuals trust one another.
- Trust is particularly important since nearly all economic interactions, including innovation, require some form of trust.
- Trust also correlates strongly with other measures of social cohesion e.g., social capital.

The benefits of high trust

Source: Algan and Cahuc (2013)



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The benefits of high trust Source: Algan and Cahuc (2013)



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Explaining variation in trust

Question

• If trust increases the incomes of countries, why don't all countries have high levels of trust?

Answers

- Adverse historical shocks (e.g., Nunn and Wantchekon, 2011; Lowes and Montero, 2018)
- Multiple equilibria and 'distrust traps' (Guiso, Sapienza, and Zingales, 2008)

• What is optimal at the society level is not optimal at the individual level (Butler et al, 2016)

Trust and income

Source: Butler et al. (2016)







FIGURE 4. The empirical relationship between trust and income in low-, average-, and high-trust countries.

Micro-level evidence on trust and innovation Source: Nguyen (2019)

- Studies the CEOs of 3,598 public firms in the United States.
- Collects information on the ancestry of the CEO and of all inventors in a firm.
- Finds that innovation is more rapid and of higher quality when:
 - 1. CEOs are from places with higher levels of trust.
 - 2. CEOs exhibit more trust towards the inventors themselves.

Micro-level evidence on trust and innovation

Source: Nguyen (2019)



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Can policies increase trust and cohesion?

- Integration and contact
 - Government-mandated integration of children from different economic classes in private schools in India (Rao, 2019)
- Shared group experiences
 - National team football matches in Africa (Depetris-Chauvin et al, 2019)
 - Independence day celebrations in the United States (Madestam and Yanagizawa-Drott, 2011)

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- Lower barriers to entry and increased competition
 - Firm competition and trust (Francois et al, 2010)

Global migration and the collective brain: Increasing γ and θ internationally



• One can think of the collective brain network in global terms.

• International contact and migration, increases the size, diversity, and connectivity of the collective brain.

Evidence for the benefits of immigration

Source: Sequeira, Nunn, and Qian (forthcoming)

- Study the effects of immigration during America's "Age of Mass Migration".
- Immigrants increased the rate of innovation in their county of residence.
 - Directly through immigrant innovations.
 - Indirectly through native-born innovations.
- Places that had more immigration historically, are wealthier, more educated, and more urban today.





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Migration and global connectivity Source: Burchardi, Chaney, and Hassan (2019)

- Study the origin countries of immigrants to the U.S.
- Locations with more immigrants from an origin country have more foreign ownership links (i.e., FDI) with that country today.





Transportation costs and global connectivity Source: Campante and Yanagizawa-Drott (2017)



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Small costs matter a lot

Source: Campante and Yanagizawa-Drott (2017)



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Implications for visa requirements

Source: Umana-Dajud (forthcoming)



Figure: Visa requirement for an Ethiopian traveling abroad

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Lessons from our collective brain

- **1. Greater inclusion and equality of opportunity**, whether it be along ethnic, socioeconomic, or gender lines, is beneficial for innovation and economic growth.
 - Shows that there is no trade-off between equality and economic growth.
 - Highlights the importance of policies that provide equality of opportunity for all segments of the population e.g., universal free education, healthcare, etc.
- 2. Greater cohesion within a society is beneficial for innovation and economic growth.
 - Trust can be increased through integration and contact, shared experiences, and an open and competitive environment.
- **3.** The **movement of populations** (e.g., migration) is beneficial for all involved.
 - Has important implications for countries' migration policies.