Talk_Models_of_inequality

Talk - Models of inequality - March 25

1

Hi everyone. For the last year or so, I've been studying the evolution of social learning strategies. Specifically, I'm interested in how people use gender, racial and ethnic categories to pick who they should learn from. I want to give you all a few high level results from my research.

Let's start with a motivating example. Young children are surrounded by potential role models. They need strategies to separate out good role models from bad ones. For a lot of problems, the strategy is simple - imitate whoever is most successful. But some learning problems are harder. What enables success for some people is dependent on what other people in the community expect of them. And, crucially, different expectations are placed on different people.

This is the problem of how children learn social roles. Children will be involuntarily socialized into gender and racialized social roles. Those roles will impose constraints on their behavior - acting inconsistently with one's social role can result in punishment and failed coordination.

2

Many cultural evolution theorists have suggested that we have evolved psychological traits that steer our attention to appropriate role models. There are two I'm interested in here - gender-biased social learning and ethnicity-biased social learning. Perhaps the most clear articulation of an evolutionary story for either of these biases can be found in Natalie and Joseph Henrich's 2007 book - Why We Cooperate.

Individuals have to figure out what the right norm is for getting along in their social groups, keeping in mind that different social groups culturally evolve different norms. By "right," we mean the norm that allows the individual to maintain their reputation, avoid punishment for norm violations, and coordinate their behavior with other members of their social group. …

Human psychology evolved to seek out "indicator traits" (language, dress, etc.) that match its own because people who have the same markers tend to also have

the "right" norms. Using such markers, individuals can bias both their learning from, and interaction with, those individuals who share their same culturally transmitted indicator traits.

The basic thought is that we evolved these learning biases because they allow the smooth acquisition of our social roles.

I want to probe that story a bit. I want to see the assumptions we need to make for this argument to be valid. I'll present a pair of formal models - one for gender and one for ethnicity.

I think this topic is really important for work on bargaining models of inequality. Those models typically assume a two-population structure in which people of one race or gender only learn to bargain from other people of the same race or the same gender. I would like to understand how strong the justification is for that assumption.

3

There has been a great deal of experimental work attempting to measure whether children exhibit these biases. The literature on gender-biases in learning goes back 40 years. But the main point I want to make is that nearly all of it is supportive. Experiments consistently find that young girls tend to imitate women and other girls while boys imitate men and other boys.

The literature for race or ethnicity is much newer and finds a far less consistent pattern of results. Some studies find that people tend to imitate others who share their racial appearance or accent. But there are also many null results in this literature. This is puzzling - if the learning biases evolved to help us absorb social roles, why would one literature be so consistent while the other literature is so mixed? I'll return this question at the end.

4

Now let's build an model that describes when gender-biased learning is adaptive. The first step is to specify what gender lets us do. In Cailin's book, the first four chapters propose a theory whereby the core function of gender is to solve complimentary coordination problems.

Divisions of labor can often be beneficial. They help people become really specialized in one skill. They allow societies to pool benefits from diverse specializations. Many divisions of labor are organized by gender - hunting and gathering, market labor and domestic labor, technical labor and emotional labor, and so on.

We can model this rough sketch of a theory with this game table in the middle. When players take opposite actions they get a payoff of 1. When they take the same actions, they get a payoff of 0. Without some additional piece of information, two players will coordinate only at chance rates. Cailin clearly

shows that gender could provide that extra information - if societies develop a convention where men perform A while women perform B, coordination between genders is ensured.

5

I built a model that shows that gender-biased social learning can *co-evolve* with gendered behavioral conventions. A society that starts out with neither gendered learning nor gendered behaviors can evolve each of them, incrementally. Here's how the model works:

Suppose there is a population divided into males and females. That is depicted by circles and squares. Players begin with a random strategy. There are four possible strategies in this model: you might always perform action A or always perform action B, or you might condition your action on the sex of the other player. Strategies are depicted by colors - the two blues are unconditional strategies while red and orange of conditional ones. Finally, players have a random learning strategy - they might learn from people who share their sex or they might learn from anyone.

6

The model evolves over a series of rounds. On each round, three things happen.

First, players pick a random partner and play the coordination game with their strategy. They receive a payoff based on how they play.

Second, players learn to improve their behavior. If they have the gendered-learning bias, they pick a partner that shares their sex. Otherwise, they pick a random partner. If the partner's payoff is larger than the learners, then the learner will copy their behavioral strategy.

Third, players learn to improve their learning strategy. In other words, they engage in second-order social learning. Again they pick a random partner and copy the learning strategy if the partner is more successful.

We can watch the model develop. What we see is the process by which the population gradually develops gendered behaviors and learning. By the end of the simulation, men perform one characteristic action whenever they pair up with women. To put it another way, this population has developed a gendered division of labor and learning.

7

Gender-biased social learning always evolves in this environment. By the end of the simulation, every player only learns from people of the same gender. Here's a graph depicting the frequency of gender biased social learning over time. I've plotted the frequency for 1000 simulation. As you can see, all trials tend toward universal learning bias.

This provides some formal validation of the intuitive argument - the learning bias helps people sort through potential role models and learn the skills they need to occupy their social role.

8

Let's turn our attention to ethnicity now. The setup is similar. We need to specify the kind of coordination problem that ethnicity is supposed to help with. Here, I'm drawing on work from the anthropologists Richard McElreath, Robert Boyd and Peter Richerson. They argue that ethnic markers typically function to solve correlative coordination problems - that is, one's where people benefit from doing the same things or following the same rules.

Consider greetings. Some cultures bow while other cultures hug. It's a bit embarrassing to go in for a hug while the other person goes in for a bow. Ethnicity often settles the problem in advance. There is no question about how to greet people - it's a background assumption of cultural groups. Many of other conventions work like this - what language to speak, what slang to use, what currency to offer, what taboos to avoid.

9

Here's the model. Again we have two identifiable groups. Except this time, groups begin with a distinctive coordination convention - one group plays A while the other group plays B. The thought is that two different ethnic groups are meeting which creates uncertainty about conventions.

There is a external parameter that controls the rate at which the two groups interact. This might be thought of as a psychological preference to interact with in-group members. Or, we might think of it as representing a structural constraint - if the town of the other ethnic group is far away, you will interact with them less often.

At startup, a fixed proportion of players use ethnicity-biased social learning. This is another parameter that we can vary to explore it's effect.

10

Here are the dynamic assumptions. It's very similar so I'll just highlight one differences. Look at play. Unlike before, pairing is not random. It's controlled by the parameter as I described above.

If we watch the model evolve, we see there is some uncertainty about what strategies to adopt. Players who play with the other group often might be tempted to adopt the other behaviors. But ethnicity-biased learning resists this temptation. Because players still mostly pair with people from their own group,

it's in their best interest to keep their original behavior. So ethnicity-biased social learning spreads and seals the two groups off from one another.

This is consistent with the story from Natalie and Joseph Henrich I gave you at the beginning.

11

But there is trouble. There is another possible outcome. The two group might just decide to adopt the same behavior. Now there is no problem with coordination. Everyone does the same thing.

This solution has considerable benefits. Before, players took loses whenever they played with the other group. But if everyone does the same thing, it raises the average payoff of each group. Everyone coordinates all the time now. So a good deal of the runs converge to assimilation outcomes, rather than growing ethnicity-biased learning.

There is further trouble - the model is extremely sensitive to structural assumptions and parameter values. You basically have to build it exactly like I did to get ethnicity-bias to grow. For example, I assumed the two groups already have well-formed conventions. You might think that's an odd choice - I didn't make that assumption in the gender case. But if the groups face internal uncertainty about their own conventions, assimilation is just about guaranteed.

12

The other batch of problems concerns parameter sensitivity. If you vary the initial conditions, you can get fairly different results.

Consider the first graph. The y-axis is the frequency of trials in which the population adopts ethnicity-biased social learning. The x-axis is the the random-pairing parameter. When the random-pairing parameter is high, meaning the two groups intermingle often, assimilation is very likely. When it's low we can get reliable success.

The second graph varies the initial frequency of the learning bias. When the model starts up, some players already have the learning bias. It turns out that when the learning bias is initially rare, it doesn't grow. Assimilation is more likely.

This finding makes it hard to explain where the learning bias came from in the first place. If it doesn't evolve when rare, how did it ever become common enough to experience the good cases?

13

Okay this has been a very quick summary of a bunch of results. I want to pull out a couple of lessons.

First, there seems to be a parallel between the modeling and experimental results. I found that gender-biased learning evolves under fairly general conditions. None of the issues I just raised show up for gender. Ethnicity-biased learning is far more fragile. That's also what the experiments showed - maybe the reason why we get null results so often is because there is not very robust evolutionary pressure to develop the trait.

Second, it can shine some light on how to interpret bargaining models. Given the gender results, it seems like two-population bargaining models are a plausible candidate for explaining the origins of gender inequality. It's less clear whether they are appropriate for historical questions connected to race and ethnicity.

Finally, I have a suggestion for people working in this area. I think we need to be more explicit about the justification for the two-population structure. We might tell an evolutionary story. But if we want to go that route, we need better ones. The kind of story that Henrich and Henrich are sketching is a bit too vague to rely on. We need to fill out other assumptions for it to go.

There are also other routes we might go. We could point to structural constraints on social learning, rather than psychological biases. Racial groups are often separated by spatial or network structures. These might be a source of stronger justifications than evolutionary stories.