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RAJ CHETTY AND RICHARD V. REEVES

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P R O C E E D I N G S

MS. PITA: Hello and welcome to Intersections, part of the Brookings Podcast Network. I'm your host, Adrianna Pita. With us today are Raj Chetty, who's a Professor of Economics at Stanford University; and author with his colleagues at the Equality of Opportunity Project of a new paper, *Who Becomes an Inventor in America? The Importance of Exposure to Innovation.* Also, with us is Richard Reeves, who's the Senior Fellow and Co-Director of our Center on Children and Families here at Brookings; and the author of *Dream Hoarders:* H*ow the American Upper Middle Class is Leaving Everyone Else in the Dust*, *Why That is a Problem, and What to Do About It*. Gentleman, thank you both for being with us today.

MR. CHETTY: Thank you.

MR. REEVES: Thank you for having us.

MS. PITA: So Professor Chetty, amongst your many previous works, you've examined how inter-generational mobility varies by geographic area, the role of colleges in inter-generational mobility, the growing inequality of life expectancy, and also about the use of behavioral economics in public policy. And those are just the papers of yours that you had events for here at Brookings. But in this latest paper of yours with your co-authors Alex Bell, Xavier Jaravel, Neviana Petkova, and John Van Reenen you're examining what are the main determining factors which affect whether children grow up to be inventors? And who are the people who never get a chance to pursue innovation as a professional career because their circumstances in their life never gave them the opportunity? Can I ask why was this the next logical area that you chose to look at? And how did you set about trying to study it?

MR. CHETTY: So in our research team, we've been focused on studying issues of equality of opportunity. How can we give more children a shot at achieving the

American Dream? And often, a question we get in studying those issues is, should we just think of this as musical chairs? If we give a child from a lower-income family the chance of succeeding, of going to a good college, of getting a good job -- does that mean that they just displace a kid from a higher-income family who would have previously had those opportunities? So is this sort of a zero-sum game? Which we might care about because of fairness, right? We want everybody to have a shot at succeeding. But maybe it's less relevant from the perspective of expanding the size of the economic pie and economic growth overall. So thinking about that issue, I was interested in understanding the extent to which that's true. And wanted to focus on one particular angle, innovation. It occurred to me that innovation is widely viewed as the engine of economic growth. And it's a case where we think it might have less of a zero-sum feel. If I discover a new drug or invent a new technic, a new computer chip -- maybe that actually benefits you as opposed to taking away a position you might have had. And so that motivated us to think about issues of opportunity and inequality, and their implications for innovation in economic growth. So the particular approach -- to distill that very big question into something tractable -- was to use kind of a big data methodology to study who is doing the inventing in America. There's been a lot of prior work on innovation that focuses on companies and R&D tax credits and legal issues and so forth -- but much less data analysis of who the people actually are who are doing the inventing. And so what we did here is link the variety of data sets -- patent records, information from tax returns, and school district records -- to form this data set that allows us to track inventors chronologically from birth to adulthood, and ask questions like, how does your family background or where you grew up or the resources you had affect your chances of becoming an inventor?

MS. PITA: One of the interesting things that I thought you did in laying out your findings in this paper is that you really whittled down, okay, if you're a kid and your

parents come from this kind of income, is what's getting you into innovation your sort of natural ability? It's like, okay, are these kids who are going into these fields, just they're really good at the science and math? Or is it sort of natural preferences? Are some people just more risk averse and so they don't go into exploring things? And you sort of whittle away, well, we looked at this and it's not that so much, and we looked at this and it's not that so much. Can you talk a little bit about that? How you got to what were the main factors of this?

MR. CHETTY: Yeah, that's right. I mean, we felt that there were basically three main explanations for the finding that we start from. Which was that kids from high-income families are much more likely to become inventors than kids from lower-income families. So for example, if you happen to be born to parents in the top one percent of the income distribution, you're ten times as likely to become an inventor as if you happen to be born to parents at the median of the income distribution. So why do we see that big gap? It could be about differences in ability, as you were addressing. Perhaps kids from higher-income families, you know, their parents were quite talented to get to the top of the income distribution. Maybe that's transmitted genetically and that's why they're more likely to be inventors. It could be about preferences. Maybe if you're from a low-income family, you want to pursue a safe career. You want to become a doctor; you want to do something more stable. Innovation is a very risky career; you could do extremely well.

MR. REEVES: Mm-hmm.

MR. CHETTY: Often your idea might end up failing. A third possibility is that this is about constraints or barriers. Maybe if you're a low-income kid you don't have access to the resources -- to the mentors, to the schools -- that you need to get through the innovation pipeline and thrive in the end. And so after setting out, you know, those three buckets of possibilities, we explored each of them systematically. Starting with the ability

hypothesis, where we used data on kids test scores early in childhood -- for instance, when they're in third grade -- as a rough measure of ability. And what we find is even among kids who are scoring at the top of their third-grade math class -- in general kids who were scoring at the top of their grade math class are very likely to become inventors. But even among that subset of kids, it's only the kids from high-income families who are likely to become inventors. Kids from low-income families who were scoring at the top of their third-grade math class are not all that much more likely to become inventors than other kids in general. And so to put it differently, that data seems to suggest that to become an inventor in America, you need two things -- you need to be smart or good in math and science -- as measured by these tests -- but you also need to be from a rich family. And so that suggests that this is not just about ability, it's about something else. So we then considered the preferences explanation. One piece of evidence that I think suggested that's probably not all of what's going on, is if you look at a set of kids who go to a given college -- let's say Stanford -- at Stanford you find that there are some kids from lower-income families, there are kids from high-income families as well. If you compare those kids, their rates of going into innovations are not all that different. Now if you think about a preference as a story, you would have thought that kids from lower-income families at Stanford would be more likely to pursue the safe occupations rather than go into innovation. So that piece of data, again suggests that this is perhaps not about preferences. So that leads to the third possibility that this is about environment and constraints. And so in particular, the key finding of the paper, the mechanism that we think is really at play here, is that exposure to innovation -- being in contact with inventors while you're growing up -- through your family, through your neighbors, through other people in your network -- might be the key driver of why some people become inventors and not others. And importantly, kids from higher-income families, kids from non-minority families, men -- are much more likely to be exposed to inventors than

women, minorities, and kids from lower-income families.

MR. REEVES: One of the things that struck me reading this -- in light of your other work -- was the idea of inventiveness and ingenuity is also a profoundly American idea. And so many of the conclusions that might come sometimes from the analysis of inequality and lack of mobility is universal pre-K, more investment in K-12, etcetera. Which to American ears can sometimes have a slightly European feel -- if I can say that.

MR. CHETTY: Mm-hmm.

MS. PITA: Heavens.

MR. REEVES: Yes. And sort of a social welfare type of approach -- which is not to say that they're wrong -- but one of the things I liked about this paper is -- not only their sort of lack of zero-sum that Raj has already mentioned -- but it's a sense of the idea that you can invent your way to a better life. That you can use your inherent natural ingenuity to kind of make something more of yourself -- is a profoundly American idea. And as new American I think I can feel that quite strongly. It also speaks to an American way of achieving the American Dream. Which I do think is a really nice additional element to this story.

MS. PITA: How did you measure exposure? Like, what counts as exposure? And how do you quantify that?

MR. CHETTY: So the way we think about exposure in the data is -- how much contact do you have with inventors? So what's the simplest way in which you might have contact with an inventor? Maybe your mom or dad was an inventor. And so we start out with that very simple way of looking at it. Are kids of inventors more likely to become inventors themselves? And the answer to that is yes. If your parents were inventors you are ten times more likely to be an inventor yourself than if they were not. Now that fact by itself doesn't prove that there's an exposure affect. That could just be genetics, right? If your

parents were good at innovation, maybe you are, too. And so how do we know, why do we think this about exposure? It's because we find that the particular area in which you innovate is very closely related to the field in which your parents innovated. Just to give you an example, if your dad had a patent in amplifiers, you were more likely to have a patent exactly in amplifiers but not in antennas -- a very closely related field. Where you would have thought, you know, it's unlikely you have the antenna gene, but not the amplifier gene.

MR. REEVES: Right.

MR. CHETTY: And so this seems more consistent with the idea that it's something about exposure. What's on your radar screen in terms of possibilities. What types opportunities do you have in terms of an internship at a company or things like that. Now parents are one source of exposure -- a very significant source of exposure -- but kind of a non-replicable source of exposure from a policy point of view, right?

MS. PITA: Right.

MR. CHETTY: So thinking about it more broadly, we then turned to look at people in your neighborhood -- more generally. So are you growing up around many inventors? For example, in Silicon Valley. Kids growing up in Silicon Valley were more likely to see inventors among their friends' parents or other people they come in contact with relative to other parts of the country. And so again, you find that kids who grow up in areas where there are more inventors are more likely to become inventors themselves. And again, in this very field-specific manner. So if you take two kids who are currently in Boston -- one of whom grew up in Silicon Valley and one of whom grew up in Minneapolis, which has a lot of medical device manufacturers -- you find that the kid who grew up in Silicon Valley is more likely to have a patent in computers, the kid who grew up in Minneapolis is more likely to have a patent in medical devices. So it really seems again like it's the surroundings, what's going on around you, who you're in contact with has a very direct influence on what

you're doing. That's what we call exposure affects.

MR. CHETTY: Uh-huh.

MS. PITA: I don't know if you measured for this, but is there an age at which that exposure has to happen by? Like if kids aren't getting exposed to science and math or to amplifiers before they're ten -- are they out of luck? Or can you catch up to them in high school or in college? Does the kid who goes away from wherever they went to and go to MIT, can they make up for that lost ground?

MR. CHETTY: That's an excellent question. It's a tough question to answer with the data we have. Our sense is that at some point in childhood -- perhaps as early as the elementary school years. Because we see that things like your test scores are predictive of what you end up doing at later ages -- even as early as third grade. Suggesting that you might be able to identify kind of the candidate lost Einstein's -- as we put it. The kids who could have had great innovations, become great scientists, but ended up not coming through the pipeline because they didn't have the right exposures. So what exact age interventions can be most effective, I think, is a question that remains open for future work. It's a very interesting question. But somewhere in childhood seems quite important relative to adulthood.

MR. REEVES: Well, I think it's an interesting question in relation to your earlier work -- showing that kids who move from low-opportunity to high-opportunity areas do better. But only if they move at a relatively young age. So they have to move before the age of 13 to get those sort of benefits. And that might not be the case here. You know, the average three-year old doesn't know the difference between an antennae or an amplifier. But a 13-year old or a 15-year old might.

MR. CHETTY: Yes.

MR. REEVES: And so you may see a very different age gradient --

MR. CHETTY: That's right.

MR. REEVES: -- and exposure effect from the general neighborhood effects to this specific kind of exposure.

MR. CHETTY: That's quite correct.

MR. REEVES: Would you expect that?

MR. CHETTY: Yeah, I think that that's an interesting hypothesis. It seems very plausible to me. And so Richard is alluding to the fact that in an earlier work we've shown that the earlier you move to a better neighborhood -- where kids are doing well in terms of earnings or college attendance -- other outcomes besides innovation -- the earlier you get there, the better you do. It's a very linear effect.

MR. REEVES: Completely, yeah, uh-huh.

MR. CHETTY: It's meaning that every extra year adds up to better outcomes. So getting there at 10 instead of 11, or 14 instead of 15 helps. And I'm sure your intuition, that if you go back to the very earliest years in the context of innovation, I'd be very surprised if getting to a place where there are a lot of inventors when you're two instead of three really makes a difference. You would expect that it's more at the later ages. Now it could still be the case that 16 is too late.

MR. REEVES: Sure.

MR. CHETTY: And maybe it's really about 10, or 12, or 13.

MR. REEVES: Hum.

MS. PITA: I want to get back to that question of neighborhood. In your data, you were looking specifically about the top cities where a lot of innovation takes place. Like Austin, like Silicon Valley, San Francisco area, Detroit, and Minneapolis, and that kind of thing. And I want to talk a little bit more broadly than just the very specific inventive innovation question. Because Richard you had done some earlier work with one of our

colleagues, Elizabeth Kneebone, looking at neighborhoods and the effect of neighborhoods on how children excel at school. Can you talk a little bit about some of the other factors that are going on and how what's going on in your neighborhood effects whether you can learn at school?

MR. REEVES: Yes. I think that we do have to think about this multi-dimensionally. And the work that Elizabeth was talking about multi-dimensional poverty. And I think that what becomes troubling is when you see many of the trends that Raj and his team have looked at around social capital family structure, schooling, college attendance, etcetera. Is there are great inequalities in each of those, but they also are visited on the same people. And so what you see is a clustering of advantages at one end and disadvantages at the other. And you see that particularly in place, you see that in space.

MR. CHETTY: Mm-hmm.

MR. REEVES: And so the places that have high numbers of single parents, the lowest resources in terms of schools, all of those things tend to go together. And they cluster in space. And then you see huge race gaps in that. Because there is such segregation by race in the U.S. still to this day. Actually, what you see is multi-dimensional poverty rates -- if you add education and health altogether.

MR. CHETTY: Yeah.

MR. REEVES: The gaps for multi-dimensional poverty by race are much bigger than they are for just any single dimension.

MR. CHETTY: Single dimension.

MR. REEVES: Yes. But when you read Raj Chetty equality opportunity paper, you sort of have to read in line with all the others. And say, yeah, and that's the same people, and that's the same people, and that's the same people. And of course, that's an exaggeration. But on life expectancy, neighborhood --

MR. CHETTY: Yeah.

MR. REEVES: -- inventiveness, teacher equality, etcetera -- these things stack up. They cluster together. And then the question is, how do you de-cluster disadvantage? Or what are the most fertile ways to sort of break up those clusters of disadvantage? And I think that's really where the policy work is going to go now.

MS. PITA: I want to ask a little bit about the gender gap? Because you also had some really interesting slides about how boys are inspired to be inventors and how girls are inspired to be inventors, and what's different in there? Can you talk a little bit about that gap?

MR. CHETTY: Yeah, I think the gender findings probably are what surprised me the most in these data. So the starting fact is that there's a huge gender gap in innovation in America today. Fourteen percent of patents or so go to women. That's changing slowly over time. And about every year an extra quarter of a percentage point of patents go to women. But if you extrapolate that out, that means it's going to take another 118 years to reach gender parity in innovation. So we're making progress, but extremely slowly. So a key question is why is there such a big gender disparity? And coming back to these issues of exposure, we find a very interesting pattern in the data which was that these exposure effects are gender specific. So what I mean by that is, if women grow up in areas with more female inventors, they're much more likely to become inventors themselves. But if they grow up in areas with more male inventors, that doesn't have any impact. Conversely for boys, if a boy grows up in an area with more male inventors, they're more likely to become inventors. But if they grow up in an area with more female inventors, that doesn't have much of an effect. And so what that shows is these exposure effects cut in very fine ways. It's not just generally about the climate in your area -- it's about particular mentors you may connect to because they have things in common with you, such as your gender, for

instance, or other elements of your background. And these effects can be quite big. So if women were as exposed to female inventors while growing up as men are to male inventors -- we estimate that you'd close the gender gap by 50 percent, right there. And so these exposure effects by themselves at the area level can explain half of the gender gap that we're seeing -- showing their importance.

MR. REEVES: Hum. I'm going to make a nerdy point about the value of data. The reason why Raj and his colleagues are able to speak with this level of specificity about the kind of pattern, and which area, which gender, which race -- is because of their access to huge administrative data sets. Tax records, census -- completely anonymized, of course. And then to match them together in a way that gives us this unbelievable ability that Raj and his team have to make these kinds of claims. So I think it is important -- as well as the findings -- to realize where they come from. And they come from scholars having access to high-quality administrative data -- which they can then use to inform their scholarship. Which then Raj and his team kindly, again, in a suitable format, share. So it's then available to other scholars, too. And so we shouldn't skip over the fact that we couldn't even be having this conversation about whether it's super conductors or antennae -- or whether it's girls in Detroit -- if we didn't have these huge data sets that have been made available to Raj and his team. And so if you need the evidence for the value of access to high-quality data, then I give you the Equality of Opportunity Project.

MS. PITA: Right. And definitely for our listeners, check out the show notes for this episode. We'll linking out to the Equality of Opportunities main website where all the report is and all these data sets and where you can access all this information. Because it's really incredible as Richard said. Do you know if there are any data on this "like inspires like" question of the gender? Are there similar effects with racial representation?

MR. CHETTY: So that's a question we weren't able to look at in this

particular paper because of certain data limitations.

MS. PITA: Mm-hmm.

MR. CHETTY: I suspect -- based on other work -- that that's the case. That black kids are more likely to be influenced by black adults, black mentors. How strong those affects are -- I think remain to be quantified. But my guess is it's not something that's just unique to gender. The way I'd interpret that finding is people are influenced by people who they share common traits with. Gender being one example of that.

MR. REEVES: (Reshna) had great line, didn't she, in the event today, which is you can only be what you can see.

MR. CHETTY: Yes.

MR. REEVES: And I think it does speak to that kind of point is -- having that visibility of people like you doing that.

MR. CHETTY: Yeah, that's right. I mean I think it's about being able to see someone in the same shoes, right? That it's not just knowing abstractly there is this courier called innovation where you can do X-Y-and-Z. It's seeing, yeah, I can see myself in ten years being that person. This doesn't seem unobtainable. That's the --

MS. PITA: People like me have done this.

MR. CHETTY: People like me have done this. Exactly.

MS. PITA: On that question of cultural similarities and how you learn from the people around you -- Richard, you had a really interesting piece recently, where you talked about a hardening of cultural pockets of people. You were talking about the trickle-down norms.

MR. REEVES: Mm-hmm.

MS. PITA: That questions of what we value as a society, as a community, those have typically floated down between classes, between cultural groups. But as society

has become more and more homogenized, we risk cutting off peoples access to people who are maybe just one rung up about them class-wise or education-wise. And so they can see someone and be inspired by them. Can you talk a little bit about this problem? Why is this happening?

MR. REEVES: Mm-hmm.

MS. PITA: Bring that into this, please.

MR. REEVES: Sure. And I think it speaks directly to the work on exposure. This is a kind of broader point about how ideas are formed. How ideas about yourself, how norms are formed about behavior, work, family, etcetera. And it's really strong about social capital. It's really inside kind of networks. And how do we influence each other? How do we affect each other through our daily lives? And I'm reasonably convinced that one of these pathways we do it is through exposure. And not exposure at a very distant level, right? It's not a President preaching at you to go for a run every day -- don't make you go for a run. It's your neighbor saying let's go for a run. And so I think that in a phrase that Jerry Cohen the philosopher uses, is that the changes happen in the thick of everyday life. And I think one of the potential consequences of a more class-stratified and class-segregated society is that even if there are kind of positive norms being developed and nurtured -- kind of in, yeah, upper-middle class or more affluent communities -- not necessarily shared or exposed to those who are in less affluent communities. And so some of those mechanisms by which we learn from each other and share norms in both directions -- but I think in this case in particular -- we're thinking about successful norms, norms of success -- are actually undermined by inequality and by separation. And so my conclusion from that is that things that conservatives more typically worry about -- like culture and norms and so on -- and things that liberals typically worry about more -- like inequality and segregation -- might actually be connected to each other.

MR. CHETTY: Mm-hmm.

MR. REEVES: In quite important ways through the sort of social tissue that are these sort of norms and connections, then the sort of exposure affects that Raj writes about. And it's very hard to prove, but I think it's a way we should be thinking about the potential costs of inequality -- above and beyond the obvious ones.

MR. CHETTY: And just to pick-up on that point -- I mean, I think what you're saying is structural factors. Things like the traditional policies that liberals talk about -- investments in education, or housing policy, tackling problems like segregation -- can have impacts on culture. And have impacts on exposure. One salient place where we see that is in the Bay area, the heart of innovation -- whereas housing prices have gone up -- inequalities sky-rocketed because of restrictions on land use. You see more and more segregation where lower-income people are commuting two hours to get to their job, and are disconnected, presumably, from communities that they previously would have interacted with. Which then is going to affect norms and affect exposure and affect the next generation of mentors.

MR. REEVES: Hmm, that's right.

MS. PITA: We've talked about sort of early exposure -- when you're exposing children to innovation and learning opportunities. What happens sort of next -- after they've had that good early exposure? And I want to ask that because there's research that shows that both women and African-American -- science and engineering PhD's -- are more likely to leave their field than other science and engineering PhD's. And you see this among some other fields as well, too. But this is the one area that there's a lot of really hard numbers for -- that suggest that even though these kids had good opportunity, they got a good education, they got into good schools -- something happens that kicks them away from it. How would you go about measuring sort of the effects of some of this? It might be

sexism, racism -- how do you look at that? How do you start measuring it? And how do you try and compensate for it in these high-innovation fields?

MR. CHETTY: Yeah.

MS. PITA: To keep these people there?

MR. CHETTY: Yeah, and so I think you're absolutely right. I mean, the way I think about it is there's kind of a pipeline that takes you from birth to becoming a successful entrepreneur and mentor something else. And that pipeline can be leaky at many different stages. We've been emphasizing the leakiness in early ages -- in the context of exposure in particular. But you're absolutely right that even once you get to adulthood and you've made it to graduate school and you're starting a PhD program -- you continue to see big divergences across groups. And that could be because of factors like discrimination, it could be because of other challenges -- like family leave policies that might affect women differently from men. And I think it's very important to continue to think about how you tackle those challenges the same way that we're thinking about how we might increase exposure. Now I will note that there's quite a bit of nuance in understanding those patterns. So often the first thing that comes to people's mind is, this is driven purely by discrimination. Maybe bias on the part of men who are not interested in hiring women for some reason. The way to tackle that, I think, from an empirical perspective -- the most interesting work I've seen -- are these audit studies where people take resumes -- fictitious resumes -- where you have a certain set of credentials, but you just vary the name on the resume from a male name to a female name. And see what the call back rate is when you apply for a set of jobs. And you find first that women are less likely to get called back than men. But second you find that that's true both if the person managing the lab or running the firm is a woman or is a man. And so it's not simply driven by a cross-gender bias. There's something more widespread going on about norms and expectations. Which gives us a sense of how we need to go

about tackling this problem, I think. It's more complicated than just saying men need to be less biased than they previously were.

MR. REEVES: Mm-hmm.

MR. CHETTY: I mean I think that also might well be the case. But I think there are additional things going on.

MR. REEVES: Right.

MS. PITA: I also wanted to ask if you know of any sort of similar studies maybe have been done in any countries? Are other countries experiencing similar things to what you had studied here in the U.S.? Does anybody else have any maybe good policy suggestions that we can maybe learn from?

MR. CHETTY: As Richard said, you know, the key to being able to do any of this research is having this type of data. And there are very few countries that have this type of data. They tend to be developed countries, and in particular Scandinavian countries -- where you have very good data bases of this type. My sense is you find broadly similar patterns. There's been relatively little work done on this particular issue of exposure to innovation. But in terms of thinking about the influence of neighborhood environments more broadly -- on social mobility -- the findings we've had in the United States have been replicated now in several other countries --

MR. REEVES: Mm-hmm.

MR. CHETTY: -- and Scandinavian data and so forth. And so I think these are broader principles that don't just apply in one economy. Some of the findings I take from the international data is there are societies like Sweden, for example, where you just see smaller gaps between kids from lower-income and higher-income families. And yet you have fairly high rates of growth and, you know, a high standard of living in general. So I think, thinking about how those models are functioning -- is it something about social ties

and the unique populations that live in Sweden that are different from the much more heterogeneous population in the United States? Or is it something about the set of policies they have? That's an extremely important issue that hopefully can be unpacked with these types of data.

MR. REEVES: You might speak a bit to this question of risk that we've talked a bit about, too. In the context of innovation, too. I was struck a survey recently -- and I haven't actually looked at the survey so I'm not sure how good it is. But it made the point that whiles most Americans are worried about the effect of automation on jobs, most Swedes aren't.

MR. CHETTY: Yes.

MR. REEVES: And so one potential speculation is that if you go to very well-developed social welfare states -- which I'm not suggesting for a moment you can simply import -- but that it changes the way you think about risk.

MR. CHETTY: Yeah.

MR. REEVES: And an argument for certain aspects of kind of welfare provision is that it de-risks some of the kind of downside of innovation or entrepreneurship. And that ironically, it might be easier to take those kinds of risks in those sort of countries -- which we don't think of traditionally -- like Sweden than in the U.S. which we see often as this great land of innovation and invention.

MR. CHETTY: That's quite right. And I mean, I think that touches on a broader theme which relates to what brought me to study these issues -- which was, we often think that there's a tension between inequality and growth, right? We think of it as the equity efficiency trade-off in economics. If we have incentives like lower-tax rates that stimulate growth -- we're gonna have more inequality and we kind of need to choose which of those two we want. And I think what this data suggests -- and the argument you made --

pointed in the direction of maybe you shouldn't think of it as -- these things as being at odds with each other, right? So in this case we're suggesting that if you have less inequality and opportunity, at least, you give kids from lower-income backgrounds the resources, the exposure, the mentors that they need to succeed. You might actually end up with more economic growth thereby both reducing inequality and opportunities -- and stimulating growth at the same time. So I think that perspective -- that these things are not fundamentally at odds with each other -- is extremely important. Especially at this moment -- a very polarized moment in the U.S. -- where people feel like they need to go in different directions. Then this can be potentially a unifying way to think about issues of inequality, opportunity, and growth.

MS. PITA: I think I want to end with asking what some of our policy options are? Right? I always like to ask that. It's really interesting research, now what do we do about it? You mentioned at the beginning that a lot of times people think about the policy options from the demand side of the equation.

MR. CHETTY: Yeah.

MS. PITA: Are these tax cuts or increased funding to R&D, but this is more of a supply-side question.

MR. CHETTY: Yes.

MS. PITA: Can I ask that both of you weigh? And do you have any suggestions? Have the data suggested certain interventions that might be better than others?

MR. REEVES: You mean specific on this innovation and invention question?

MS. PITA: Yes.

MR. CHETTY: Yeah, so I mean, I wouldn't say from the work we've done

that we've identified, you know, and this is the exact intervention you need to do in order to increase exposure. I think the question is are there sets of programs -- like mentoring programs or girls who code program that tries to get girls to do more computer programming -- can those be effective ways to immerse students in this kind of experience. Right? So my sense from looking at the data is it's not enough to just send people brochures and tell them, there's this career that you can pursue. It's got to be more organic and more immersive than that. The question really is how you go about implementing that. So I think what we can say is you can identify kids at a relatively early age who are potential candidates to be inventors -- the potential lost Einstein's if you don't bring them through the pipeline. I think the next step is to try a set of different treatments. Many of which are currently being tried in the field. Like these coding programs. Like trying to connect youth with mentors in their area. I think it's very important to evaluate the impacts of those programs to really figure out which types of programs work most effectively. And I think the data that we've been using here can be very useful in obtaining those answers. By going back and looking when there was a program rolled out in this particular area for this particular set of kids -- do we see really different outcomes for them relative to others? So that's the next step that we hope to take in our thinking on these issues. We don't have the answer yet -- but we feel like there's a path to getting the answer.

MS. PITA: Okay. And then seeing what can be scaled up from that locality to another.

MR. CHETTY: Exactly.

MR. REEVES: I think the value of this research is that it provides us with a stronger foundation upon which to think about and build policy. The way I like to think about this is -- you might find a gap -- say between rich and poor kids in X. In this case invention. It could be college going and so on. But the goal of good research is to get as close to

causality as possible. And to try and understand what it is that lies behind that gap. What's causing that gap? It's easy to describe -- but get close to causality. And that the nature of this kind of work -- the big data work -- because what it seems to be about is exposure -- but what kind of exposure and exposure to who and at what age and at what circumstances -- brings us closer, I think, to kind of feeling like we're getting closer to something that's actually going to be causal. And then you can start to evaluate policies which get directly at that cause. The danger in too much policy making is that we say, oh, there's this huge gap. Let's start a mentorship program and throw it at girls, for example. Without doing the prior work -- which I think Raj's team is helping us to do. Which is to hold on, let's get closer to causality first. Let's try and just drill down a bit further. Do the patient work that's required with these big data sets. Then build policy on that and then use that data to evaluate it. Because very often we don't close enough to causality before we start throwing money at the problem. It's a big problem -- and I think we could invest in solving it. But we do need to do what I think Raj and his team are doing -- which is to get a better sense of not just what is the gap but what lies behind the gap. And therefore, what can policy-makers do to address it?

MS. PITA: Great. Well gentleman, thank you both very much for explaining all this to our listeners. And I again encourage our listeners to check out the show notes. We'll have links back to all of the research, also to the transcript and video from today's event that you've heard us making reference to. Which has another really fascinating conversation with some practitioners in the field of dealing with these mentorship issues. So thanks again for listening. Gentleman, thank you for being here.

MR. CHETTY: Thanks for having us.

MR. REEVES: Thanks for having us.

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