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**PROFESSOR:** So I guess maybe the lecture today is the one that is going to have the findings which in a sense are the most surprising to me and probably the most, let's say, unconventional or that would upset the most people. None of these studies are mine. They're all studies by other people. But I think that together they paint a somewhat surprising picture.

A small family is a happy family. This is actually a bag of rice that someone took a picture of with the slogan, "A Small Family is a Happy Family" painted on it. That's a picture from someone's travel.

So most international public policy has been predicated on this idea that large families are bad, and particularly bad for children. And the second one is this one, that poor people are unable to control their fertility. So that's kind of some of this maybe slightly despising view about what the poor can do.

Here you have the social worker coming to the very poor, dilapidated house with a large number of children and the mom saying, but I take the pill every time and become pregnant, and it doesn't help. So that seems to me like a pretty good summary of where a lot of people are explicitly or implicitly. And what I'm going to argue today, and not on the basis of what I've done but on the basis of a lot of work that I've accumulated, is that both of these statements are actually wrong, not mostly wrong.

But let's start with the beginning. Why does it matter? Why do we spend time on this issue? And why is it important that people get it wrong and to try and get it right instead?

It's because these kind of views actually influence policies. So the first example is

the sterilization policy during the emergency period in India. So what happened during this period? What was the story?

**AUDIENCE:** There was this huge campaign for sterilization. And basically there were lots of incentives or hand [INAUDIBLE] provided to ensure that people met certain quotas. Like, various policies, Muslim people were taken into jail and then forced to be sterilized. It was just a very harsh technique to achieve a quota.

**PROFESSOR:** Exactly. There was a huge, very fast campaign for sterilization, which was very much delivered from the top. 7 million people got sterilized in a very short period of time. If you're interested in reading an account of the emergency period in India, there's actually a novel called *The Fine Balance* by Rohinton Mistry. It's a whole kind of full spectrum novel about the emergency period, has some horrific descriptions of those camps which are based on some of the accounts that people have given.

So some of this, of course, is people were given incentives to be sterilized. But people were also sometimes given offers that they could not reject. So there was sterilization that was not voluntary. And, for example, people traveling on trains without tickets, which was a widely accepted practice at the time, were all rounded up and say you get sterilized now or else.

Widely unpopular policy, as you can imagine. Then when Indira Gandhi called an election towards the end of emergency, she was convinced she would win the election partly because that's the problem of being all alone in power, that you don't understand. No one gives you the real view of what is going on.

And she did lose the election pretty badly. And it is, of course, hard to tell but it is widely believed that sterilization policy was part of the reason why she lost the election. And, in fact, there was this slogan which was based on a pun in India, kick down or kick out Indira and save your penis, which is based on the phonic analogy between the two.

So that was a success in very immediate terms and a very big failure in a longer

sense because people in the rural areas are pretty reluctant of having anything to do with family planning. For example, there is this very safe way of providing family planning, which is an injection that is valid for 3 months. And that's very convenient because then you can forget about it. You don't have to remember to take your pill every day.

It's not very healthy, which is why people don't prescribe it so much. But it does have the convenience of being very easy to use. And people are really not a big fan of it in India partly because they are wondering if it's some roundabout way to actually sterilize them.

Worse than that, and we discussed that in the context of immunization, people feel that other things could also be some roundabout way to try to sterilize them. And in particular because Muslims were certainly a group that was particularly targeted during the sterilization wave in the emergency, Muslims sometimes refuse to take even things like the Pulse Polio drops on the ground, that what do we know whether it's something like sterilization?

So that's one example. Another very famous example is the one child policy in China. So the one child policy started in 1978, 1979. Very brutally because before that Mao was actually in favor of Chinese people having many children because that would constitute a large army of people to construct the country and to be strong and all that. But then they realized that, oh, we have too many people or they believed we have too many people and started the one child policy.

The one-child policy, at the beginning, was very strict. So basically you can only have one child. The second child, not only the parents get heavily fined, but in addition the second child has no rights, can't go to school, can't get health care, can't get housing, can't get a permit to live somewhere. So basically you don't want to be a second child.

So it was very effective in terms have not having a second child. But they had one consequence, which you probably have heard of, which is the ratio of boys to girls in China is completely skewed in the favor of boys. As of 1986, when Amartya Sen

wrote his famous paper on missing women, it was 94 women for 100 men in China.

And since then it's only gone down and down, especially as abortion became available and in particular ultrasound technology to figure out the sex of the fetus. So nowadays less infanticide but more abortion. So they've relaxed the policies in a way that I'm going to describe a little bit later to allow in some places people are to have a second child if the first child was a girl.

So what is interesting about that is it means that actually in those places the gender ratio at first birth actually reverse where people were more likely to keep a girl than to keep a boy because that give them a kind of second ticket for the second child and they could always abort the second child if she was a girl. So that's, again, another pretty drastic policy which is not popular at all and had a lot of consequences. So those are pretty extreme examples, one of them.

But most of the poor people in the world live in countries where at some level or another the government thinks that the population is too big and needs to be controlled. And usually it's done in a more civilized way of trying to make contraceptives available to people, convince them to use them, et cetera. And an example of an incentive program of this kind is the ICDDR, B in Bangladesh, which was initially a big site where they provided control of diarrhea diseases-- so actually it's ICDDR,B because diarrhea diseases, Institute for the Control of Diarrhea Diseases-- in one region called Matlab in Bangladesh.

And then at some point they started in about half the villages in the region to provide a lot of counseling. There was a woman who was coming to every house once a week or twice a month to provide advice and deliver contraceptives and deliver injectable contraceptives, et cetera, to both make contraception available and try to change people's view. So this one is a more usual form of what intensive, or a more benign form of what intensive family planning policy can do.

So why is policy so worried about the number of children? It really comes from this very basic idea that if you have a pie and you have more people who want to share the pie, there's going to be less pie for every person. And if you really have too

many people around the pie, you're going to have very small slices for each person.

So it's a pretty basic idea. This was, maybe not first, but at least famously expressed by Malthus, who basically explained that there are fixed factors in the world. For example, there is only so much land. So because there is only so much land, we can only grow so much food. So if we have large population, we are fighting for this restricted food. Eventually we will starve.

Now, the advantage is that this is a stabilizing force because when everybody starves, everybody dies. And when everybody dies, there is again fewer people. So the remaining people can again eat whatever food is left.

And he cited as an example the black death, which was a plague epidemic. So here's a poor person who is affected by the plague. It was a huge epidemic in Europe. If you have not seen *The Seventh Seal* by Bergman, you should see it. It's about the plague in the North and in Sweden.

It was believed to have killed half of the British population between 1348 and 1377. And Malthus explained that this happened. Half the people died. And in the following century wages kept rising. So that was, for him, an example of what was going on.

In the book we discussed the more recent incarnation of Malthus' view and in particular some analogous of the black death. What is it? Suzanna.

**AUDIENCE:** HIV and AIDS.

**PROFESSOR:** HIV and AIDS. So there is this professor at the LSE, interestingly, [? Avignon ?] was also in England, who makes the same argument saying HIV and AIDS, of course, it's bad because people die. But people dying, in the end, will free up productive resources both because people are dying so that's fewer people.

That's not great because the people who are dying of HIV, AIDS are mostly the active generation. So it's not great to lose those guys. But the remaining people also have fewer children. That should be good for GDP per capita.

That's a bit galling as an idea. And the question is whether it's true or not. So what

is potentially wrong in Malthus' argument about this idea that we have a fixed pie, there is only so much land, we can only produce so much food, and if we have more people, there'll be less food for everyone? What's problematic with this idea?

**AUDIENCE:** He doesn't leave room for innovation. So in the green revolution, population pressures actually spurred technological innovation that boosted green production.

**PROFESSOR:** Exactly. It doesn't leave room for innovation. So the first thing is when we write down a production function, we tend to write down the production function with a big  $A$  that multiplies how much capital there is in the economy, which multiplies how much labor there is in the economy. So that's how production functions.

The big  $A$  is these unknown things that we discussed last time when we talked about education. It's like the productivity, the innovation, et cetera, of people. Usually we consider this  $A$  to be non rival, which means that if you come up with a great idea, your great idea can be used not only by you but by anybody else.

So, for example, if I come up with a new thing in the Green Revolution then everyone can use it. So the mechanically, if there are more people around and if ideas tend to come in this kind of random way, you know, every morning during your shower you have some probability to come up with the new seed for the Green Revolution or to come up with the concept of iPad or to come up with a Facebook, then the more people we are, the more chances there is that one of us comes back with an idea. So this is a feature of all of those models of technological progress, that the more people we have, the more likely we are we have a good idea that's going to benefit everyone.

That's a feature of models that people generally don't like. They think it's a bit strange. But why not? At the end of the day that's true.

And then there is the argument that reinforces this effect furthermore, which is the argument you had which is in addition, if we are about to starve because there is so much population pressure then that puts pressure on us to have more ideas. So that gives us all the right incentive to try and figure it out. For these two reasons,

what we should expect is when there are more people around, people have more ideas, and therefore growth is also faster.

So there is a very interesting paper by Micheal Kramer which looks at that in the world. So this is population growth five million BC to 1990. As you can imagine, the quality of the data improved a little bit between 5 million BC and 1990. And the data points in five million BC are a little bit scanty.

However, what he does here is that he has periods of data. So his first point is from five million BC. It's estimated, obviously. Then the second might be one million BC. So that's a very long period of time. And then he may have annual data between 1960 and 1990.

But what he does is for each period he has, he calculates the annual growth rate of population in between one year and the next year and regresses here or plots it against how much population there was at the time. This is done world wide. So this is population growth rate on population billion.

And what we see is the exact opposite as the Malthusian graph, which is particularly the more people there are, the faster the population growth. And that's about linear. So the more people we are, the more our population grows, which suggests that this idea for fixed land is wrong because that would go the other way, that there's no stabilizing force that brings the population back to zero, and instead it's the opposite that happens. So far, there has not been really any evidence that the Malthusian theory was right.

In fact, we have many, many more people than we were in Malthus' time. And people are by and large much richer than they were in Malthus' time and eating much more and healthier and having longer lives. So it doesn't seem that if you look at the very short history of the world you get so scared by what's going on here.

And yet these Malthusian arguments in a form or another somehow never dies. It always keeps coming back. And interestingly where it mostly recently came back or more permanently came back is in Jeff Sachs' new book-- not the *End of Poverty*

book that we discussed before.

But he has a book called *Common Wealth*. And the subtitle is *Economics for a Crowded Planet*. So that pretty much said it all. The planet is crowded, too crowded. One of the main challenges is population.

This, I took from his website where he kind of advertises the book. "Stabilizing the world's population is crucial to ensuring peace and prosperity on this already crowded planet. If we ignore this issue, we risk a massive and unsettling youth bulge, unbearable environmental pressures, and unchecked global migration."

So the "unbearable environmental pressure," that refers to exactly the type of limited resource argument that we can have in the Malthusian world. So what are the environmental pressure that he's worried about?

**AUDIENCE:** The more people you have, the more green house gasses we emit.

**PROFESSOR:** Sorry. Say it again.

**AUDIENCE:** The more people you have, the more green house gasses you can emit.

**PROFESSOR:** Right. So climate is one, that maybe more people generate more greenhouse emission.

**AUDIENCE:** Water because we have a fixed amount of freshwater that we can access. But the more people there are, we have to grow more food. We have to irrigate all of that. And it's important that we have access to clean water for daily use.

**PROFESSOR:** Right. Water is one. There is big pressure on fresh water. And what's the last? Yeah.

**AUDIENCE:** Energy.

**PROFESSOR:** Energy. And particularly there is only so much oil. So until we figure out something else-- and certainly nuclear energy is probably going to be one of them-- there is also going to be eventually a pressure for that. And what's the last one that we



discussed in one of the first lectures that people also have brought up this year?

**AUDIENCE:** Food.

**PROFESSOR:** Food. Exactly. In the end, food is back. Can I ask you guys to not do something else? It's a bit unsettling. There are too many people who are doing something else.

I am pretty tolerant with that. But that's just too much. Like, there's half the class with computers open. I'm assuming that about 90% of you are checking some other website or whatever.

That doesn't help my focus. So if you are doing something else, just shut your computer. Thanks.

And so is there reason to worry about that? Indeed, what we do find that is something pretty striking is that the countries that have higher fertility rate are much poorer. So here it's plotted in the other direction. We have the wealth of the country and the fertility rate. It's a nice log relationship. If we were plotting it in log, that would be log linear. Yep.

**AUDIENCE:** Is there any investigation about why Saudi Arabia and Israel are so noticeably removed from the trend?

**PROFESSOR:** So what do you think? So the first thing, why are they both removed from the trend?

**AUDIENCE:** They have higher fertility rates than you'd expect for their GDP.

**PROFESSOR:** Exactly. They are richer than you'd expect given how populous they are. So how about Saudi Arabia?

**AUDIENCE:** Oil.

**PROFESSOR:** They have oil, so they are pretty rich. Israel?

**AUDIENCE:** They have an existential threat to their existence. They want to populate more?

**PROFESSOR:** Yeah. That's a very good way to set it. They have an existential threat to their

existence. On the other hand, it's an intellectually very rich country. They also get a lot of support. And it's also very small, so that might eventually create issues. In fact, that does create issues.

But that's probably the reason why Israel is so much richer compared to their income. And the Israel case kind of illustrates well the problem with this graph which is you could read from this graph that, oh, having a large population makes you poor. Or you could read from this graph that poor countries have more kids or richer countries have fewer kids in the opposite direction.

That is, the lack of wealth that makes people have a lot of children maybe because of people's choices. Because when we explain Israel, we don't want to explain why Israel is rich despite having many children. We want to explain why Israel has high fertility rate despite being rich. So we explain here what are the reasons why people in Israel would like kids.

That's not the case in other countries. So that's kind of what I'm saying here. As usual, the correlation could go either way. We could find that poor countries could be poor because they are too crowded. A rich country could have lower fertility because they are rich.

Maybe as people become richer, the opportunity cost of their time is higher. As a country becomes richer, women are more likely to find things that they can do in the labor market. And therefore women are more likely to participate in the labor market. And therefore, having a kid, you know, you don't want to be taking off a year of your life every other year because you are bearing or nursing a very small child.

So it's kind of difficult to answer this question. It's not going to be solvable by looking at other countries. And it's even harder to ask what population increase would do to the planet.

It might be right even if Malthus was wrong. The [INAUDIBLE] might still be right. It might be right that we will never find a solution to get clean water access to

everyone, especially if it's a much larger group of people. It might also be wrong. But it's difficult to know. Yep.

**AUDIENCE:** Is there a correlation with religion in fertility at all?

**PROFESSOR:** I would assume so. I don't know which way it is though. It used to be that Catholic country would have a lot of children. And now it's not true anymore. The countries that have the fewer children in Europe are the traditionally Catholic countries like Italy and Spain.

So actually I think there is a correlation, and I don't even know what it is. Like, for example, what are the-- but you're right. That brings to the number of children you decide to have, et cetera, depends on your culture as well as other things.

So it's difficult to say anything about countries. It's even harder to say anything about the world. So we can go back to our traditional refuge and start looking at the family and ask whether it is true that a small family is a happy family.

And, of course, that's not necessarily the answer of what it would be for a country or let alone for the world because there are externalities of a large population in a country or in a community or in the world that the family might not internalize or take into account. For example, having more kids, the kids may still be as educated and you may have as much water to feed the kids today. But the fact that you have just one more kid puts more pressure on water resources for everyone in the world.

So we are not fully answering the question were we answering this particular question on what happened to family. However, it's still an important question because, in fact, even if you were convinced that family or that large population is a problem for the world as a whole and you really want to deal with it, even if you were that convinced you would have to find a way to do it. And the issue is an effective way to do it would certainly depend on whether having a large family is something that's immediate costly to people.

And therefore you need to make them realize that, and then they'll have fewer children on their own or whether it's something that's beneficial to people. So we

need to answer this question even if we are interested just in the external world wide effect of large population. Moreover, if you find out, for example, that it's very bad for children to live in a large family then you could want to design a population family that would increase the cost of having children by ideas ranging from I'm going to reduce the cost of not having them by reducing the cost of contraception to I'm going to make it illegal to have more than one child in China.

So if we consider that parents are not fully maximizing the welfare of their children and of the second generation then we might be even more concerned about a population policy for the sake of the children, even if we weren't sure of what it would do to the world as a whole to have fewer or more kids. So these reasons, that's a question which is pretty much immediately important. And if you read Sachs' book, *Common Wealth*, he's going to tell you very assertively, very authoritatively. He's going to tell you that large families are bad for kids, that there is plenty of evidence that large families are bad for kids.

And that's not really the subject I study. So when I went into this to review the evidence when we were preparing the book, I assumed that I would find a number of studies finding exactly this. And, of course, when you look at the reason we assume that, well, that seems, again, pretty much intuitive that if you have a larger family, that's more people on one single pie. That's fewer to eat for everyone.

There's also a very, very famous paper by Gary Becker who won the Nobel Prize for his work on the economics of the family, which coined the term the quality quantity trade off. And the quality quantity trade off is exactly that. Siblings compete for resources, parental attention, money, time, et cetera.

So if you have more siblings, they will compete for this. And, therefore, it's bad for all of them. So the paper starts from this as an assumption and then from this assumption builds a model which shows that suppose that the quality is a normal good.

So you want more quality children when you become richer. Then as people become richer, they will move on the quality quantity trade off towards fewer kids of

higher quality. So the paper's argument was not-- the first one with the second one which is given the quality quantity trade off, we should see that richer family have fewer children of higher quality.

So I sort of assumed that it was a given that this quality quantity trade off existed. Now, another thing that if you look at the data you do find, as [? West ?] pointed out earlier, that in general it's true that children are of lower quality in larger families. They tend to have less education, to be smaller, et cetera, when they have more siblings. It's not even always true. But it tends to be true.

The problem, of course, is we can't look at that because even in Baker's model he just explained to us that because there is this trade off between quality and quantity, the families where we are going to see many children are precisely the families which don't care so much about quality. So even if we manage to force them not too have many children, they would still want lower quality children and would spend their money on other things than quality children. That goes back to the first concepts we saw when we looked at program evaluation and this idea of potential outcome.

The potential outcome, the potential quality of the children born in large families, is lower than the potential quality of the children born in small families, keeping the family size constant just because the people who have large families in Baker and Tomms' world are people who care less about the quality of the children. I don't know if that is right. But under this model that we are trying to test I would be right.

That means we cannot look at just the correlation. More specifically, we know that poorer families are larger. And therefore it is likely that large family is correlated with poverty, which would make children less educated for all sorts of reasons.

So what can we look at? We need to look at things that somehow have forced families to be larger or smaller than people wanted them to be. Or we need to look at policies that made it easier or harder for people to control their family. So what is a thing that makes your family bigger than you may have planned it to be?

**AUDIENCE:** Having twins was one of these, I guess.

**PROFESSOR:** Having twins, yes. And what is another one?

**AUDIENCE:** In some families, in some countries that consider that they really want to have a boy. Let's say their first child is a girl. They're more likely to have more children because they want [INAUDIBLE].

**PROFESSOR:** Exactly, the gender of the family. So, specifically, before sex selection was available, gender was more or less exogenous. Or in places where people don't do sex selective abortion, gender is more or less exogenous. So if you really want a boy and you have a girl then you're going to have one more child.

This means, by the way, that girls tend to live in large families, which could be one reason why girls do worse in life than boys, not because people treat them worse once they are born but because they live in large families. Now, another thing related to the gender of the children is that in a lot of cases people want to have a mix composition. So for example in the US, you are more likely to have a third child if your first two children were of the same gender, say, two boys or two girls. You are about 8% more likely to have a third one.

And that, again, conditional on the gender of the first child. The gender of the second one is random in the US, assuming people don't abort kids based on their gender. Then therefore we can use that to look at the effect of a larger family size than you would otherwise have had because now we have two families that are all exactly the same, except one of them end up with three kids and one of them ends up with two kids, either because of a twin in the second birth or because of this gender selection. So of course with the twins, we cannot look at the twins themselves. Why looking at the twins themselves would be problematic?

**AUDIENCE:** Because at the point when the twins arrive, there's, like, nothing to compare it to, right? So wouldn't it be more useful to look at situations where there was a single kid and then the second child ended up being twins?

**PROFESSOR:** Right. So you could say let me compare at first births the families which have twins

versus families which have one. You would compare two to one. And why wouldn't we want to do that comparison?

**AUDIENCE:** Can you repeat the question?

**PROFESSOR:** So suppose that I want to use twins. And I'm saying let me focus on first birth. And I am going to compare all of the kids that are born as single children and all of the kids that are born as twins. So the twins are two, and the singles children as one. Is this comparison valid?

**AUDIENCE:** No.

**PROFESSOR:** So why?

**AUDIENCE:** Because isn't it the case that we just talked about the fact that it's safe. If you get a kid, then you want another kid. Then you can say if I get twins, then I'll have one more than I actually intended to. But if you want a kid and then you get twins-- I don't know what the expression is.

**PROFESSOR:** You mean you are saying that the kid who is single birth eventually will have a brother. So maybe twins at first birth might not change the total family size?

**AUDIENCE:** Right.

**PROFESSOR:** So that's true, which is there might not be an effect on total family size or the effect might be very small because almost everyone wants at least two, in which case if we go with [? Deck's ?] idea of saying let's look at the second birth and you move from two to three, and maybe there are fewer kids who would want three, that creates a bigger impact on family size. That's right. And there is another problem with twins, pretty obvious, like, direct. You guys are over thinking it. Yeah.

**AUDIENCE:** I don't know if this is it. But the reason I think you couldn't hurt the kids who weren't twins because if you're a twin you'd probably get fewer nutrients. So you're less likely, especially in countries with poor families, they're less likely to have the same potential.

**PROFESSOR:** Yeah, exactly. That's the problem. Twins are fragile. Even here they are born with lower weight. They are more easily premature children and even more so in places where the health care might not be so good. So twins are, in general, weaker. So if we go back to your point and say, well, maybe the family size is the same at the end between a family that has twins at first birth and a single child at first birth, you end up with three regardless, say, or two regardless, but there might still be a difference between the twins and the non twins just because the twins were born weaker.

**AUDIENCE:** Can't you account for that?

**PROFESSOR:** How?

**AUDIENCE:** I don't know. If you have, like, data on the average wealth of twins versus the average wealth--

**PROFESSOR:** So it's not only the wealth. The wealth would be the same. So you could adjust looking at birth weight, for example.

So some people have done that, to look at the difference between twins and non twins comparing for birth weight and assuming that birth weight completely captured the fact that twins were in a more adverse in utero environment. But another thing you can do is to do what was suggested before which is to say, let's look at that kid who was born, the first one, and then at the second birth it gets either one sibling or two. And that's a shock for him or her. And he or she is no different.

It's the same child and the first few years were in the same environment. But certainly there are these two kids who are coming instead of one. So that gives you a shock. Yeah, Ben.

**AUDIENCE:** Isn't it also difficult to look at the relative treatment of the children because there is no prior child to look at? But if we have twins in the first trial, they're born at the same time, they're the same age. You can't say one education-- the parents did something completely different than they would have done otherwise--

**PROFESSOR:** Yes. So knowing what they would have done is looking at the single child in other



family and saying that getting twins is random. So they would have treated them like people generally treat their single children. But the problem is that probably they wouldn't because they are twins and they're very fragile, whereas if I look at the first child, the first child is the same. But then he is in a family of three or in the family of two.

So there is a paper-- so we went over gender-- a paper by George Angrist, Victor Lavy, and Eliot Schlosser looking at exploiting the twinning and the gender differences, both the sex mix and the fact that people prefer boys in Israel. Now, you might think Israel is a rich country. Why do we care? Or we might care about Israel in general, but why do we care in this class?

Well, Israel is a rich country but it also has poor people. And they are using pretty much all of Israel. So it's very large samples, including a large sample of poor people because they also look at the Israeli Arabs which are getting to be as poor as some of the people we look at in other countries. So they are looking at that in a lot of detail, comparing the siblings of twins, first born, when the second birth is a twin, comparing the children born in different gender mix, and then putting all of this together.

And they find no effect at all of larger family size. They find absolutely no adverse impact of being born in a larger family. That is a bit surprising since, again, I think most people would have expected large effect.

So you can think, OK, maybe it's Israel and even Israeli Arabs live in an environment where they are poor but they can go to school for free. They can get good health care. So maybe we don't see the quality quantity trade off in this context because these are Israeli Arabs. So let's look at other places.

Well, in obvious other places the one-child policy where the state forces you to have fewer kids. So here there is a paper by Nancy Chen, who interestingly is a student of George Angrist, former student, who looks at the one child policy. So that's pretty clear, the one child policy. Either you can have a second child or you cannot.

And I mentioned that since the mid 1980s, some areas allow you to have a second child if your first one was a girl, which means that if you want a girl in an area that relaxed the policy, after the relaxation policy was put in place then you're more likely to have a sibling than if you're born a girl in a non relaxed area or if you are born a boy in a relaxed area. So she exploits that. And you're very much more likely because pretty much everyone who had a chance to have a second child did. A lot of people did. So what do we find?

This is a graph that tells you the number of siblings that the child has as a function of whether they were born and whether they were born in a relaxed area. So this is the difference between the family size. This is the difference between the number of siblings that the girl has in a relaxed area versus non relaxed area.

So not all the areas relaxed. And the areas that relaxed, the 1978, 1970s, because before they didn't have a one-child policy. So what you find is that before the one-child policy, there is not much difference between the number of siblings that the girls have in area that eventually will relax the policy because there is no such policy in other area. So those places are not fully random.

But girls have an average of maybe 0.50 more sibling in the relaxed areas before the policy. And boys have 0.50 areas as well, which shows us that they tended to allow people to relax the policy in places which like children more. But what is interesting and what's happening after, the relaxation of the policy only affect the girls.

So after the one-child policy, you start seeing bigger and bigger difference between the number of siblings that the girls have in a relaxed area versus non relaxed area. And towards the end of the period where most places passed the laws, a girl had an average of about half more sibling in places that did pass such a law. That means that every second family who had a chance to have a another kid after a girl had it. Zach.

**AUDIENCE:**

Wouldn't you expect there to be a gap? In the places that relaxed the policies, didn't they only relax the policies to have a second child if the first one was a girl?

**PROFESSOR:** Yeah. So it's exactly what you would expect. So this is telling you that in places which had relaxed area, that did have an effect, that people took advantage. And if they had a girl as the first born, they had a second child, whereas for the boys, since that doesn't allow them to have when a policy, there is no difference.

So you're exactly right. This is exactly what you would expect. It's not an interesting fact. It's just showing you that the policy worked as you would expect.

Now we're going to exploit that to say is it the case that this first girl, who has more siblings, is she less educated compared to what would have been the case if she were a boy? So we are looking here at the first stage, if you want. Yeah.

**AUDIENCE:** So is this all looking at the first borns and showing their--

**PROFESSOR:** This is looking at the number of siblings of the first born. So it's telling you that if you're a girl, you're more likely to have a sibling if you're born relaxed than non relaxed towards the end of the period. But that's not the case for boys, which is exactly what we would expect. Yep.

**AUDIENCE:** Is all this data from areas eventually [INAUDIBLE]?

**PROFESSOR:** So each of these points is the difference between all the places that will eventually be relaxed and all the places that will never be relaxed. So all these points are already differences. But the reason why it keeps increasing is that it's the difference between places that will eventually be relaxed.

And some of them got relaxed only towards the end. And that's why the difference keeps increasing. Does that make sense? So each of these is a difference.

And it's telling you that if you look just at this point in 1981, if you were a girl born in a relaxed area, you had about half a sibling more than if you were a girl born in a non relaxed area. But for boys, you had only a tenth of a sibling more, like, strictly speaking, zero. So that is exactly right. There's nothing particularly interesting there. That's just the basic fact that we are going to rely on to now show we're going to run the exact same analysis for the first born, not looking at their number of siblings but

looking at their education.

So if having more siblings is bad for your education, what would you expect the shape of the equivalent of these red lines? It would be decreasing, because the later you were born, the more likely that you have one more kid. And, in fact, what do we find?

We find that it's increasing, and moreover it's increasing for girls but not for boys. So towards the end of the period, girls born in relaxed area are actually more educated than boys born in a relaxed area, compared to what happened in a non relaxed area. Yeah.

**AUDIENCE:** Can you help me understand what the y-axis is?

**PROFESSOR:** The y-axis here is the difference in the years of education between the relaxed and the non relaxed area. So it's saying that the relaxed area, probably we are poor because the kids at the beginning of the period tended to be less educated in a relaxed and non relaxed area. And at the end of the period it's towards zero.

**AUDIENCE:** So the more kids you have, the more education you have.

**PROFESSOR:** Exactly. The more siblings you have, the more education you get. Remember, it's not going from one to eight. It's going from zero siblings to half a chance of a sibling. Yeah.

**AUDIENCE:** So how much more education does that translate into? Because if, for instance, you have a first child that is a girl and then you wait, say, six years, so the child has a year of school, which [INAUDIBLE] haven't gotten, and then you have a second child, then you're still not actually trying to educate your child anymore. You're just still investing in the children that you have.

**PROFESSOR:** Can you repeat the question?

**AUDIENCE:** I mean, if you have two children, can't you say your [INAUDIBLE] goes to school? Whereas if you just were stuck with one child-- how do I explain this? And really

does this show at all that there was the intent to educate these girls who were first born? Or does it just show that they were investigating whether they'd have while they had it. And then once they got a second boy, they started investing in the boy?

**PROFESSOR:** So if this were in the model then we would find the girls to be less educated because once the boy comes-- or at least as much-- because once the boy comes then they start, you know, sharing the resources or giving everything to the boy. It's good pointing out that mostly the second kid is a boy because selective abortion of the second child is horrible. Like, most of these second kids are boys. Yep.

**AUDIENCE:** So you were saying that if you get another child [INAUDIBLE] schools that they actually get more schooling, but with this school is that they get just as much.

**PROFESSOR:** Oh, well, this is the idea of starting from the differences. So the idea is that those regions were regions where before girls tended to be less educated. And even the boys tended to be less educated. And nothing really changed for the boys. But for the girls it went up.

So the point is these regions that relaxed, they are not the same as the regions that didn't relax. Those were poor or more backwater regions where the problem of infanticide was bigger or accepted [INAUDIBLE]. That's why they relaxed.

So that's why we are more interested in the slope and how it looks at the end compared to the beginning than the levels. So the levels are wherever they are. And in particular what is very interesting is that the girls tend to do better than the boys in the relaxed areas, relatively better in the relaxed area than the boys, which is saying that if you have to be a girl, it is better to be a girl in the relaxed area compared to being a boy in the relaxed area.

**AUDIENCE:** I mean, it mean-- [INAUDIBLE] anything about Chinese culture-- it might mean that the parents that are in these relaxed areas which might be in more rural areas, they want to educate their girls more because they want to then send them so that they can find a husband. If they have more education, maybe they have more chance of getting a good husband.

**PROFESSOR:** I think you're right, except that this is what it's trying to account for, which is, let's say from 1973 to 1977 is when the areas-- there is no relaxation because there is no policy yet. So this is saying that those places, before the relaxation, girls tended to do much worse, whereas after the relaxation they do somewhat better.  
[INAUDIBLE].

**AUDIENCE:** I was wondering whether this can be considered a good refutation of the quality quantity credo because firstly when these people with large family and position of birth [INAUDIBLE] is not quite the same as having two children. And, number two, we also need to know whether there was a cultural and infrastructural change. [INAUDIBLE] changing attitude towards girl's education and more schools perhaps in rural areas, for which, you know, girls always tend to pick up any opportunity much better than boys do.

**PROFESSOR:** Right. So that's an excellent point. Let me start with the second point, whether things changed. That's the advantage of comparing the relaxed versus non relaxed. Things probably would have changed in parallel in the two places. The first point is quite important. Yeah, that's a bit late. You can't show up at 2:00. Sorry.

The first point is very important, which is it's not going from six to seven. It's really going from one to two. And so there are two things that are relevant here, something which you also kind of alluded to earlier.

One is we know that being a single child is not that much fun. And maybe going from one to two is good, but going from four to five is bad. So maybe we are not learning about what we're really interested, which is whether families would reduce from five to three by looking at the one to two phenomenon. So that's very, very true.

The second thing is all of these children are girls who are acquiring a brother. And in a culture which is not very favorable to girls, it might be very good to have a brother for a girl because then the family is going to send the kid-- I think that's kind of related to what you were saying anyway. The family's going to send the little boy to school. Well, I might as well send the girl with the boy anyway.

You know, instead of competing for the resources, people actually drag themselves. You need someone to bring the boy to school and there you have the older sister. That's kind of convenient. So what we're learning from this may not be actually-- I think we are learning that having second child, for girls in China, having a brother was actually a good deal. But whether this is telling us about the quality quantity trade off more generally, I think you're right to be suspicious.

**AUDIENCE:** I was just wondering if there's selection bias. So for families that have the boy first time around, is it possible [INAUDIBLE] going on? So if there are two children, it sort of shows that you value girls and would be more likely to send them to school. Does that make sense at all?

**PROFESSOR:** Right. Yes. You might have this problem. And it would become problem if the selection bias changed over time, which is at the beginning you have no selection bias because there is no abortion. Towards the end you have more and more abortion so the families that still have a girl are the ones who care more about girls. And that could be different.

So the thing is that it should be different in a relaxed and non relaxed area to create a problem. But if we are thinking that the relaxed areas are the areas where the bias was the worse to start with then this bias gets more and more chances to express itself over time because the abortion becomes available. And so that might also create a bias.

So these two points are both excellent points. But they are different points. One is that these might be a bias in estimating the effect. And yours is a point about the interpretation, which I think is quite valid. [INAUDIBLE].

**AUDIENCE:** This doesn't tell us anything about average levels of education again, though, right?.

**PROFESSOR:** No. This is all in differences.

**AUDIENCE:** Yeah. So if girls get, say, a year of education now where they got zero years of

education before, the difference is made up, whereas boys get, say, 10 years of education.

**PROFESSOR:** Absolutely. This tells you nothing about the difference between girls and boys. This tells you that whatever this difference was and whatever this difference-- it used to be bigger. Girls used to be more disadvantaged in the relaxed areas before the relaxation happened and after.

**AUDIENCE:** I was just thinking, if for boys there was no change but boys were still getting a high level of education, this doesn't really say anything. But also if girls who were getting zero education now are getting one year, that also doesn't seem that significant.

**PROFESSOR:** Right. That is always like whatever the outcome versus the-- it turns out, I think, that in China once they're born, it's not that girls get very different level of education. So in that sense, I don't know what the levels are. But I don't think they're quite different to start with.

So those are all excellent points. So all that to say that maybe this is-- I agree with you. In fact, I put [INAUDIBLE] point on the slide. Your other points were also well taken.

Maybe that's not the end of the world. That's not the end of the story. This is definitely probably the opposite of what would have been expected. I'm sure it's quite the opposite of what she expected to find.

So here is one more normal example where it's not the one child policy. We are not forcing you to abort the child that you don't like the gender of, et cetera. That's the ICDDR,B program in Bangladesh where they provided women in treatment areas with regular access to contraceptives, a community health worker that visits women at home regularly, et cetera.

And they did this program pretty constantly since the late '70s. It went on and on and on and it's still going on today. And that program was effective after really insisting, very effective in reducing the number of children. At the beginning it was the most effective. And then this effectiveness went down, not because the number



of birth increased a lot in the program area, but because the number of birth declined everywhere and everywhere in Bangladesh very fast during the period.

So at the end of the day the effectiveness of this program is a bit contested in that it might just have accelerated a trend that would have happened anyway. But regardless, it provides us a good window into what is the effect of a smaller family because by 1996 women in treatment area had 1.2 fewer children than women in the control area, out of an average of perhaps four or five. So that's not an insignificant change. And there we are very much closer to the type of evaluation that you wanted to see, which is if I reduce from five to four, do I see a difference in the outcomes?

Another thing the program did is to provide very good prenatal and postnatal care to the kids. Immunization, oral rehydration solution, et cetera, et cetera. So one outcome that you don't get is that kids are much more likely to die in infancy. That's fine. But that may not be an effect of having fewer families because all these external inputs were given at the same time.

In 1996, a group of researchers led by [? RAND ?] went back to the area and did a very detailed survey of everybody living in both treatment and control villages, which is available on the web. So that is something which people can-- if we want to do, like, undergraduate projects or whatever involving data, that should be a good source of data, very rich.

And first they look, of course, is to look at whether you find any affect on the quality of the children who were born during this period in treatment area and in control area, given that in treatment they lived in a much smaller family. And what they find is no difference, no difference in height, no difference in weight, no difference in school enrollment, no difference in years of education, nothing. So, again, here it's your most, like, kind of classical example of effective population control of family.

A lot of the argument that you guys discussed in the context of the one child policy can't really be made. It's not Israel. We can't say it's a rich country that is able to educate all these kids. And, again, we find no effect. Yeah.

**AUDIENCE:** I thought this was really interesting because it kind of ties into what we've discussed throughout the class. I thought there has to be more inputs into this equation. So if students or parents are more educated on the effects of how their children could potentially benefit from more years of education then you would expect if they reduce the number of children, the children would get more years of education. But if the parents weren't necessarily educated on that and didn't see the benefits of it, then they just may substitute away from the research they would expend on an additional child [INAUDIBLE] or-- I don't know. Something other than the things we're looking at here.

**PROFESSOR:** Exactly. So one possibility is that that's going back to the argument we are making about Malthus is maybe the pie is actually not fixed because as you have more children, well, you're going to spend more money on the children. And as you have fewer children, you're spending less money on the children so that what determines how much you decide to invest in the child is less the number of children you have total but what you think the returns to this investment is going to be.

And another thing is that in a lot of cases the investment that we are talking about, they are not so much money because even in Bangladesh school is largely free. Maybe keeping a child, you know, nourishing your child is, of course, not free. But it's not very, very expensive compared to other things you could do.

So maybe what we see is that there is not so much of a fixed budget constraint for how much you can afford to spend on your children. But it's a whole family constraint. And what is determined in children investment is less how much money do you have or how much time do you have, but how you decide to allocate this budget, which corresponds more to the perception of cost and benefits as we've seen in all of our previous lectures. So maybe you're right and maybe we should have expected that, and it just didn't tie into things. Yeah.

**AUDIENCE:** Maybe one way to look at it is to look at the effect on everyone else in the family, like the parents. Because, I guess, maybe a mom would feed her children the same as how many children she has. But, it would affect, like you said, that overall budget

[INAUDIBLE].

**PROFESSOR:** So that is discussed a little bit in the chapter you read. So what did people find when they looked at the mothers?

**AUDIENCE:** The women in the treatment areas ended up with more jobs. I don't remember if they had [INAUDIBLE] or not.

**PROFESSOR:** So in Matlab, what you find is the mother in the treatment areas are more likely to work and their BMI is higher. And then there was this other study from Colombia, which we are going to see in a minute, which showed a modest reduction in the number of children but also a lot of effect on the timing of children where people are having children later. And you find large effect on women's education and woman's job market participation.

So I think that's where you do find it's exactly what you're saying is happening, which is that the pie expands and contracts with the number of children. And, of course, something else gives in. But that's maybe the mom for example.

**AUDIENCE:** One of the things that was brought was the idea that children are kind of used like pension plans in a way. And if you have less children you save more [INAUDIBLE]. Has there been any studies looking at difference in governments, if it's more of a socialist government and how much social security they give and then relate that to fertility?

**PROFESSOR:** So it's a great question. And the quick answer to that question is, surprisingly, no. So if you've read the book carefully, you notice that we talked about the effect of family planning and we talk about the effect of culture or social norms and stuff like that, which I'm going to do in a minute.

And then when we want to talk about economics, we start looking at the opposite research is people who have more children save less, or people who have fewer children save more. So we switch the equation suddenly, and therefore we don't provide evidence that if there is a Social Security introduced or better insurance, essentially people have to fewer children. We make the argument, but we actually

have no study that directly supports this argument. We only have the opposite studies, that people who have fewer children save more. And so that is likely. That, I think, actually would be a very nice study to do.

So that was for the first part of the argument that large families are bad. And so by the end of whatever literature there is right now, we are yet to see any smoking gun for that one. The second part of the argument is people cannot control their fertility.

The not so nice version is the cartoon I showed you where basically they can't control their fertility because they are idiots. And the nicer version, at least the more politically correct version, is they can't control their fertility because access to contraception is difficult. So let's test that. What's the impact of making contraceptive available on reducing family size?

I mentioned that program a moment ago. It's a program that was introduced by Colombia by a young doctor. Well, eventually he aged. But in the beginning he was young.

There was nothing before him. And there was a big reduction in fertility in Colombia between the time that he introduced his program and when it was fully expended. Fertility in Colombia reduced from about-- you must remember that I showed it yesterday-- seven children per woman to about three children per woman between the 1960s and the 1990s.

Now, fertility declined in all of the Latin American countries. But it declined much faster in Colombia. Colombia used to be the country in Latin America with the highest number of children per woman. And it switched to being the one with the lowest number of children per woman. I think it was the second highest, and went to become the second lowest.

So is it due to the program? Of course, many other things happened in Colombia at that time. So it may or may not be due to the program. So to look at the effect, young professor in Stanford named Grant Miller looked at the way the program expanded.

And what he argued is that the doctor had limited resources and he didn't have a strong view about where the program should be put in place because he wanted the program to be put in place everywhere anyway. So whenever he had a chance somewhere, he would go. So what he argues is that we can compare women who had access to women who didn't have access at various periods in their life.

And then because maybe you don't want to fully believe this argument, he says, well, that's fine. Let's also look at how has this changed over time. So let's compare a woman who was born later in the places that got the family program later to a woman who was born earlier in a place that got the family program later. So the second woman didn't get to benefit from the program, and the first did. And if you combine the two sources of variation, you get some idea of what was the effect of the family planning program, very much like the same kind of strategy that we used for the one child policy in China.

So here you have the results, first in log number of births, which telling you it's 11% fewer children per woman who got family planning access. Maybe it's easier to look at this one, which is a number of birth of kids born to a woman. This is when you just assume that the program is randomly assigned. So compare places which got the program early to places that got the program later. This is controlling for inherent differences by using the expansion. Now, it's also very similar, so we can focus on this one.

And that tells you that having access to the program when you were young does have an effect, very significant effect. That's the t-statistic, 6.4% divided by 0.004. The t-statistic is through the roof. That's extremely significant. Shows you that a woman who had access to the family planning when she was 15 to 19 had about 6.4% fewer children. So that's very significant.

But is it very large? It's very, very small. It's less than one tenths of a child per woman. So it's like that much.

[LAUGHTER]

**PROFESSOR:** That's not a big part of a child. So it's not a very big effect, even though it's very precisely estimated. The biggest effect are obtained for teen, people who got the program when they were a teen and then a few when they were 20 to 24 and 25 to 29 and then, of course, the effect become lower because after 35 most people are finished, have completed their fertility.

So what this tells us is, yes, there is an effect of getting access to contraception. But it's tiny. It's tiny, tiny. It's like 5% of a child. That's not a big effect at all.

And, in fact, that corresponds to a very small part of the overall trend in fertility reduction in Colombia at the time, about 1/10, maximum 1/10. So this wasn't a very big deal. So was this unique? It was not very unique.

Other program was submitted in Indonesia which varies the same type of idea, found no effect at all. But I already spoke to you about the Matlab the ICDDR,B program in Bangladesh. Matlab is not only a software program, it's also a place, which is the place where they did this program.

And in Matlab I just told you that the fertility got reduced by the program. But there's two points to make about Matlab. Number one, it was a very intensive program where someone came to the house every other week. It's also a place where a lot of women were in [INAUDIBLE]. So they were not allowed to get outside of the home. So it was harder for them to access the contraception or even to know that it was available.

And this community health worker was very dynamic, very forward young women that were going to everybody's family and really trying to convince them. So you would think that the Matlab program is something else than access. It's also changing people's preferences. That's point number one.

Point number two, as I was saying a minute ago, initially the effects were very large. But then the effect in differences between treatment and control decline and decline and decline because everywhere in Bangladesh, including in the control area, fertility declined anyway. So this is an extremely expensive program, which by the

end of the day just accelerated a trend that happened in Bangladesh where the reduction in fertility was huge over the period and seemed to have very little to do with this program but everything to do with other things that were happening in Bangladesh.

So it seems that contraception plays a role but not a very big one, maybe an acceleration role, maybe a small reduction in fertility, maybe a timing role. Of course, that doesn't mean that you don't want to have contraception available because it is much nicer to control your fertility with contraception than without. And the timing is also important.

So I'm not here advocating we should stop spending any effort trying to make contraception available. Just to say that as a population control policy, paradoxically it's pretty ineffective, which means that if you wanted to control family planning policy, you would have to understand why people make the decision they make because it seems that they are able to make their decision and then they will stick to them. And if you make contraception available, they'll use the contraception to stick to them. And if you don't, they'll anyway find a way. So we need to go further in understanding the decision, which we'll do next time. You.

**AUDIENCE:** Just a small thought that maybe it's possible that as long as the program's in place, everyone heard about it, and this brought the subject of not having as many children closer to mind, and that helped anyway despite not directly helping.

**PROFESSOR:** Yes. So we'll discuss that. Except that I don't think the discussion went much further. In fact, there is a paper I will discuss briefly next time where the discussion is very narrow. It's like people from you compound and you discuss with them. Even within treatment villages we see the differences. Yep.

**AUDIENCE:** I was [? really flustered ?] in the same thing. Is that the kind of acceleration that you're talking about? That, like, having this program in place caused the rest of the country to have--

**PROFESSOR:** No. What I'm claiming is that if no one had done any program in Matlab, fertility in

Bangladesh would be today what it is. Matlab is a very small place that technically didn't effect the rest of Bangladesh. But what happened is that it was faster in Matlab because of the-- that said, both of you make a good point about social norms that may have shifted in part.

I think Matlab was too small to make any big impact on the rest of Bangladesh. So what it did is that people were running a race in the family reduction. And the Matlab people arrived a little bit earlier. But they didn't arrive much faster. You had a point?

**AUDIENCE:** [INAUDIBLE].

**PROFESSOR:** OK. So we'll stop here and pick up again on decisions next time.