

Pinelopi Goldberg

On developing countries, measuring economies by satellite, and the learning crisis

Yale economist Pinelopi “Penny” Goldberg was educated in her native Greece at a German-language school, the Deutsche Schule Athen. “My parents were engineers, and they had a natural admiration for German engineering,” she explains. “So they sent us to a German school.” From there, she went to study economics at a German university, where the curriculum at the time centered on the writings of the field’s important figures. “We were very much encouraged in Germany to read the great texts, with everything in the original – Adam Smith, Keynes, the great thinkers.”

As a Ph.D. student at Stanford, Goldberg did research on the trade war between the United States and Japan, looking at the countries’ auto industries and strategic trade policies. “There are many parallels to what’s happening now,” she says. Her research work gradually moved into development economics as she saw the dependence of low-income countries on trade for economic survival.

Today, she is a leading researcher in trade and development economics, with a series of faculty appointments at Columbia University, Princeton University, and Yale, interrupted by her tenure from 2018 to 2020 as chief economist of the World Bank. There, she was active in the Bank’s efforts to improve the measurement of human capital in developing countries as well as research into the use of satellite data to measure economic activity, among other areas. She was editor-in-chief of the *American Economic Review* from 2011 to 2016.

David A. Price interviewed Goldberg by videoconference in January 2022.



EF: Many people and institutions involved in development economics in the 1990s were optimistic about the ability of globalization to bring progress to developing countries. Reducing trade restrictions and eliminating barriers to direct foreign investment were of course a major part of the so-called “Washington Consensus” about what developing countries should do. Is there still such a sense of optimism?

Goldberg: Globalization was just one component of the Washington Consensus. In my opinion, it did deliver. It did help countries, especially in East Asia, reduce poverty and grow quickly.

But right now, there is a pessimism that the same model can deliver in the future. So my answer to your question is “no.” This is partly because of the rise of automation. The traditional advantage of low-wage countries has been in low-skill-intensive manufacturing, which they would export to richer countries consistent with their comparative advantage. At the same time, this process created export revenue, which they could invest in physical infrastructure, human capital, institutions, and so on. This is a model that worked well in many countries, especially in East Asia.

With the rise of automation, there is fear that machines are going to replace low-wage workers in many developing countries. That said, this has not happened yet. But the concern is there.

What is more real, in my view, is that there has been an enormous backlash against globalization – not just in the United States, in many countries all over the world. We’ve seen worldwide the rise of economic nationalism. Trade is not dead; trade is still growing, actually. But I don’t think

that Africa can play the same role in the future that China or Vietnam or Korea played in the past. The conditions for such export-led growth are not there anymore. I cannot imagine the United States opening its borders these days to an influx of imports from low-wage countries in Africa. So I don't think this model is viable anymore.

DEVELOPMENT AND RANDOMIZED CONTROL TRIALS

EF: What have been the biggest advances in development economics since the years of the Washington Consensus?

Goldberg: I think the main advances have been more on the micro side. Early on, development was much more macro-oriented, focusing on models and theories of structural transformation, starting with the seminal work of Arthur Lewis in the 1950s. Of course, this work is incredibly important and still very relevant. But in the last two decades, people have realized that the micro foundations of growth are equally important, especially in the context of developing countries. So there has been a lot of work on the role of human capital in developing countries, on the role of institutions, on the role of gender. That's one aspect of progress.

The other aspect is that there has been a realization that it doesn't just matter what policies you adopt, but also how they are implemented. Careful implementation is key for success. So there has been a lot of work in trying to figure out which policies work and why they work. And that has led to the rise of randomized control trials, in which the field of development has played a key role. Development led the charge for what people call the credibility revolution in economics.

I see these two aspects as the main contributions of recent work in development. At this point, the field is very general. It stretches across every area of economics and every subfield within economics.

EF: What is an example of the use of randomized control trials in development economics?

Goldberg: One example is a famous paper in 2004 by Michael Kremer and Ted Miguel on deworming, which was shown to have long-term effects on people's health and on economic outcomes. It was one of the first papers in development economics to use a randomized control trial. The main insight of this paper is that in the case of many health interventions, one needs to randomize across groups — across schools, in this case — and not just within groups (that is, within schools). Why? Because there are externalities: When one deworms some students, other students in the same school also benefit. This was an insight that *ex post* may seem obvious, but at the time was not.

Many years after the completion of the randomized control trial, Kremer and Miguel went back with some

additional co-authors and examined the long-term trajectory of people who had been exposed to this intervention, and they found extremely large effects.

Early on, randomized control trials were very limited in scope. That has changed. These days, randomized control trials tend to be much more ambitious.

MEASURING BY SATELLITE

EF: You have experimented with using alternative measures of economic growth for developing countries, such as satellite measurement of nighttime lighting. Why is this interesting to you?

Goldberg: First, let me emphasize that I am an advocate of these measures, but as a supplement to traditional methods, not as a substitute. To give you one example, in work we published in the *Journal of Economic Perspectives*, we talk about the vegetation index, which is based on satellite data. Of course, no one would ever think of replacing the systems of national accounts with the vegetation index. But for some countries, especially in Africa, we show that the vegetation index can capture small-holder agricultural activity, which is very important for these countries. So if you combine that index with traditional data, you can get a more accurate measure of GDP and of growth. So sometimes this data can complement existing measures.

A second big advantage is low cost.

Third, such data come in high frequency. If you think of a census of population, it's every 10 years. The data are, of course, more current if you're using mobile phone activity or nighttime lights to estimate economic activity in a particular area.

Another advantage, finally, is that in some settings, where we may not trust the authorities, satellite data offer an additional way of checking the official data. A good example is the Billion Prices Project. In most cases, the inflation measures you would get out of this data would be similar to what you would get from the official data. But in the case of Argentina, people got a very different estimate of inflation based on this data in the past. So this is a good way of providing an additional check.

Of course, the main disadvantage of all these data is that they're not collected for the purpose of measuring economic activity. With the system of national accounts and the data sets that are collected by statistical agencies, statisticians put considerable effort into making sure that the data are representative of the whole population. This new data is not necessarily representative of the whole population, and this is something we need to keep in mind. My first choice would be to promote the collection of better data through statistical agencies in low-income countries and better training of statisticians in these countries. But this is not always possible.

MISSING EDUCATION

EF: While you were at the World Bank, you and several co-authors developed a new way to compare the formation of human capital in different countries. Why does this matter?

Goldberg: Human capital, generally speaking, refers to resources embedded in people. Broadly, we associate human capital with the knowledge, skills, and health that form an individual's potential to contribute to an economy. In the common definition used in the academic literature in economics, we tend to focus on education.

Human capital is important because people are one of the most important resources of a country. There has been a lot of work that shows that human capital is positively associated with growth. The question of causality — what causes what — is always a tricky one, but there is substantial supporting evidence that investing in human capital leads to higher growth. So these are some of the reasons to take human capital seriously.

While I was at the World Bank, we put a lot of emphasis on human capital. The main reason is that policymakers tend to prioritize investments in physical infrastructure — roads and bridges. It's quite striking that in many countries, policymakers are willing to invest very heavily in physical infrastructure, but not in human infrastructure.

Of course, roads and bridges are important. From a policymaker's point of view, they also have the advantage that the results are visible in the short run or medium run. You can see the bridge, you can see the road, you use them, and then you value the politician who's behind it. Investments in human capital take many years to bear fruit. Because of that, we thought it was important to promote this agenda and to provide incentives to policymakers to invest in human capital, because left on their own, they would not do that; the political incentives are not there.

Pinelopi (Penny) Koujianou Goldberg

■ PRESENT POSITION

Elihu Professor of Economics, Yale University

■ SELECTED PAST POSITIONS

Chief Economist, World Bank Group, 2018-2020; William K. Lanman, Jr. Professor of Economics, Yale University, 2010-2017; Professor of Economics, Princeton University, 2007-2010; editor-in-chief, *American Economic Review*, 2011-2016

■ SELECTED ADDITIONAL AFFILIATIONS

President, Econometric Society; Faculty Research Associate, National Bureau of Economic Research; Distinguished Fellow, Centre for Economic Policy Research; Member, National Academy of Sciences; Member, American Academy of Arts and Sciences

■ EDUCATION

Ph.D. (1992), Stanford University; Diplom in Economics (1986), University of Freiburg, Germany

EF: You and your co-authors said it's important to go beyond looking at years of schooling when making these kinds of comparisons. Why?

Goldberg: Years of schooling is the standard measure of education. The reason people have traditionally used it is because it's easier to obtain than any other measure. It's also comparable across countries. But there has been a lot of recent work by the World Bank, UNESCO, Lant Pritchett, and others that argued that in many countries, we saw increasing enrollment rates in primary school and increasing years of schooling, yet we saw no improvements in education. There are some examples in the *World Development Report* of the World Bank in 2018. For instance, in India, kids in grade three could not do a two-digit subtraction, like 47 minus 18. Or they could not read a very simple sentence.

So there was anecdotal evidence suggesting that kids were going to

school, but they were not learning basic skills like reading or writing or simple arithmetic. Then what's the point of going to school?

In our further work, we showed that this didn't apply only to a few isolated countries. It's a global phenomenon. Many institutions have called it a learning crisis.

EF: What do you think has been going on here?

Goldberg: There has been a lot of evidence on what has not worked in education. There is little evidence of what has worked. Let me start by ruling out one hypothesis that has been suggested. The first thing that comes to mind when you talk about increasing enrollment is that this may generate selection effects — that is, if you increase enrollment rates, some marginal students may enter the system, and those students will not do well in tests. I think that in general, this is a very valid comment, especially if you apply it to secondary education. But at the primary school level, we are talking about very basic skills, reading and writing. And the whole point of going to the primary school is that you learn these basic skills. It's not rocket science; you don't need to be a genius to know how to read a sentence. So if the additional students who enter the primary schools do not improve, even if they were marginal by some metric of ability, that would be a failure of the educational system, because these are very basic skills. In addition, in many settings, we can show that the outcomes are not driven by selection effects.

So what is going on? In some countries, there is evidence that in many schools, there is absenteeism — on the part of the teachers and on the part of the students, partly because there's no accountability. Teachers may not show up for whatever reason. Or students may not show up because, in some cases, the parents do not value education; they enroll the kids in school, but then the kids miss many days.

Another factor is that in many low-income settings, teachers and books target the top students but not the average student. So the teaching methods and the books are great if you are a student who is going to continue onward to secondary school or get a university education. But for the average student who needs very basic skills, the system fails them. Some people have suggested tracking as a better method to address this issue.

One thing that has not worked to improve the quality of education is spending on buildings or computers. I mention that because donors are often eager to help and they send money in. And this money is invested in textbooks, beautiful buildings, laptop computers. But a lot of work has shown that none of these has helped much to increase the quality of education. The lesson is that simply throwing money at the problem does not solve it. This is a case where randomized control trials have helped because you can often use randomization to see which interventions are effective and which are not — and the results may not be what was anticipated.

THE COVID-19 SURPRISE

EF: In work with Tristan Reed, you have found that COVID-19 deaths per capita were actually much lower in poorer countries than in richer ones. This seems surprising. What happened?

Goldberg: Tristan and I presented this research at a Brookings conference in June 2020 with great trepidation, because that was near the beginning of the pandemic. Most people's reaction was that this result was just because poor countries are not connected, so COVID-19 had not arrived there yet. But there was anecdotal evidence that COVID-19

had indeed arrived there. Most capitals of low-income countries are not as isolated as people think; many of these cities are global cities. They are connected to the rest of the world. So it was surprising that the deaths were so low.

Another reaction was that this was all measurement error. And, again, that

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comes back to the issue that people tend to dismiss data coming from developing countries. It's clear that measurement error exists and is important in the case of COVID-19 in many countries, especially in low-income settings. But the differences in deaths are huge — orders of magnitude apart. Just to give you one striking example, in the United States right now, the deaths per million are around 2,500. In Nigeria, the number is 14; in India, it's 340. And it's not easy to hide deaths. Yes, there is measurement error — probably deaths and hospitalizations are much higher in low-income countries than the statistics show — but still, there is a big difference between low-income countries and richer ones.

I think there are three reasons at work. We pointed out two of them in this initial working paper. First, everyone agrees that two of the risk factors for a serious reaction to COVID-19 leading to hospitalization and death are age and obesity. The age distribution in many low-income countries is very different from that in the United States. To mention a striking case, in Niger, the median age is 15; there, COVID-19 would probably not have very severe health effects on the

population. On top of that, in low-income settings, obesity is much lower. These two factors alone could explain a lot of the difference.

In addition, many epidemiologists talk about what they call "trained immunity" for low-income countries. The idea is that people in those countries are exposed to disease all the time, so their immune systems have learned how to cope. An alternative interpretation is that there has been selection; the ones who have managed to survive the various diseases they've been exposed to have very strong immune systems.

It seems that all these factors have contributed. It's still the case that the poorer the country, the lower the per capita COVID-19 deaths so far. We'll see whether this holds in the future.

EF: In research that was published in 2020 in the *Quarterly Journal of Economics*, you looked at the effects of the 2018 Trump tariffs. You found that between those tariffs and the retaliatory tariffs of other countries, such as China, there was a substantial redistribution from U.S. buyers of foreign goods in favor of U.S. producers and to the government. Is this what you expected to see?

Goldberg: To a certain extent, what we didn't expect to see is that U.S. buyers would be hurt. This is because the United States is a powerful country; to a certain extent, everyone thought that China would eat some of the tariff. What our work showed, and others' as well, is that the tariffs were completely paid by the U.S. importing side. The other effect that some people didn't expect is that the part of the economy that was hurt the most by the tariffs was people in Republican counties, and this is because of the retaliation by China; they targeted mainly agricultural commodities.

We have a follow-up paper where we look at how third countries were affected by the tariffs. What we show is that many countries benefited from the tariffs; trade seems to have been reallocated from the United States and China toward other countries. What did not happen is reshoring of economic activity back to the United States.

EF: What are you working on now?

Goldberg: I have three different lines of research. One is my follow-up work on the U.S.-China trade war. As I mentioned, we focus in our new paper on bystander countries or third countries. One interesting finding of this work is that we find that the trade war didn't simply reallocate the exports of these countries toward the United States and China, as you might expect. It also increased global exports. So, to a certain extent, it led to net trade creation, which is surprising. We don't expect a trade war to actually lead to more trade. But it seems that happened in this case, maybe because countries decided to invest more in trade capacity, or perhaps because there are scale economies. We think it's an interesting pattern.

Then I have a line of work on informality in developing countries. By informality, I mean the part of the economy that's invisible to governments. And often, this informal sector emerges in response to labor market regulations and restrictions. We look at the case of Brazil in particular. We developed a framework that helps us understand the emergence of informality, and we ask the question of how trade policy affects various outcomes in the presence of informality.

And then I have a new line of research — new for me — on gender in developing countries. This line of research that was inspired by my time at the World Bank in which I saw how important these gender issues are. In

low-income countries, they're important not just for the women who live there, but also highly important for the country as a whole for growth.

RESEARCH INSIDE POLICY INSTITUTIONS

EF: Based on your experience at the World Bank, do you think institutions outside of academia — such as the World Bank or the Fed — benefit from having their own research departments?

Goldberg: I think they benefit greatly from their research departments. And

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these research departments also benefit both academia and the world at large. The reason is that the research in such institutions tends to be a little different from the research in academia. It tends to focus on policy-relevant questions. People who are close to policy tend to have a much better sense, at least in the short run, of what the important questions are. So in terms of coming up with and framing questions, they're often ahead of academia. I think that's an important service that research departments in these institutions provide.

An additional reason research departments are good for the institutions is that they offer a way to attract the best talent. If you want to attract talented, creative people, you have to give them some freedom to think independently.

Finally, structured thinking is important in policymaking. Research

tends to hone precisely those qualities that are important in policy: You have to be creative, you have to be able to question assumptions, you have to be able to formulate hypotheses and test them, you have to be able to abandon hypotheses that were proven wrong.

EF: And from the researcher's point of view, what is different about doing economic research in an institution outside of academia?

Goldberg: I already mentioned they're much closer to policy and to applied questions. For many people, this is fascinating. Another big difference, I

think, is that you operate on a different time horizon. In academia, we can take our time, we can spend five years on the project, we can revise the paper multiple times if we want. Research departments in policy institutions are not given five years to complete a project. So there is more time pressure, and that has pluses and minuses. On one hand, your work is much more topical and relevant.

On the other hand, sometimes you are under pressure to put out work that is not completed.

Another difference — which, in my opinion, is often exaggerated — is freedom of speech. I agree to a certain extent with Paul Romer that when you work in the private sector or in a policy institution, you cannot say whatever you want. But the fact is, neither can you in academia. In academia, of course you can write whatever you want, and you can put it on your website. Most academics, however, want to be published. And if you want to get published, you are constrained by the conventions and norms of your field. And most academics internalize those norms. So yes, there are constraints in both settings. But if you're in a good policy institution, there is a lot of freedom to do interesting and important work. **EF**