



Redrawing the Poverty Line

For those who help the poor, a bit of math is exposing a kaleidoscopic view of poverty.

BY ANDREW EDER

On the wall of economist James Foster's office hangs a painting of blossoming roses, connected by a stem. Woven into the dark background is a repeating string of letters and symbols—a piece of a mathematical formula.

Muted and gray, the equation would seem a strange accompaniment for the vibrant red roses. But like the roses, it hints at a brighter future.

The formula—developed by Dr. Foster, a GW professor of economics and international affairs, and Sabina Alkire of Oxford University—is redefining the

meaning of poverty and, with it, reshaping our understanding of how to ease that burden. It's used to measure "multidimensional poverty"—the concept that poverty and well-being are defined by factors such as education, health, and housing, not just income. The United Nations Development Program has made use of it, as have the governments of Mexico and Colombia, and other organizations

are just under the line rather than the ultra-poor, like the more than 150 million people who live on less than 50 cents a day. Dr. Foster and Dr. Smith say policymakers have told them that this pressure to target the "low-hanging fruit" is very real.

If policy is informed by a more comprehensive picture of poverty, then the pressure increases to direct benefits to the poorest of the poor—to truly move the bar on poverty.

ratio—the percentage of people living in poverty. Another version of the formula gives what's called the average poverty gap—the average amount of income that each person would need to reach the poverty line.

One of the innovations of Dr. Foster and his co-authors was to take the formula a step further, creating a version that emphasized the variations in income

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looking to extend their definition of poverty beyond the traditional "dollar-a-day" measure.

"Education, health, sanitation, asset-building, quality of jobs—these are all dimensions of poverty," says Dr. Foster, who is director of the Institute for International Economic Policy (IIEP) at the Elliott School of International Affairs.

That kind of data, he says, can generate a comprehensive, three-dimensional image of poverty capable of helping policy hit its mark.

The idea now drives the work of the institute's ultra-poverty initiative, led by Dr. Foster and Stephen Smith, a professor of economics and international affairs and Dr. Foster's predecessor as IIEP director. The institute, with the support of an anonymous donor, is uncovering a more nuanced understanding of the reality of poverty—extreme poverty, in particular—and the programs aimed at addressing it.

The effort is important, Dr. Foster and Dr. Smith say, because many international evaluations of poverty still rely on the "headcount ratio"—the proportion of people in a country or region who live on less than a certain amount (the equivalent of \$1.25 per day is the typical cutoff for "extreme poverty"). But if the goal is to reduce this proportion, there's an incentive for policymakers to target people who

"What gets measured gets focused on," Dr. Smith says. "And what gets measured *well* can get focused on well."

In 1981, as a Ph.D. student with a background in mathematics and theory, Dr. Foster co-authored a paper presenting a series of measures that attempted to shed light on the depth of poverty and the level of disparity in incomes among the poor.

That the paper was published at all, in 1984 in the journal *Econometrica*, was surprising. In initial comments to the authors, one reviewer openly doubted whether the paper's contribution was sufficient to warrant publication, while the journal's editor said he was "not anxious to publish 'another poverty index'" and gave the paper, even with revisions, a 50 percent chance of acceptance.

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Several concepts introduced in the paper have proved influential in the years since its publication.

The paper outlined variations on a formula. At its most basic level, the FGT formula shows the headcount

among the poor. The measure helped call attention to the condition of the poorest of the poor.

Another innovation was the "decomposable" nature of the measures, meaning they could be applied to both a large population and subgroups of that population in order to see how they compare—for example, whether a particular region or ethnic group suffers from a disparity in poverty compared to the country as a whole.

These characteristics of the FGT measures have helped move them beyond the realm of research and into the real world. When the government of Mexico created the anti-poverty program Progres (now known as Oportunidades), it used the measures to ensure the program was targeting those in greatest need of assistance.

"What was interesting was that when the paper and our measure started becoming more important, people directed me back to it, saying, 'Yeah, but what can we do in this case? How can we extend it in this way?'" Dr. Foster says.

The answer walked right up to him.

In 2006 Dr. Foster presented a paper that applied the measures to the condition of chronic poverty. Afterward, Sabina Alkire, director of the Oxford Poverty and Human Development Initiative (OPHI), approached him and raised the idea of applying the FGT measures to multidimensional poverty.

The formula composed by Dr. Foster and Dr. Alkire to help measure and alleviate poverty has also inspired art. In this painting, the formula weaves among a flock of canaries.



James Foster stands in his Foggy Bottom office, in front of the painting where roses juxtapose his formula for measuring multidimensional poverty.

WILLIAM ATKINS

factors contribute to well-being and development.

“People can get it,” he says, “and therefore there’s this dialogue that can go on between civil society, policymakers, and people who are poor.”

The governments of Mexico and Colombia have both used the Alkire-Foster methodology to create multidimensional poverty measures that help coordinate policy. The country of Bhutan drew on the methodology to create its “gross national happiness” index, and other countries are considering using it as well.

Earlier this year the U.S. Agency for International Development, in partnership with OPHI (where Dr. Foster is a research associate) and the International

Dr. Foster and Dr. Alkire are both disciples of Nobel Prize-winning economist Amartya Sen’s capability approach, which examines human development in terms of a person’s capability to do and to be what they value. Poverty is seen as a deprivation of the capabilities needed to live a good life, while development is the expansion of those capabilities.

“The whole capability approach is a great way of conceptualizing poverty and well-being,” Dr. Foster says. “But it has resisted practical implementation.”

So when Dr. Alkire raised the idea, he was skeptical. How could a quantitative measure like income relate to a qualitative measure like educational quality?

For five hours the two scrutinized the puzzle pieces and found a fit, sketching out a formula and framework for reliably and practically relating, essentially, apples to oranges. By accounting for the numerous deprivations of the poor in a single measure, the new direction had the capacity to expand on Dr. Sen’s work while helping to guide public policy.

The next year Dr. Foster and Dr. Alkire released a paper that detailed a new methodology for measuring multidimensional poverty. It involves first choosing dimensions (such as health or education) as well as indica-

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tors for those dimensions (such as child mortality or years of schooling). Cutoffs are then set for each indicator in order to determine who is deprived. Another cutoff is used to determine how many deprivations a person must suffer to be considered multidimensionally poor.

With this information in hand, the data can be aggregated, using an extension of the original FGT measures, to show the full spread of poverty as well as the specific deprivations suffered by the poor—financial hardship, access to education, access to water—and how deep those run. As with the FGT measures, these data can be broken down by subgroups such as regions or ethnic groups, or by individual dimensions to examine their contribution to overall poverty.

The Alkire-Foster methodology also allows countries or development agencies to select their own dimensions and indicators, based on local context.

Most importantly, says Dr. Foster, the simple nature of it encourages reflection among all stakeholders about what

Food Policy Research Institute, released the Women’s Empowerment in Agriculture Index, which uses the methodology to measure the status of women in the agricultural sector.

Perhaps the most notable application of the methodology has been the Multidimensional Poverty Index, launched in 2010 by OPHI and the United Nations Development Program. This measure, which is published in the UNDP’s Human Development Report, draws on survey data from more than 100 developing countries to examine poverty across three dimensions: health, education, and living standards. Households are evaluated across 10 indicators; people who were deprived in 33 percent or more were considered multidimensionally poor.

The results offered a different view of global poverty than that produced by simply looking at income.

While 1.3 billion people across the countries measured were estimated to live on less than \$1.25 a day, about 1.7 billion were classified as multidimensionally poor. Individual countries showed disparities,

too: Ethiopia, for example, had 39 percent of its population living on less than \$1.25 a day but 90 percent in multidimensional poverty, suggesting that most Ethiopians face deprivations beyond just income. On the other hand, 89 percent of people in Tanzania were poor by income measures, compared to 65 percent under the Multidimensional Poverty Index.

“The MPI provides a fuller measure of poverty than the traditional dollar-a-day formulas,” Jeni Klugman, the then-director of the UNDP’s Human Development Report Office, said following its release in 2010. “It is a valuable addition to the family of instruments we use to examine broader aspects of well-being.”

Evolution and improvement

in poverty measurement march on, Dr. Foster says. There’s much left to be done.

He notes that countries report data on labor conditions regularly, but poverty measures are far more infrequent. And there are frontiers yet to be explored in translating the underpinnings of poverty into mathematics and in evaluating aid programs.

Chrysanthi Hatzimasoura, a lecturer in economics and doctoral candidate studying under Dr. Foster, is working to create measures for psychological variables of well-being, such as empowerment, motivation, and self-esteem—measures usually reported on an arbitrary scale. She is using them to evaluate the impact of a World Bank program in Nicaragua that aims to increase women’s empowerment.

Dr. Foster’s colleague Stephen Smith, the former IIEP director who in 2005 wrote the book *Ending Global Poverty: A Guide to What Works*, is on the U.S. advisory council of BRAC, by some measures the world’s largest nongovernmental organization. He has conducted evaluations of BRAC’s work to help the ultra-poor in Bangladesh by transferring assets such as livestock or seeds and training the beneficiaries to earn income.

Dr. Smith sees promise in building on Dr. Foster’s work to improve the targeting and evaluation of anti-poverty programs.

“We think that better measurements and the application of these measurements, which our research has also shown how to do, is likely to make a very big difference,” says Dr. Smith, who is on sabbatical during the 2012-2013 academic year—serving first as a Visiting Fulbright Scholar at India’s Kurukshetra University, then as a visiting scholar at the Brookings Institution.

Another key issue, says Dr. Foster, is forecasting poverty. “How do you create numbers that reflect reality and do a good job of estimating what is going on now and what might occur in the future so that you can direct policy in the right way?”

That research informs their teaching, too. Dr. Foster and Dr. Smith say current work makes it into their classrooms almost immediately.

Ms. Hatzimasoura, the doctoral student, says Dr. Foster has “rewired”

her brain to think differently. She says his work on multidimensional poverty has prompted people to really think about and define the concept before trying to measure it.

“It’s spoken to people who don’t necessarily understand the black box of statistics,” Ms. Hatzimasoura says. “I think it’s very close to the way people naturally think about poverty.”

For Dr. Foster, it represents a way to use the language of theory and mathematics to illuminate what exists in the real world. Like the painting of roses on his wall, Dr. Foster’s research shows the potential of data and measurement to cultivate a better future.

“I think the strong link between what’s in the world and what’s in the office really keeps the work alive,” Dr. Foster says. “It wouldn’t have importance if it didn’t do anything.” 



About the artist:

The concept of multidimensional poverty has struck a chord with more than just economists and policymakers. The rose painting in Dr. Foster’s office and the artwork on Pg. 24 are among a series of pieces by Santa Fe-based artist Regina Glassman Foster, Dr. Foster’s sister-in-law, which were inspired by his work on multidimensional poverty. For her, the concept represents not just suffering, but the ability to make changes and pursue happiness.

“It rings true,” Ms. Foster says. “If we can work on areas where we’re deprived, it will be a better world for our children, the next generation. It’s something that is doable.”

See more of Ms. Foster’s work at reginafoster.com and artandinequality.com.