

Improving management everywhere

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In the Indian state of Karnataka, many smallholder farmers have traditionally sold their products to intermediaries—wholesale traders who turn around and resell the goods for a quick profit. Much of the dealing between farmers and those traders has occurred locally, and farmers do not typically know what should be a "fair" price for their

products.

Recognizing that these farmers were not getting a reasonable share of the value of the products they grow, with many still living in poverty, the Karnataka state government wanted to create more transparent markets. They initiated a new digital market platform to connect over 150 previously isolated physical markets and unify all trading. To further improve the platform, the government started a collaboration with MIT Associate Professor Karen Zheng, an operations management scholar whose work often relies on [field research](#) to create data-driven new ideas, especially about supply chains.

The first step in the collaboration was a rigorous empirical assessment of how much the platform has increased prices for farmers. The analysis revealed that although prices increased significantly for some products, the prices of others practically stayed the same. So Zheng, working with several colleagues and students, began looking for solutions to boost prices for these products. Eventually they designed a new two-stage auction, with a second round of bidding added on for the highest-offering traders from the first round, and ran a pilot of the new auction for a major lentils market.

The result? Over a three-month period in the spring of 2019, average prices increased by about 5 percent, benefitting more than 10,000 farmers who traded under the new auction design, when compared to a similar market using the legacy auction format.

"Implementing the two-stage auction really led to significant improvements," says Zheng, the George M. Bunker Associate Professor at the MIT Sloan School of Management. "It is equally exciting to see that the same improvements persist into the next selling season."

Agricultural markets are hardly the only kind of topic Zheng studies. She

examines a wide variety of [supply-chain](#) issues, including matters of corporate social responsibility. But the Karnataka project does reflect the kind of work Zheng does more broadly, in that her research takes a multimethod approach, is based on extensive field work, and aims to have an applied impact.

"This whole process is really important to me as a researcher and reflects my perspective," Zheng says. "I want to know how I can model a problem correctly and shape my research to capture what is happening in the real world. And then you bring practical solutions back to the field and evaluate their outcome. I really enjoy this entire cycle of doing research."

For her research and teaching, Zheng was granted tenure at MIT last year.

Driving changes

Zheng, who grew up in China, credits her parents for fostering an environment focused on education.

"They put a lot of their influence and hope in me, but in a good way, not in a very pressurized way," Zheng says. She attended Tsinghua University in Beijing, receiving her undergraduate diploma as well as a master's degree in the field of automation—a blend of computer science, electrical engineering, and control theory.

Zheng then earned a Ph.D. in management science and engineering at Stanford University, fulfilling a longstanding ambition of studying abroad.

"At that time, it wasn't that I had determined I had to go into academia and become a professor," Zheng says. "I always just wanted the

experience."

Zheng might have ultimately gone into the [private sector](#), but at Stanford she became increasingly interested in the research challenges and practical applications of operations management.

"I like the applied aspect of math—to develop sensible mathematical models to capture practical challenges, and then solve them to create solutions that actually drive changes," Zheng says. "I think that's why I settled on operations management. I like to apply math to figure out how we can improve the world."

Zheng received her Ph.D. from Stanford in 2011 and joined the MIT faculty later that same year. She has remained at the Institute ever since. Having now gone through the rigors of the tenure track at MIT, Zheng adds that she appreciates "the transparency they [her senior colleagues] offered me throughout the process, and the frequent feedback on what I was doing. I've been very thankful for all the support I've received."

Visibility, transparency, and responsibility

Zheng's current and future research has multiple threads. While she continues to examine supply chain efficiencies and logistics in agriculture and other sectors, she also continues to pursue projects regarding environmental and social responsibility in supply chains.

"A lot of my work looks at social responsibility, especially in labor practices," Zheng says. Referring to the 2013 Dhaka garment factory collapse in Bangladesh and the string of suicides at a Foxconn plant in China, she adds, "All of these tragedies were part of the motivation."

A starting point for her research in this domain, Zheng says, is the lack of transparency in global supply chains. Even multinational brands

cannot usually track the sourcing of many of the materials and parts in their products.

"It's not only that consumers don't have visibility, but companies often don't know where products come from, how things are made," Zheng says. "Traditionally, they at best know their first tier of suppliers, and have little knowledge beyond that."

Using modeling, behavioral experiments, surveys, and on-the-ground-studies of companies, Zheng has been studying the potential benefits of greater visibility into companies' global supply chains. For one thing, her research has shown, creating transparency into the social responsibility practices in supply chains—outdoor wear firm Patagonia is a well-known example—pays some obvious dividends.

"If I'm Patagonia and I tell you 80 percent of my suppliers are compliant and another 20 percent need work, versus another company with no history of supply chain monitoring but making a similar claim, what is the reaction of stakeholders?" Zheng says. "We find differences, in that companies with better visibility into their supply chains gain more trust from their stakeholders."

Ultimately, the goal of this area of Zheng's research is to motivate firms and their suppliers to develop end-to-end transparency in the supply chain and to adopt more responsible practices, both for the environment and for the people.

"You need a coordinated effort from all companies," Zheng says. "Look at it from the suppliers' perspective. If I'm working with 100 companies and only one is telling me to change my practices, I'm not going to change as much as if 99 tell me to change. The bigger challenge is how to organize that coordinated industry-level, and even cross-industry-level, effort."

That's an ambitious goal, but as Zheng knows, creating work that can have an impact is a long-term endeavor that blends theory, field testing, and action.

"We have a theory of change," Zheng says. "Can we create a system, together, that will generate value for all? I believe the answer is yes, though not an easy yes, and I am excited to be part of the MIT family to contribute to that effort."

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