

Sherlock *of* Trade

Bruce Edwards profiles MIT's **David Donaldson**, who makes no assumptions about trade that are not based on facts

Trading gold for salt is clearly a thing of the past. But studying the market for salt in 19th century India and the effects on trade of building a railroad led the prize-winning economist Dave Donaldson to important new findings that are relevant today.

“Whether it be by the construction of a railroad a hundred years ago or by opening up to trade with the global economy, I’m fundamentally a big believer in the gains from trade,” says Donaldson, a professor at the Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts. “Trading between pairs of people, whether it’s between two people who happen to live in the same household, the same village, the same country, or the same planet, is the basic source of economic development. It’s the reason that we no longer live like cavemen.”

Donaldson’s work put a value on the economic contributions of trade and won him the 2017 John Bates Clark Medal—known as the Baby Nobel—awarded for the most significant contributions by an economist under the age of 40.

Donaldson’s research reaffirms the benefits of trade and thus flies in the face of a wave of populist skepticism going back to the anti-globalization protests that started almost 20 years ago. Today, the intricate international web of multilateral trading relationships is under pressure from protectionist policies in the United Kingdom, the United States, and elsewhere.

Donaldson, now 40, has changed the way economists conduct empirical research on trade, says Esther Duflo, a cofounder of the Abdul Latif Jameel Poverty Action Lab at MIT and herself the winner of the John Bates Clark medal in 2010.

“He has ushered in a totally new era for our understanding of trade” by studying new, mostly microeconomic data, Duflo says. “He has also had a large impact on development economics by bringing trade and development closer together and introducing development economics to new ways of thinking about key issues such as infrastructure, with a trade lens.”

Although Donaldson’s work does not speak directly to current controversies and tensions over trade, “it contains a powerful message that is relevant to the debate,” says economist and trade expert Douglas Irwin of Dartmouth College. “Integration with global markets produces tangible economic benefits, and economic isolation can leave regions poor and left behind.”

Donaldson did not set out to become an economist or to study trade. Raised in Toronto, he initially focused on physics, completing a master’s degree at the University of Oxford. He was following in the footsteps of his British scientist parents—a father with a degree in physics and a mother who taught chemistry.

While he was still studying physics at Oxford in 1999, the anti-globalization movement came into prominence. Demonstrators hit the streets outside the World Trade Organization’s conference in Seattle and the IMF headquarters in Washington to protest the increasing unification of the world economic order that they maintained was leaving too many people behind.

Donaldson’s then-girlfriend—now wife—was studying economics at the time. The couple talked a lot about the economic issues behind the discontent. Donaldson says he supposes he “fell prey—prior to learning the basic logic of formal economics—to the trap of thinking that international things like trade, development, and FDI [foreign direct investment] might have a strong zero-sum-game feature to them whereby rich countries might get rich at the expense of their interactions with lower-income countries.” It inspired him to pursue a PhD at the London School of Economics (LSE).

“I got hooked on the idea that economics was the physics of the social sciences, or physics for public policy,” Donaldson says, “using theory and evidence to come up with answers to those policy questions that were being raised by the anti-globalization movement—and I wanted to learn how to do that.”

After completing his doctorate at LSE in 2009, Donaldson joined the economics department at MIT. For all his research on trains, Donaldson cycles to work every day from his home on the outskirts of Cambridge. He lives there with his wife and their four children.

Donaldson first traveled to India, “partly because it is a fascinating place that I read a lot about, but partly because my advisors did all their work on India, and their enthusiasm was kind of infectious,” he says. India was also a rare example of a country that taxed trade within its borders, he says.

“That is the kind of thing that doesn’t happen at all in most countries,” he says. “In the US it is constitutionally prohibited.” Also, a professor at LSE suggested that the unusual circumstances around India’s salt trade might contribute to his research.

He spent two years digging into the archives of the British government’s India Office, poring over

salt reports and ledgers from 124 districts dating back as far as 1861. He was trying to determine the extent to which India's colonial railway system might have raised real incomes by reducing trade costs. After collecting data on trade flows among 45 regions in India and more than a hundred thousand observations, Donaldson was able to put a value on the role of trade.

"That number turned out to be about 16 percent of GDP," Donaldson says from his book-lined office at MIT. The study made the case that the benefit of the railways was indeed the result of increased trade.

He published his findings originally in a 2010 working paper, then in the *American Economic Review* in 2018 under the title "Railroads of the Raj: Estimating the Impact of Transportation Infrastructure." His extensive use of data made the work stand out and led to his winning the John Bates Clark Medal last year.

He just started doing things that nobody else was doing.

"Donaldson's work on railroads brought a whole new approach to 19th century history, particularly in India," says Nobel laureate Angus Deaton.

The "Railroads of the Raj" study was not driven by a particular interest in railways but by the desire to better understand the true value of large transportation infrastructure projects, Donaldson says. More World Bank lending in 2007, for example, went toward transportation infrastructure than to education, health, and social services combined, he says, without a rigorous empirical understanding of just how much transportation infrastructure projects actually reduce the costs of trade, and how those cost reductions affect welfare.

In the India study, Donaldson learned of one of the world's truly unusual trade barriers. To enforce a tax on salt in the early 19th century, the colonial British authorities built a thorny, 12-foot-high thicket stretching 2,300 miles down the middle of India. The Salt Hedge blocked hundreds of millions of people in India's interior from getting tax-free salt from the seacoasts as the British administration's appetite for tax revenue grew. The wildly unpopular salt tax eventually spurred Mahatma Gandhi's campaign against British rule. In the end, it was found that the Salt Hedge was too much of an impediment to trade and was abandoned.

"I read about all this history and found it fascinating but quickly realized that salt had a completely auxiliary benefit for me," Donaldson says. "They collected a lot of data about salt." Because salt production was confined to a very small region and everyone needed it, Donaldson says, it was the perfect product for measuring the impact on trade of the railroad system that was built during the same period.

Donaldson found that the railroads brought significant welfare gains to India because they reduced the cost of trading and enabled India's diverse districts to enjoy unprecedented gains from trade.

In a separate study of the economic impact of railroad expansion in the United States in the late 1800s, published in the *Quarterly Journal of Economics* in 2016, Donaldson and coauthor Richard Hornbeck examined the effect of increased market access to counties across the country. Using a sophisticated geographic information system data network, digitized maps, and advanced trade theory, they looked at how market access raised agricultural land values and compared their findings with those of the Nobel laureate economist Robert Fogel in his 1964 study *Railroads and American Economic Growth: Essays in Econometric History*. They found that railroads had a substantially larger economic impact than Fogel estimated based on data and analytical tools available 50 years earlier.

"Fogel's approach and our approach both focus on railroads' impacts through the transportation of agricultural goods, but Fogel's estimates neglect ways agricultural land value fails to bound the economic losses from impacts on the agricultural sector," the authors wrote.

"He just started doing things that nobody else was doing," says Arnaud Costinot, a fellow MIT economics professor and frequent collaborator. "He uses a lot of new data sources and is seemingly unconstrained about what you are able to do empirically."

Donaldson's work on railways is important because it documents and quantifies *intranational* trade, Costinot says—something that often gets lost in all the noise about international trade.

"In the case of a large country like India, for instance, trade flows between states are subject to many frictions, and the gains from removing them are potentially large, likely larger than cutting import tariffs further," Costinot says.

While railways were once the backbone of trade and development, technology has moved on, radically changing the nature and role of the transportation infrastructure. Donaldson says

the move away from rail to more modular forms of shipping such as trucking indicates how economies are evolving and becoming more diverse.

“Just as the economy modernizes, things become less commoditized in some sense,” he says. “The complexity of the product space is always growing, and I can’t help but think that as we get richer and our needs and capabilities to produce get more complex and more luxurious that diversity will rise. Things that allow diverse people to connect with one another will rise in importance. So modes of transportation that allow that will become more and more important.” Extrapolating from there, Donaldson says, “I have to wonder what’s the next thing that would be even more modular than truck shipping. Perhaps it will be drones that could just pick up whatever you need at the factory and take it to you at your house.”

Just nine years into his career as a professional economist, Donaldson has seen how technology is transforming the field.

“The biggest change by far in economics, I think, in the last 10 years has to be the massive flood and availability of data,” he says. And Donaldson loves to dive into the data. “I was inspired by something I read by Angus Deaton. He said something along the lines of looking at raw data and getting your hands dirty with collecting and finding and cleaning and understanding the sources behind the data somehow makes you see economics differently.”

In some ways, Donaldson’s background as a physicist may give him an edge in interpreting raw, highly technical data. He and Tufts University economist Adam Storeygard in 2016 published an article, “The View from Above: Applications of Satellite Data in Economics,” in the *Journal of Economic Perspectives*. It amounts to a guide for economists on the use of satellite data such as measurements of nighttime light to calculate economic activity or information on weather to predict the potential yields for any crop anywhere on Earth.

At the same time, Donaldson says his grounding in hard science also leaves him conflicted when using economic models that often accommodate considerable variability.

“Social sciences are a little awkward because we don’t have that micro unit that we really think is stable and always behaves in a certain way,” Donaldson says. “You might think the micro unit is a human being, but obviously human beings don’t follow laws of behavior always and everywhere. But equally, the macro units matter to us, whether they’re the market for salt in a



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corner of India, or the market for T-bills right now, or the market for software engineers in Silicon Valley.”

New data sources are helping economists better understand the decisions people make, Donaldson says.

“Recently, I started a project about the high-speed rail system in China where we have access to all the credit card transactions in China,” he says. China built the first 70 miles of its high-speed rail for the Beijing Olympics 10 years ago and has since turned it into a 15,000-mile nationwide system. Meanwhile, China is still a poor country, and it’s unclear how many people can afford to use the system.

“There is an interesting question about the long-run effects of these projects that maybe we can’t fully foresee,” Donaldson says. “The bullet trains are incredibly expensive and an ambitious engineering project that generates nowhere near the short-run economic surplus, the welfare that would be needed to justify its horrendous cost. But I wouldn’t be surprised if we look back in 50 years and say that it’s a heavily used system that is generating lots of benefits for that economy.”

While Donaldson says he believes that trade offers people new opportunities, he also acknowledges that sudden change can leave many behind. “Damages from shifting economic opportunities are happening all around us all the time, usually for reasons that have nothing to do with international trade,” he says. “We can’t have society-level economic growth without new and more remunerative activities replacing old ones. But what is absolutely essential is to make sure that the unlucky few whose expertise is displaced by the sudden arrival of new competition are compensated and helped to adapt.” **FD**

BRUCE EDWARDS is on the staff of *Finance & Development*.

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