How machine learning can break down language and trade barriers

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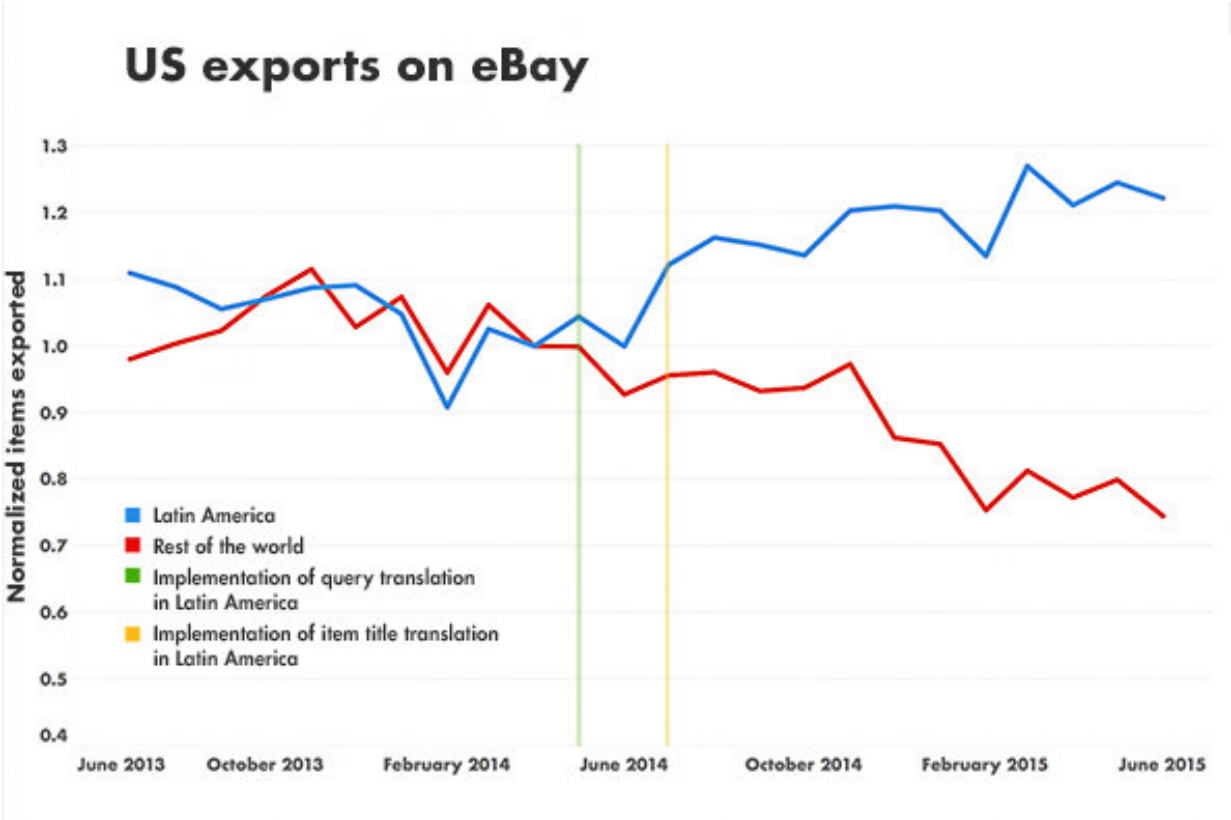

Following the deployment of a new AI language translation system at eBay in the spring of 2014, exports to Latin America on the platform rose compared to the rest of the world. Data has been normalized to place exports to the rest of the world on the same scale as the lower amount of exports to Latin America. Source: "Does machine learning affect international trade? Evidence from a large digital platform." Credit: MIT Sloan School of Management

Steep tariffs, challenging geography, government subsidies, and restrictive quotas come to mind when we think about the barriers to international trade. But there are lots of different languages in the world, and translation problems can slow things down, too.

But evidence from a new translation technology powered by artificial intelligence from e-commerce and online auction giant eBay shows that machines might be able to help clear those hurdles, new research has found.

MIT economist Erik Brynjolfsson and his colleagues, Meng Liu and Xiang Hui of the MIT Initiative on the Digital Economy and Washington University in St. Louis, Missouri, carried the study out because the economic effects of the use of AI have gone largely unmeasured, despite the technology's growing prevalence in many sectors.

That's because there's typically a significant lag time between the adoption of AI by a company, which involves costly investments, and the delivery of benefits in terms of greater output, the authors wrote. At first, Brynjolfsson said a company's investment in new AI technology can actually show a decrease in measured productivity, reflecting the initial costs, then later a sharp increase, as the benefits are harvested. He calls this phenomenon he calls the "productivity J-curve."

But digital platforms like eBay are often able to more easily integrate AI into their existing operations, reducing that time lag.

In 2014, the company mediated over $14 billion of international trade in over 200 countries. That same year, the company introduced eBay Machine Translation, or eMT, an in-house machine learning system that translates between languages when users search or view listings on its website.

"This is an example of where we had a sharp introduction of a new AI-based technology, and you could look before and after the technology was introduced," Brynjolfsson said.

The system was about 7 percent more accurate than the previous translation service the company was using and that led to a 17 to 20 percent increase in exports through the platform to Spanish-speaking countries in Latin America.

Brynjolfsson said the team was able to rule out explanations for the jump other than the translation system, such as whether eBay ramped up its advertising in that market or whether it was merely coincidence.

The system was introduced in other regions like Russia and the European Union, but the researchers didn't study those rollouts due to major political events in the region like Russia's annexation of Crimea, which could have tainted the data.

Trade lost in translation

Issues related to language are just as important in trade as taxes, tariffs, and geography, Brynjolfsson said. Eroding the barriers that they erect between two countries has the effect of bringing them closer together, he said.

In fact, the effect on trade from machine translation, the researchers found, is roughly equivalent to making the world 37 percent smaller.

"Language barriers have greatly hindered trade. This is true even for digital platforms where trade frictions are already smaller than they are offline," the researchers wrote. Brynjolfsson continued: "Countries that are closer to each other tend to do more trade with each other. It's really increasing trade just as much as if we reduced distances by about 37

percent."

Products that were cheaper; had more words in their listing titles; had unique qualities like jewelry, clothing, or art; or those that were purchased by less-experienced buyers saw the largest boost, the research found.

And language translation isn't the only application of AI that may improve global trade—it's just the most easily integrated, Brynjolfsson said. New machine learning systems focused on speech recognition, computer vision, and recommender systems can also be expected to affect industries from medical diagnoses, customer support, and hiring decisions to self-driving vehicles and trucking.

Those applications, however, will require more extensive changes to how business is done, not just how technology works, Brynjolfsson said. Trucking, for instance, might require re-thinking how insurance policies and traffic laws are designed.

"I expect this is just the leading edge of a broader set of activities where we'll see economic impacts," Brynjolfsson said. "The introduction of machine translation is a relatively clean experiment where we can measure the effects. But I think ultimately almost every industry will have significant economic effects just as we've seen in this particular category … Ultimately, we'll see these technologies applied to all kinds of trade, and more generally, people interacting with one another."

Provided by MIT Sloan School of Management