# Mathematics Professor's Study Delves into Internet's Influence on Global Economy

October 9, 2020
By **Laurie Kaiser**

Long before Instacart grocery orders and increased Amazon deliveries became a ubiquitous response to the coronavirus pandemic, **Bruce Swan**, Buffalo State College associate professor of **applied mathematics**, understood the powerful sway the Internet has on global commerce.

Beginning in 2015, Swan and his wife, Tina Swan, a former researcher with the **University of Pittsburgh**, measured city-level databases in 10 countries on a weekly and monthly basis to determine how the Internet influences the economy, especially in regard to commercial trade. They published their various studies in 2015, 2018, and 2020, most recently in the July 17, 2020, issue of the ***Journal of Economic Studies***.

Their approach, which included downloaded information from the **Center for Applied Internet Data Analysis (CAIDA)**, marked a shift from the way the data had previously been mined.

"Our most recent research revealed strong evidence that the Internet stimulates international trade for all investigated countries," said Swan, who also serves as editor-in-chief of the ***International Journal of Data Analytics***.

One of the reasons is that the Internet has narrowed geographic trade gaps.

"South America is closer to the United States than Asia," he said. "However, the United States does much more trade with Japan and China. Since the advent of the Internet, there has been more trade with Asia, more influence on infrastructures, connections, and information flow."

Their research also revealed that the increased growth of bilateral trade volumes exceeded the growth of the gross domestic product (GDP). The GDP plays some roles continuously across countries, while population growth and labor supplies have little effect on trade volumes.
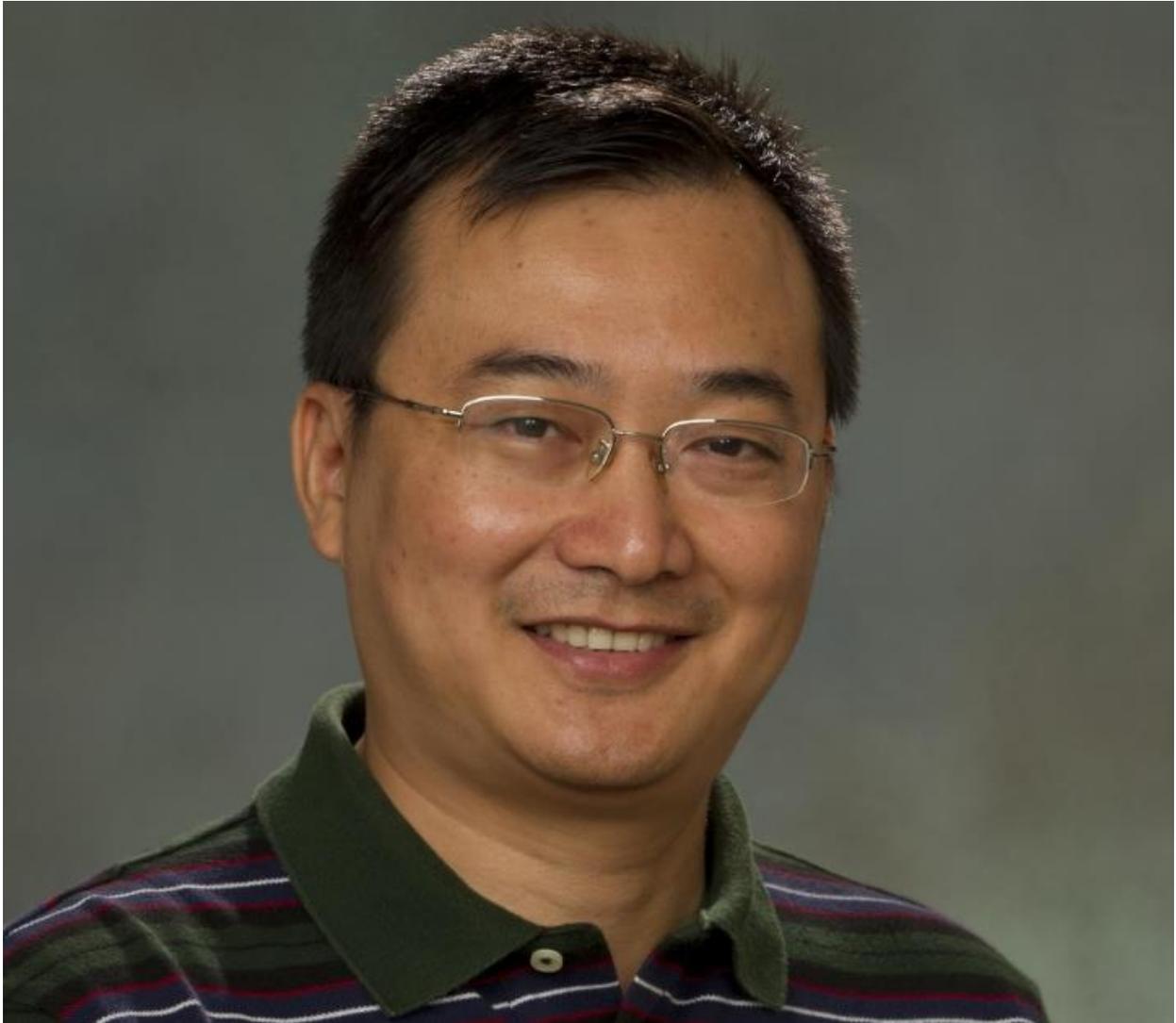
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— Bruce Swan, Ph.D., Associate Professor of Mathematics

When it comes to using the Internet for personal consumption, he noted that shopping habits were moving online in the months and years leading up to the pandemic, especially among millennials and Generation Z. This shift reveals the positive and negative sides of Internet commerce.

"I like Amazon, but it's like a monster," he said, pointing to the recent demise of malls, iconic retailers such as Sears and Toy 'R' Us, not to mention numerous small mom-and-pop businesses.

He noted that even when the economy was still relatively strong in 2019, **more than 9,000 brick-and-mortar stores closed**.

"Some people call what has happened the 'retail apocalypse,'" he said. "It is very easy to relate the rise of e-commerce to the physical stores' struggle. When you add new technology like the applications of big data and artificial intelligence, e-commerce more efficiently and effectively captures customers and markets."

Swan, who joined the Buffalo State faculty in 2012, worked as a market researcher for a securities company and as a financial analyst for the planning and credit department of a bank, before and in the early '00s. He then earned his doctorate in financial mathematics from the University of Pittsburgh in 2010 and launched his academic career.

His prior financial industry work influences his research interests in applied mathematics, financial mathematics, statistics, and actuarial science. He developed a **new undergraduate certificate program** at Buffalo State in statistics in insurance in 2018. It's designed to prepare students to take the professional examinations given by the Society of Actuaries (SOA) and the Casualty Actuarial Society (CAS) and enter the actuarial and financial professions.

At that time, he worked with researchers at Carnegie Mellon University in Pittsburgh to study datasets on Internet behaviors from other countries.

"We knew that this type of research was new," he said, "and more was needed."

In coming months, the *International Journal of Data Analytics* will feature studies on how the coronavirus has affected people's daily lives, including more reliance on the Internet. Some researchers already have applied

new statistical models to investigate the impacts of COVID-19 and sent their most recent research articles to the journal.

"Employees are working from home, students are learning from home, and this may continue into the future," he said. "This is especially true in states like California and big cities where people have easy access to the Internet and good connections."

Following the pandemic, he predicts, urban and rural dwellers alike will continue to rely more on the Internet for many aspects of their daily lives, including shopping.

"We recognize that younger generations are used to one way of shopping—online—and that will only continue moving forward."