THAT IS A PROBLEM CAUSED BY THE CONTRACTUAL INCOMPLETENESS, WHICH IS CALLED THE HOLD-UP PROBLEM.

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BLOCKCHAIN BREAKTHROUGH

CONTRACTS ARE KEY IN MODERN business, but high transaction costs and the challenge of verifying unforeseen events can leave agreements incomplete, which can strain supply-chain relationships.

"Ideally, we want to include all the details about every contingency in a contract, and if those are violated, then we are not going to fulfill the contract," said Qinxi Wu, PhD, assistant professor of Finance. "But the reality is, in many cases, you cannot put all the contingencies there ex-ante."

This causes what Wu calls contractual incompleteness and can lead to severe consequences down the line. There could be suboptimal investment and a consequent loss of value, Wu said.

"That is a problem caused by the contractual incompleteness, which is called the hold-up problem," she said.

Wu and Assistant Professor of Finance Sophia Hu, PhD, studied these issues in their paper, "Can Blockchain Technology Help Overcome Contractual Incompleteness? Evidence from State Law," published in *Management Science*. Mark Chen and Joanna Wang of Georgia State University also joined the two.

Blockchain—most known as the technology behind cryptocurrencies—is used in more and more areas of the business world, Hu said. The unique feature of blockchain is that many different copies of the same record can be stored on a decentralized platform, which helps crosscheck the information.

"It is also hard to go back and change the information," Hu said. "That is a special feature that matters to our study."

Prior research had established that a particular application of blockchain technology called a smart contract—which could automatically track whether or not conditional terms were being met—could potentially help alleviate contractual incompleteness. However, little to no empirical work showed it would be successful.

"Previously, no one could show that because it is really hard to observe how firms actually make their decisions related to solving this problem and how they change their strategies," Wu said.

The research team decided to observe states with existing laws concerning blockchain technology, which made it easier for firms to adopt blockchain technology—specifically smart contracts. The team also identified firms with high asset specificity, which are considered more vulnerable to contractual incompleteness. Then, they examined whether firms with high asset-specificity benefit more from the passage of a pro-blockchain law.

Using a quasi-natural experiment, the team found firms with greater asset specificity in states with pro-blockchain policies are more likely to adopt these technologies and have better market values. These firms also expanded their customer base from a geographic perspective, Wu said.

"Previously, they preferred geographically closer customers perhaps because they could get some soft information," she said. "However, with the help of contracts based on blockchain technology, they do not need to rely on close customers. They can enlarge their pool."

While the research shows positive outcomes to adopting blockchain technology, there are barriers to doing so. Companies need to evaluate their situation; that is, how vulnerable they are to incomplete contract issues, and identify if this is something that will help them, Hu said. Tech firms trying to build products for their clients should gauge their client's situation and how they can customize the product based on their needs.

Several opportunities for future research arise from this study, the team said. The laws they studied were primarily passed between 2016 and 2019, so it is still too early to observe some real effects of the adoption. ■