

Considering how many firms can meet pollutant standards can spur green tech development

May 6 2020

When a government agency considers tightening a standard on a pollutant, it often considers the proportion of firms that can meet the new standard, because a higher proportion suggests a more feasible standard. A new study developed a model of regulation in which the probability of a stricter standard being enacted increased with the proportion of firms in an industry that could meet the standard. The study found that regulations that consider the proportion of firms that can meet the new standard can motivate the development of a new green technology more effectively than regulations that do not consider this factor.

The study, by researchers at Carnegie Mellon University and The Hong Kong University of Science and Technology, appears in *Management Science*.

"Our analysis highlights the importance of considering the interplay of industry capability and uncertainty about a new green technology's payoff in a firm's decision about development," says Alan Scheller-Wolf, Professor of Operations Management at Carnegie Mellon University's Tepper School of Business, who coauthored the study.

A government agency's potential regulatory action is an important driving force for firms to develop and adopt new green technologies. Despite the fact that regulation often takes industry capability into

account, most prior research has assumed that [government agencies](#) move to stricter standards with fixed probabilities regardless of industry capability. In this study, researchers sought to determine how the uncertainty of a new technology's payoff, and the strategic effects induced by regulation based on industry capability, jointly affect firms' incentives to develop or adopt a new green technology.

To do this, the researchers developed a model based on game theory to study firms' decisions on developing, or adopting, a new green technology when there was a possibility of new regulation. The model considered factors that may affect a firm's decision to innovate or adopt a green technology: potential benefits from the technology; anticipated costs of developing, adopting, and using this technology; other firms' decisions, and regulation.

The study found that regulations that consider the proportion of firms that can meet the new standard (often indicated by the industry's voluntary adoption level) are more effective at spurring development of a new green technology than regulations that ignore the voluntary adoption level.

"What this means is that in an industry in which firms can easily catch up with a new technology, a government agency may want to use a regulation that explicitly considers industry capability to encourage innovation," suggests Xin Wang, Assistant Professor in the Department of Industrial Engineering and Decision Analytics at the Hong Kong University of Science and Technology, who led the study (Wang received his Ph.D. in operations management from the Tepper School of Business).

The study also found that regulation that is more aggressive (for which there is a higher probability of enforcing a stricter standard for a given voluntary adoption level) encourages more firms to adopt a green

technology once the technology becomes available, but may discourage firms from developing it in the first place in the face of intense competition.

"This suggests that in an industry with intense competition, a government agency should exercise caution about being too aggressive with [regulation](#), which could stifle innovation," explains Soo-Haeng Cho, Associate Professor of Operations Management at Carnegie Mellon University's Tepper School of Business, who coauthored the study.

More information: Xin Wang et al, Green Technology Development and Adoption: Competition, Regulation, and Uncertainty—A Global Game Approach, *Management Science* (2020). [DOI: 10.1287/mnsc.2019.3538](#)

Provided by Carnegie Mellon University

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