

DISSERTATION DEFENSE

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Operational Decisions under the Influence of Government Regulation

This dissertation focuses on examining firms' operational decisions under the influence of government regulation, including the regulation of anti-trust agencies and environmental protection agencies.

In the first chapter, I investigate a merger between price-setting newsvendors in an oligopolistic market. It is well-known that inventory pooling can greatly reduce inventory costs in a centralized distribution system because it helps reduce aggregate demand uncertainty. Although such statistical economies of scale are important benefits of a retail merger, the extant literature models cost savings from a merger only through reduction in a post-merger firm's marginal cost. In this paper, I develop a model of a retail merger under uncertain demand that distinguishes between cost savings from conventional economies of scale and those from statistical economies of scale. I show that these two sources of cost savings have substantially different impacts on firms' decisions in a post-merger market. Specifically, and contrary to the existing theory of mergers developed under deterministic demand, I find that although inventory pooling enables the post-merger firm to achieve cost savings, it always induces firms to raise their prices, and that marginal cost reduction induces firms to lower their prices only when it is substantial – consequently, larger marginal cost reduction can benefit even nonparticipant firms when it induces the post-merger firm to raise its price. Finally, even if a merger induces all firms to raise their prices, it can still improve expected consumer welfare by increasing firms' service levels under uncertain demand.

In the second chapter, I investigate firms' development and adoption decisions of green technology. This work is motivated by the observation that while enforcing a stricter standard on a pollutant, a government agency often takes into account the proportion of firms that are able to meet the new standard (I refer to this proportion as a "capability index"). Despite this fact, existing research assumes that a government agency might move to a stricter standard regardless of the industry's capability index. Additionally, the literature also assumes that a firm's benefit from developing a new green technology to reduce pollution is deterministic. By contrast, I develop a novel model in which the probability of enforcing a stricter standard increases with the capability index, and in which the benefit of a new green technology is uncertain and correlated for all firms. Thus, one firm's adoption decision can affect the adoption decisions of other firms through enforcement interactions with the government (via the capability index), requiring a firm to conjecture on other firm's decisions using its own payoff information. Given the interactions among firms' decisions and the correlated uncertain payoffs, I use the global game framework to analyze this model; this framework was recently developed in economics to analyze similar

problems. My analysis shows that regulation based on a capability index, compared with regulation that ignores it, has a substantially different impact on firms' decisions for new green technology development. The latter effectively motivates a firm to develop a green technology when the first-mover advantage of that technology is high. Regulation based on the capability index, on the other hand, works well when the first-mover advantage is low. Surprisingly, I also find that the uncertainty about the benefit of the technology can promote a firm's development of a green technology.

In the third chapter, I examine firms' quality and variety decisions after a merger. Existing research focuses mainly on price changes in mergers, and predicts that the cost synergies achieved in mergers benefit consumers because cost synergies can reduce prices. By analyzing a merger in a market where firms sell vertically-differentiated goods, I show that cost synergies achieved in a merger might also induce merging firms to reduce their product variety and quality levels. Such reductions can be harmful to consumers, even when a merger reduces the prices of all products.