Advances in technology have implications for the way businesses are regulated and managed. This dissertation examines three issues that have arisen in response to recent technological innovations. The first chapter studies the regulation of electricity markets with rooftop solar, a technology that has recently seen a sharp increase in adoption. Innovative internet-based technologies have given firms and customers the ability to harness more information in their decision-making. The second and third chapters of this dissertation study how this increased information availability affects firm-level decisions, and how additional information can be used as a strategic lever to compensate for capacity shortage.

The first chapter is motivated by the dramatic increase in the adoption of rooftop solar systems, driven in large part by cost reductions caused by technological advances in solar panel design. This has implications for regulators, who seek to induce an optimal level of rooftop solar adoption, trading off between its environmental benefits and the financial burden that it imposes, while simultaneously safeguarding the interests of utility companies, solar system installers, and customers. We formulate and analyze a social welfare maximization problem for the regulator, focusing on how the choice of tariff structure (that governs how customers pay the utility for their usage) interacts with its competing objectives. We uncover the structural properties of a successful tariff, finding that the tariff structures used in most states in the US are inadequate: to achieve welfare-optimal outcomes, a tariff must be able to discriminate among customer usage tiers and between customers with and without rooftop solar. We present a tariff structure with these two characteristics and show how it can be implemented as a simple buy-all, sell-all tariff while retaining its favorable properties. We illustrate our findings numerically using household-level data from Nevada and New Mexico.

The second chapter is motivated by the recent practice of service providers broadcasting real-time delay information to their customers. We consider the question: is announcing real-time delay necessarily a good idea? In a market with two service providers who compete for market share, we investigate whether one of the service providers (the technology leader $L$) should make the first move to announce her real-time delay information, when her competitor (the follower $F$) can opt to respond. We model and analyze this leader-follower setting as a sequential game, using continuous Markov chains to analyze the associated queueing dynamics. We find that $L$'s optimal action depends crucially on the relative service capacities of the service providers: initiating delay announcements improves, in equilibrium, the market share of $L$ if she is the lower-capacity service provider and worsens her market share otherwise. Therefore, for a lower-capacity service provider, delay announcements can be considered a strategic remedy for capacity shortage.

The third chapter is motivated by the availability of competitor fare information to firms such as airlines, who dynamically set prices to sell a fixed amount of inventory over a finite horizon. We study the impact of explicitly using competitor pricing information on equilibrium pricing strategies in a setting with two
firms. Under a general model of demand that unifies the models used in prior work, we establish the non-
existence of pure strategy subgame-perfect Nash equilibria when some strictly positive proportion of the
customers is loyal, i.e., when the firms' product offerings are not perfectly substitutable. However, when all
customers are flexible, i.e., the firms' product offerings are perfectly substitutable, we show the existence
of a pure strategy subgame-perfect Nash equilibrium. Using these results, we study the strategic question
of whether firms should explicitly use competitor price information in their pricing exercises, or continue
to employ monopolistic models as they currently do. We argue that in general, the unique equilibrium
strategy is for both firms to use competitor fare information. We find that typically, similar to Chapter 2,
the lower capacity firm is benefited by a migration to competitive models, while the higher capacity firm
is left worse-off. However, when total capacity relative to demand is very low and the firms have roughly
the same capacity, this migration could improve both firms' profits.