do so, we make use of “technology diffusion models,” which quantify various characteristics of diffusion of an innovation. Notably, we conduct analyses for both single-generation diffusion and multi-generation diffusion of 4G-LTE services. The single-generation analysis does not take into account the sales impact due to prior generations, namely 2G and 3G, whereas the multi-generation diffusion takes into account the intergenerational dynamics amongst 2G, 3G and 4G-LTE services for a given market. Once we have decided on the suitable model to be used for 4G-LTE diffusion in India, we use the time-series data of countrywide subscription of 2G, 3G, and 4G-LTE services in India for the above-mentioned diffusion analyses. Methodologically speaking, our analyses employ a combination of linear and non-linear techniques of regression, namely ordinary least-squares (OLS) and non-linear least-squares (NLS) regression. We undertake extensive forecasting exercise to estimate the future market potential of the twenty-two telecom circles individually. We find that the informal channels of communications, such as word-of-mouth, have a much greater impact on the diffusion of 3G and 4G-LTE services in India. Such impacts are, in fact, more significant for 4G-LTE services compared to 3G services. We also find that the multi-generation model is more accurate at forecasting the future market uptake of mobile broadband services in India.

In the second RQ, we build on the output of RQ1 to propose an overarching Techno-economic model (TEM) for assessing the overall requirements concerning coverage and capacity for various 4G-LTE deployment scenarios, cost, revenue, and profitability measures important for managerial decision making. Here, we combine multiple modeling approaches

borrowed from relevant theoretical paradigms. To be specific, we draw upon radio propagation models from the wireless communications literature, and the discounted cash flow (DCF) valuation model from the strategy of financial investment literature. Taking the case of a fictitious Indian MNO, we estimate the levels of the 4G-LTE network infrastructure required for meeting the capacity across these telecom circles. We also determine the levels of the 4G-LTE network infrastructure for meeting the coverage requirements across these telecom circles by using the various “carrier frequencies” marked for 4G-LTE service provisioning in India. After calibrating the network infrastructure requirements towards coverage and capacity, we estimate the total effective capital investments likely to be incurred by the fictional MNO towards the deployment of such 4G-LTE network infrastructure. We then predict the likely revenue from provisioning such 4G-LTE services in the near future and assess the associated profits and losses across these telecom circles. Our analyses indicate that the countrywide deployment of 4G-LTE networks, which adheres to the global quality of service standards, can also be financially viable for MNOs in India. We also find the need for rationalization of reserve prices of the spectrum, especially in the sub 1 Gigahertz (GHz) carrier frequencies, across the telecom circles in the country. We conclude that the policymakers in India need to take into account the potential of spectrum in terms of estimated financial returns, in addition to valuing the spectrum based on its technical characteristics and the benchmarks of prior auction prices.

In the third RQ, we formulate various econometric models for evaluating the impacts on the incumbent MNOs’ mobile subscriber base due to capital