

My research primarily focuses on applied microeconomics, with a specific emphasis on energy economics and industrial organization. A central theme in my research is investigating firms' responses to changes in their environment, such as cost changes, spatial shocks resulting from rivals' price changes, and changes in policies or market structure. This includes understanding how quickly they adjust their prices, how frequently they make price adjustments, and the dynamics of price cycles and synchronization. Additionally, I investigate the impact of policy changes in the energy sector, particularly within the electricity and retail gasoline markets, on the behavior of economic agents.

In my job market paper, I investigate "sticky prices" in the retail gasoline market in Korea. Despite empirical evidence of price stickiness across retail sectors, economic explanations of the phenomenon are still debated in macroeconomics and industrial organization. In macroeconomics, pricing models are categorized into two types: state-dependent (SD) models, where price changes depend on changes in cost or demand, and time-dependent (TD) models, where price changes occur at regular intervals. Within industrial organization, researchers have emphasized the impact of market power on pricing, noting that prices tend to be more rigid in concentrated markets.

Using a logit model, I investigate how the probability of price changes relates to variables representing both SD and TD pricing rules. The estimation results reveal that retailers don't adhere strictly to one pricing rule but employ a mix of both SD and TD pricing rules. Additional analysis reveals that stations with more local market power tend to change their price on a weekly basis, suggesting a stronger inclination toward the TD pricing rule. These findings offer new insights into the explanation of price rigidity. The underlying rationale is that firms with market power tend to make price change decisions at regular intervals, given that information costs arise each time they contemplate adjusting their prices.

In another study, I revisit the pricing behavior of retail gasoline stations in Korea, this time with an emphasis on the speed of adjustment. Asymmetric price adjustment, commonly known as "Rocket and Feathers" refers to the phenomenon where retail product prices quickly rise in response to cost increases but fall more gradually when costs decrease. Recent studies on "Rocket and Feathers" tend to employ high-frequency data to avoid bias arising from the temporal aggregation of data.

Using an error correction model, I explore price adjustment patterns in response to cost change and examine how estimation results differ based on data structure and sub-samples. I find that the adjustment patterns estimated from weekly data maintain relative consistency across both data structure (time series vs. panel) and periods (2009-2014 vs. 2015-2019). However, results from daily data show inconsistent adjustment patterns. This inconsistency might arise from model mis-specification, which fails to account for the essential feature of daily-level data: censored responses to cost changes.

Besides economic studies, I address policy questions using economic concepts. While preventive maintenance is crucial for ensuring the reliability of a power system, it is not feasible to allocate unlimited costs to achieve higher reliability. In general, the marginal rate of increase in the survival rate of the power system diminishes as maintenance expenditure rises. Therefore, balancing reliability and maintenance costs is crucial in determining the optimal preventive maintenance.

Using a Cox proportional-hazards model, this study investigates the effect of maintenance costs on the survival rate by analyzing the outage data of substations in the power system in Korea. Additionally, lasso regression is used for determining the functional form describing the relationship between preventive maintenance cost and failure rates. The empirical findings confirm a diminishing marginal rate of failure

as maintenance costs increase. Based on the estimated results, the optimal preventive maintenance costs can be determined by considering the marginal benefit of maintenance cost and the avoided outage loss.

In my future research, I plan to conduct follow-up research for two previous studies related to retail gasoline market. Specifically, I have found an interesting pattern of price changes in which retailers exhibit a preference for particular days of the week for price adjustments, and this pattern changes as the market structure evolves. This evidence may provide insights into price synchronization and changes in strategic equilibrium. I intend to further investigate these findings and find their economic implications.

Additionally, I am also interested in the EV charging market. The Korean EV charging station industry is now emerging due to government efforts to promote the purchase of EV cars. There are two different types of price schedules for slow charging: one remains constant over time, while the other varies depending on the time. Most firms select the former schedule for price, but some firms opt for the time-varying price schedule. Using individual level charging data in Korea, I am planning to investigate how consumers respond to these two different pricing schedules and subsequently examine whether the latter price schedule is profit-maximizing.