Barriers to real-time electricity pricing: Evidence from New Zealand

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Section 1:

This paper studies the introduction of real-time electricity pricing in the New Zealand residential retail market to understand why its market share remained below 1.25%. We use rich panel data of all retail switches between 2014 and 2018 and an unexpected wholesale price spike to study adoption and attrition. We address the following questions. Which consumers abandon real-time pricing during the crisis and what drives attrition? How do spot prices affect adoption decisions and do consumers strategically time their adoption? Exploiting the staggered roll-out of real-time pricing in different locations we find that attrition decreases with experience. We also find that prospective adopters are present biased. The combination of these findings explains why adoption stalled and shows that wholesale price spikes pose a serious threat to widespread adoption of real-time pricing.

Section 2:

Time-varying electricity tariffs are necessary for the energy transition towards intermittent renewable generation, a cornerstone of the fight against climate change, and more generally for the efficiency of retail electricity markets (Ambec and Crampes, 2021). As smart meters are being installed at scale, these tariffs can now be implemented for residential households. A large and growing literature addresses the efficiency and distributional impacts of various types of time-varying tariffs (Joskow and Wolfram, 2012; Borenstein, 2012; Reguant, 2019). Yet, little attention has been paid to how market forces could shape retail electricity markets once time-varying tariffs can be implemented. Using rich panel data of all residential retail switches between 2013 and 2018 in New Zealand, we provide the first observational study of tariff choices in a retail electricity market with a large penetration of smart meters, with a focus on real-time electricity pricing (RTP). Under RTP, consumers face spot prices and pay the cost of their consumption in real-time rather than some average price, which is efficient. In a frictionless decentralized economy and absent agency costs, all consumers adopt this tariff in equilibrium (Joskow and Tirole, 2006) . In theory, the retail electricity market would gradually unravel towards this equilibrium (Borenstein, 2005b). Consumers with the consumption profiles least costly to serve self-select into RTP, increasing the average cost of serving the other consumers. Retailers then increase their rates, making it profitable for a new set of consumers to switch to RTP, creating a self-sustaining spiral. This scenario did not occur in New Zealand where the share of residential consumers on RTP has remained below 1.25% since this tariff was first introduced in 2013. The purpose of this paper is to examine this puzzle in order to identify barriers to widespread adoption of real-time pricing and their consequences for policies promoting this tariff. We do so using a unique dataset of retailer switches in the residential retail electricity market in New Zealand. We exploit a crisis on the spot market to study how consumers on real-time pricing and prospective adopters react to large and sudden price spikes.

Section 3:

Our results suggest that price uncertainty is a serious threat to widespread adoption of real-time pricing because when prices spike unexpectedly and remain high for several weeks, prospective adopters forego adoption and recent adopters switch to another tariff and do not return. Nearly no consumers who adopted RTP abandoned it until the spark of a crisis in the electricity spot market during the winter of 2017 (hereafter referred to as the crisis). The share of consumers switching to another tariff during this crisis decreased with their time spent on RTP before the crisis and the share of those switching back to RTP afterward increased with time spent on RTP before the crisis. Exploiting the fact that RTP was introduced in different places at different times allows us to rule out that this correlation is due to selection effects. We also study which prices affect adoption. We build several natural predictors for future expected spot prices that consumers may consider and show that recent spot prices better explain adoption decisions. This result holds for predictors of average spot prices over the long run (one year), the medium run (three months), and the short run (one month). Finally, we run a counterfactual exercise to predict how many consumers would have adopted RTP during and after the crisis if it did not occur and find evidence that most consumers do not strategically time adoption but rather postpone it for an extended period of time. Overall, our findings show that inexperienced consumers - prospective and recent adopters - strongly react to ongoing spot prices, which is a sign of present bias. Furthermore, we find evidence that consumers forgo adoption or abandon RTP and do not return. We hypothesize that the combination of present bias and spot price volatility jams the unraveling process: when spot prices spike attrition increases - particularly for recent adopters - and adoption drops but only so many consumers have the opportunity to adopt RTP when prices are low.

Section 4:

Our findings suggest that retailers or policymakers willing to foster the adoption of real-time pricing need to be "lucky" and hope that no unexpected period of high price spikes arises until many consumers have adopted the tariff and experienced it long enough. We derive three sets of recommendations to address this issue. First, strategically timing when consumers adopt (in an opt-in set-up) or are defaulted to (in an opt-out set-up) real-time pricing can increase the chances that consumers remain on real-time pricing and limit the risks that a crisis interrupts the unraveling process. Second, providing information to consumers, both before adoption (Ito et al., 2021) and after (Jessoe and Rapson, 2014) , can accelerate the learning process and help consumers forecast their long-term payoffs. Third, insuring consumers against price spikes (see, eg. Borenstein (2007)) may help prevent consumers from abandoning real-time pricing when losses are salient. This paper opens several promising alleys for future research. First, eliciting which mechanisms explain that time spent on RTP affects consumer decisions is an important goal to identify relevant policies. Second, while our analysis has focused on the demand side, the role of the supply side remains unexplored. Finally, the design of optimal policies to incentivize not only adoption but also retention is an open research question.

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