Promoting Innovation in the Electricity Industry

By: Seth Dimick

Dr. Lynne Kiesling, Senior Lecturer in the Department of Economics at Northwestern University, was the guest speaker at the Economic Roundtable luncheon on Monday, January 31st. Kiesling, an expert on the analysis of electric power market design, spoke on promoting innovation in the electricity industry by moving toward smart grid technology.

Kiesling opened by stating that the electricity industry has nearly altogether avoided innovation and technological advances when it comes to providing value for consumers. The primary reason for this lack of advancement is the fact that the electricity industry is heavily regulated. The industry is a natural monopoly, meaning that it exhibits barriers to entry due to economies of scale. In order to start an electric company it requires an incredible amount of initial investment to create the necessary infrastructure. In order to ensure a reliable energy source for all, the government chose to protect these natural monopolies, supporting one electric company to service one area, and substituting competition with price regulation. These regulations have created a cost driven industry that does not strive to provide new value for customers.

Under current regulations, electric companies such as AEP have control over user interface technology such as meter and thermostat technology. According to Kiesling, the meters used today are, for the most part, the same analog technology that was developed and used in the early 1900s. Kiesling then described the digital technology available today that could transform the electricity industry into a smart grid that would overlay two-way communication technology on the existing electric power infrastructure. The use of digital meters would allow consumers to see real-time prices through their devices (thermostats, computers, televisions, etc.) and also send information about consumption back to suppliers.

As more electricity is demanded simultaneously, it becomes more costly to supply. Given the aggregate routine, daily schedules of consumers, more electricity tends to be demanded simultaneously at certain peak Please turn to Kiesling, page 4
The Effect of the One-Child Policy on China’s Economic Development

Lin Li graduated from Marietta College in December 2010 with a double major in Economics and Finance. For his senior capstone project, Li examined the effect of the One-Child Policy on China’s per capita real GDP growth rate. China’s phenomenal economic growth, averaging 9.7% per year, arguably began with the economic reforms initiated by Deng Xiaoping around 1979. In addition to a movement toward more open and incentive-based policies, the Chinese government began in 1982 the “One-Child Policy” as an attempt to limit population growth in order to boost per capita GDP growth. Limiting population growth was expected to increase the amount of capital per worker, a key factor in boosting economic productivity. According to the World Bank, the fertility rate in China declined from 5.5 children for every woman during her childbearing years in 1970 to just 1.8 in 2008. Combined with a slight drop in the death rate, the Chinese population growth rate declined from 2.8% in 1970 to 0.5% in 2008.

This paper attempts to separate the effect of the One-Child Policy on China’s economic growth from the effects of other variables. This study uses the OLS estimation method and a data set provided by the World Bank on China’s economic and demographic variables during 1960 to 2008.

The results of this study confirm the hypothesis that the One-Child Policy has positively contributed to China’s economic growth during the past thirty years. The study also finds that, all else being equal, an increase in the ratios of the working age to total population, young to old population, urban to total population, and the industry value added to GDP have significantly increased the growth rate of China’s per capita real GDP. The percentage change in the amount of capital per worker is also found to have a positive and significant effect on the growth rate of China’s per capita real GDP. On the other hand, this study finds no significant relationship between changes in China’s life expectancy, the ratio of China’s old to total population, or the ratio of China’s merchandise exports and imports relative to its GDP and the economic growth in China.
As I strolled into McDonough auditorium for the 27th Annual Milton Friedman Lecture, I thought to myself: Get ready for yet another boring speech about something I could care less about. My expectations started to come into existence when I saw the title page “Regulation and Technological Change in the Electric Industry.” But as Dr. Lynne Kiesling started her lecture I realized this might prove to be worthwhile. Once she said that most think of electricity as “flip the switch and it’s on”, I felt like she had read my mind. She had caught my attention and I was then engrossed.

Kiesling wanted to help us understand the electric industry, its problems, and the opportunities which are lurking in the shadows. At the beginning she explained that she wanted to inform us on the relationship between regulation and technology. She helped us see how technological change has influenced other industries by using the mobile phone market as an example. In the early 1990s mobile phones were bulky and not dependable, but within a 20 year span we can see today the variety of sleek phones with thousands of features. This evolution came as new innovations became available. The phone market as we know is full of options and features. She explained how we can use this phone technology to examine other markets as well. Phones easily allow us to visibly see prices and transparency as well as help us make decisions.

These options and availability are not so much incorporated into the electric industry. One example was how we were still using meters which were first introduced in 1907. That is over 100 years and still the industry has failed to upgrade to more efficient models. Also, unlike other markets of today, people are not well informed about the electricity market. Most people just pay their bill regularly but could not tell someone the units, cost, or how electricity is even processed. Consumers also do not know that the industry is still subject to traditional rate-of-return regulation, which means electric utilities pay little heed to consumer needs. In other words, the lack of knowledge and innovation increases electricity consumption and decreases efficiency.

Electricity is created using many energy sources, including coal, natural gas, nuclear, hydro, and wind, among others. Because there are so many sources used there is a tendency of frequent price changes. But since the industry is regulated consumers are protected from these prices changes. The protection is offered through a standard fixed price for electricity. In the early stages of the industry competition was fierce which led to low consumer prices which would not cover a company’s cost. This was, in part, due to the high initial cost of building networks of power stations and distribution lines. Soon after the early 1900s, the states stepped in and created small “natural” monopolies where geographic markets were set aside for certain companies and rate-of-return regulation was imposed. This setup may have been useful in the early electric industry, but as Kiesling pointed out, it may not be useful in today’s society.

With this overview, Dr. Kiesling started to talk about her project, called “The Gridwise Olympic Peninsula Demonstration Project.” The project was conducted in an area known as the Olympic Peninsula in Washington. The case study looked at how population and demand was increasing in the area which pushed the limits of peak capacity. Peak capacity is known as the total amount of current the electrical network can handle before it blacks out. For most, the answer to increased demand would be to extend the network with more lines, generators, and staff. However, as Kiesling pointed out, the area consists of astounding scenery and a large national park. Along with this beauty are limits to where and how much of the land can be used for an electric network. With this problem the team looked at how they could fix this problem without extending the electrical network.

Here they asked the question “Why not use price transparency and consumer demand to help control the problem?” In other words why not take advantage of new technology to make the industry more efficient? This would be done by both informing the consumers of prices as well as using technology. The new technology being used would be a “smart” thermostat. This thermostat, like a smartphone, would let the consumer create personal settings and it would continually monitor changing electricity prices.
points in the day. With the use of digital technology, a real-time market could be created for electricity in which prices would fluctuate throughout the day dependent upon demand. In turn, consumers could determine when and how much electricity to purchase, depending upon price.

On the Olympic Peninsula in the state of Washington there is a growing demand for electricity with an increasing retirement population, but it is difficult and expensive to expand the electricity infrastructure due to isolation and mountainous terrain. Here, Kiesling was able to observe the effects of the available digital technology on electricity consumption firsthand through experimentation. Residents of the Olympic Peninsula had digital thermostats installed in their homes free of charge, and given the choice between three different contracts. They could continue receiving electricity at a fixed price, having the price vary between two prices of which the higher price would be charged during the two peak electricity consuming periods of the day (the morning and around dinner time), or real-time pricing in which they could easily program buying preferences into their digital thermostats which would react to the market for them.

The results and conclusions of this project were summarized by Kiesling. Customers experienced an average of 10% savings through expenditure reductions, and peak load demand was reduced by 15% on average. From these findings, it was concluded that if the technology was extrapolated throughout the nation, $70 billion of investment in generation, transmission, and distribution infrastructure could be avoided over the next twenty years. Kiesling suggested that the key to making these and future advancements possible would be to create and implement regulations that are able to adapt to dynamic and changing markets. Ending on that note, Kiesling argued that regulations must always be pro-market and not pro-business.

Overall the team felt the project proved successful. The average saving for consumers who used the thermostat was around 10%. The users of the thermostat were all highly satisfied. Peak demand usage also went down as consumers could now control how much electricity they use by the price they were willing to pay. Lastly, there was an overall reduced cost for both the consumer as well as the supplier because of the lowered demand.

After it was done I was very happy I chose to attend the lecture. Not only did I receive bonus points but it opened my mind to how new innovations could eventually change a very outdated electricity industry. The project demonstrated that many consumers want to take advantage of price transparency and the use of technology. It also showed how both the supplier and the consumer benefited because of the lowered demand. In addition, the environment would also be helped through decreased use of electricity. Even with the many hurdles to overcome, I feel this would be a good direction for the electricity industry to pursue. In closing, I will never again think of electricity as “flip the switch.”