If Our Preferences Change – Shouldn’t Our Model?

By Jonn Axsen

Intuitively, we know that our preferences can change. For instance, when DVD players first came out as competition for video cassette players, we didn’t all want to buy a DVD player right away. Many of us were cautious of this new technology, unsure of its quality, reliability and lasting power in the market. Would DVDs produce better sound and picture as manufacturers promised, or would they fail to catch on, leaving us with a wasted investment?

However, as the DVD gained in popularity, various social mechanisms encouraged us to put more faith in this technology. Through word-of-mouth, education and marketing we came to accept the DVD player as an attractive, convenient and dependable technology. This process is known as diffusion, the path any new technology follows to gain acceptance in the market. An important driver of diffusion is change in our individual preferences, as we learn from the experiences of our friends and acquaintances. At EMRG we call this learning process the neighbour effect.

So, if the neighbour effect is a reality, why do economic models typically represent preferences as unchanging? Usually because we have difficulty forecasting how preferences change - whether or not the DVD player will succeed. Over the last few years, researchers at EMRG have taken on the challenging task of improving the behavioural realism of our simulation model, CIMS, by accounting for the neighbour effect.

CIMS is already equipped to represent the neighbour effect. The attractiveness of each technology in CIMS is represented by an all-encompassing lifecycle cost. The lower the lifecycle cost of a technology, the more attractive the technology is to consumers. The lifecycle cost has three components: the upfront purchase price, the annual maintenance and fuel costs, and the intangible (or perceived) cost. The intangible cost accounts for all the perceptions of quality and risk not accounted for by financial costs (price, maintenance and fuel costs). Because a technology becomes more attractive to the average consumer as it becomes more widely accepted, the intangible cost tends to decline as the technology gains market share. CIMS can represent this effect,
but we are researching how preference changes will occur for different technologies.

My recently completed thesis project investigated the neighbour effect for hybrid-electric vehicles (HEVs). I constructed an internet survey to estimate changes in preferences using two methods. First, I compared real preference data from two regions where HEVs have reached different degrees of popularity: Canada (lower market share) and California (higher market share). Second, I conducted an online experiment to see how survey participants would change their preferences in hypothetical scenarios where HEVs were more popular than they are today.

I used the results of this survey to estimate a decreasing intangible cost curve, representing the neighbour effect. The graph below shows how the intangible cost of HEVs is expected to decline as they gain popularity (market share). We can see that currently, intangible costs are much higher in Canada ($41,000) than they are in California ($17,000). This is because California drivers have become more familiar with HEVs, perceiving them as more attractive and reliable than Canadian drivers do.

Accounting for preference dynamics makes CIMS more behaviourally realistic. This allows researchers to produce more reliable forecasts of different environmental policies, accounting for the impact policies can have on individual decision making. While my research only focused on HEVs, we plan to use the findings from my study to help derive the neighbour effect for many other technologies in CIMS.

By John Nyboer and Noory Meghji

New buildings are popping up all over SFU’s campus of late. One of them, known as the TASC II complex, is the new home of EMRG and its database centre, CIEEDAC. Previously, EMRG and CIEEDAC had offices in a building quite removed from the rest of the School of Resource and Environmental Management (REM). While this has been nice (sometimes isolation increases productivity), it is good to be much closer to the other REM students and to increase the interaction between the energy bunch and those involved in the management of other resources.

The new building offers space for the executive director of EMRG and CIEEDAC, Dr. John Nyboer, 5 researchers, an administrator and at least 10 students. It includes EMRG’s library and a small reading area.

The move on Thursday October 12 went very well. Everyone cleared their offices and the packing was very quick. Solomons Movers came right on time and Paulus, John and Noory unpacked whatever they could on that day. The next day everyone came out to help. It was like a family get-together! Other than very small issues, we did not have any problems.

Our new area is bright and spacious. As this building is closer to the main campus, we are sure we will see more of the students here than we did in the other office.

Thanks to all those who helped.
Issues in Measuring Refrigerator Rebound

By Dale Beugin

Analysing historical data on energy technologies can lead to both interesting insights and unexpected problems. A quick look at the evolution of refrigerators since 1990 illustrates this. Using data from Natural Resources Canada we tracked both the size of fridges, as well as the average energy consumption of fridges of different sizes.

The trends are hardly surprising. Refrigerators have become more efficient, but have also become larger. Technology improves, but demand for more refrigeration grows. For policy modellers like the Energy Materials Research Group, these trends beg the question: Do efficiency gains outweigh increases in refrigerator capacity?

By making some simple assumptions, we can combine the different sets of data to attempt to track market shares of refrigerators based on their energy consumption.

Two issues arise from this analysis.

First, evidence of a ‘refrigerator rebound effect’ is apparent in the period from 1993 to 1998. Although market shares of high energy consumption refrigerators decline, shares of moderate energy consumption fridges increase and the net effect is an increase in average energy use per refrigerator. Despite the fact that average energy efficiency has increased, total energy consumption has increased due to the increase in size of new refrigerators.

Secondly, the way in which we categorize fridges (as high, moderate, or low annual energy consumption in the case above) has a significant affect on the results. The categorization used above is only one possibility.

The motive behind this analysis is to compare CIMS predictions with historical trends. Will our model forecast a similar rebound when reconfigured to run from 1990 to today? Before answering this question, we must be sure that the way in which we define technology categories does not bias our representation of historical data.

Dale Beugin is working on improving the behavioural realism of CIMS by incorporating revealed preferences into the model’s behavioural parameters using historical market share data.
New EMRG Students

EMRG welcomes four new graduate students to the group this fall.

Michael Wolinetz graduated from Queen's University with a degree in chemistry. Since then, he has spent three years on the west coast enjoying the seasonal lifestyle afforded as a treeplanter and ski instructor. He looks forward to helping to ensure that there will be snow to ski on for many years to come.

Noel Melton obtained his undergraduate degree in Geography from the University of Calgary in 2004. His interest in climate change and the integration of economics with environmental management drew him to EMRG. For his research he will be working with fellow new students on the CIMS world project. Noel worked as a professional pilot before coming to REM.

Nygil Goggins grew up on the coast of BC, and graduated from Royal Roads University with a degree in environmental science. He has a diverse background in stream surveying, contaminated sites, planning consulting, and renewable energy. His academic interests are broad, but generally fall under the umbrella of sustainable energy systems. Nygil finds his moments of clarity in nature, and is always up for a trip to the mountains.

Suzanne Goldberg considers herself an environmental realist. The hybrid SUV she sometimes drives is a testament to her deep seeded hypocrisy. Suzanne has an undergraduate degree in business from McMaster University and worked for the Canadian Environmental Markets Association before joining REM. Her interests include climate change, energy usage and dancing like no one's watching.

New challenges...

Rapid economic growth and high natural gas prices have combined to create an enormous demand for coal-fired electricity generation in developing countries like China and India. While the installation of electrical capacity is essential to improving the lives of hundreds of millions, a dramatic increase in coal combustion could have unprecedented environmental and public health consequences. Can rapid demand for coal somehow be reconciled with environmental and public health concerns? This is the issue that EMRG researcher Rose Murphy is setting out to discover.

Six years after completing a Master of Resource Management degree, Rose has decided to take the plunge and begin a PhD with Dr. Jaccard this fall. She won a 3-year Canada Graduate Scholarship for her plan to investigate carbon capture and storage and other clean coal technologies, and to advance optimal strategies for their widespread deployment in China and India.

Best of luck, Rose!

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