MAJOR RESEARCH PROJECT

Behavioural Economics for Environmental Policy:

Lessons from Salience, Status-Quo Bias, and the Power of Social Norms in Curbside Recycling Programs

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Table of Contents

Abstract

The point of focus in this paper is the potential role of behavioural economics in environmental policy. Using the case study of curbside household recycling programs, the general hypothesis presented is that behavioural factors can provide a more complete account of the sustained increase in curbside recycling program utilization by households than can neo-classical conceptions supply and demand. Although there are many behavioural factors that have been identified in the field, the focus will be on the three behavioural factors of *salience*, *status-quo bias*, and *social norms*. First presenting a theoretical comparison of economic actors as *Homo Economicus* and *Homo Sapiens*, the paper explores the potential of behavioural economic factors to explain the increased utilization of curbside recycling programs. The findings of the various studies that are surveyed throughout the paper are then integrated to suggest behavioural approaches to improve curbside recycling and composting programs. The findings further show that behavioural approaches using salience, status-quo bias, and social norms should be combined with conventional environmental policy approaches to improve the overall effectiveness of environmental programs, particularly those that address negative environmental externalities which result from otherwise common and non-salient human behaviour.

Introduction

As *Homo sapiens* we are largely driven by habits of thought, rules of thumb, and emotions. Yet, neo-classical (also known as conventional) economics continues to assume that we are *Homo Economicus* – perfectly rational with clearly ordered sets of preferences. This is not to say that conventional economics is a poor tool to aid policy making. It is an exceptional tool. Indeed, neo-classical economics has long provided essential and effective tools for policy makers in many fields, ranging from health care, finance, and education to environmental policy. However, it is incomplete. Recognizing this shortfall of conventional economics to adequately explain our often irrational behaviour, a growing number of academics have begun applying principles established in psychology to economic models to form a field now known as behavioural economics.

Over the past decade, behavioural economics has become increasingly accepted in the broader field of economics.[1] In recognition of its potential, behavioural economics has also more recently begun to filter into the policy-making arena. This transition from the academic fringe to gradual mainstream recognition is now often attributed to the 2008 publication of *Nudge* by Richard Thaler and Cass Sunstein, who made the concepts of behavioural economics easily accessible to a wide audience. The book is known to have even become required reading within the Cabinet of Prime Minister David Cameron in the U.K.[2] Indeed, Thaler and Sunstein themselves have since gained prominent positions in the policy making arenas of the U.S. and the U.K.

[1] Dolan et al., "Influencing Behaviour," 265.
[2] Martin Hickman, "Nudge, nudge, wink wink."

The point of focus in this paper is the potential role of behavioural economics in environmental policy. Behavioural methods have been applied widely in other policy fields such as personal finance (e.g. pension plans) and health, but examinations of its applicability to environmental economics and by extension environmental policy have only been conducted very recently. This paper presents the case for a greater role of behavioural economics in the field of environmental policy. Using the case study of curbside household recycling programs, the general hypothesis presented is that behavioural factors can provide a more complete account of the sustained increase in curbside recycling program utilization by households than can neo-classical conceptions supply and demand. Although there are many behavioural factors that have been identified in the field, the focus will be on the three behavioural factors of *salience*, *status-quo bias*, and *social norms*. In common terms, these three factors respectively mean that we prioritize what our attention is drawn to, we are habitual, and that we are influenced by our perception of how others view us. By demonstrating the impact of these factors on recycling behaviour, the paper makes the case that these findings – and thus behavioural economics - can be more broadly applied in conjunction with conventional policy tools to offer more robust and thus more effective environmental policies that seek to address the negative environmental externalities resulting from routine human behaviour.

First, in *Part I* the paper will introduce the theoretical basis of behavioural economics by exploring the contesting views of *Homo Economicus* and *Homo Sapiens*. *Part II* will explore the three concepts of salience, habits and social norms as they are discussed in the broader field of behavioural economics. *Part III* will present a case study examining the role of the three key behavioural factors in the success of curbside waste recycling programs for households. The

case study presents evidence supporting the strong contribution of these three factors to the increasing utilization rate of curbside recycling programs in Canada, the U.S. and the U.K. The intent is to demonstrate the tangible utility of using behavioural factors in the design of environmental policy. Lastly, *Part IV* of this paper will offer a discussion on the lessons learned from curbside recycling programs and expanding the broader role of behavioural economics in the policy-making arena. This last section will argue that moving behavioural economics beyond small-scale experiments should be done through integration with existing economic tools and policy design. The reasoning behind this approach is to "mainstream" behavioural economics as a complimentary tool following the recycling model to increase the effectiveness of current regulatory and market-based methods in environmental policy.

PART I: What is Behavioural Economics?

Homo Economicus vs. Homo Sapiens

The fundamental difference between neo-classical economics and behavioural economics is the unit of analysis. The neo-classical model of an individual economic actor – *Homo Economicus* – is that of a perfectly rational being with an ordered set of preferences that can be represented by a utility curve.

Herbert Gintis provides a useful overview of the characteristics that *Homo Economicus* is endowed with. According to Gintis, *Homo Economicus* has the following four key characteristics:

1. She "comes to a choice situation with exogenously given and determinate preferences. These preferences apply to goods and services that are produced, consumed, and exchanged";
2. She is "self-interested, caring only about personal (or familial) commodities, work, and leisure";
3. She is "outcome oriented, caring about social interactions only so far as they affect her final consumption and wealth"; and
4. She has a "rate of time preference that allows her to allocate consumption over time in a consistent manner, reflecting her welfare and her concern for the welfare of future generations". [3]

Conventional economics assumes *Homo* Economicus to be a consumer with absolute choice sovereignty, tastes, and preferences that are given (i.e. they are exogenous).[4] The most ardent proponents of this view of economic actors argue that tastes and preferences cannot be subject to the rational analysis of behavioural economics since they are both given and are always fixed. The implication is that our preferences are unchanging throughout time. This interpretation of the individual consumer seeks to bring all consumer behaviour within the envelope of conventional economics, treating all behaviour as utility functions.[5] Simply stated, the rigid methodology of neo-classical economists such as Stigler and Becker facilitates the view that "all changes in behaviour are explained by changes in prices and incomes, precisely the variables that organize and give power to economic analysis."[6]

Although the rigid approach of Stigler and Becker is methodologically useful because it makes behaviour "neat", it is abundantly clear from everyday observation of individuals that people fail to consistently conform to the model of *Homo Economicus*. The behaviour of people is not simply determined by the adjustment of price and income variables. People may succumb

[3] Gintis, "Beyond Homo Economicus," 312.
[4] Norton et al., "The Evolution of Preferences," 195.
[5] Norton et al., "The Evolution of Preferences," 197.
[6] Stigler and Becker, "De Gustibus Non Est Disputandum," 89.

to harmful temptations, behave charitably or vengefully, and have a general consideration for fairness. Neo-classical economics has placed little credence in these observations. As will be discussed below, behavioural economics suggests that the characteristics of *Homo Economicus* should be relaxed to generate a more complete understanding of economic behaviour, evolving the unit of analysis from *Homo Economicus* to *Homo Sapiens*. Such an evolution can lead to better informed and thus more effective public policy.

Behavioural Economics: From Homo Economicus to Homo Sapiens

The foundational models and assumptions in behavioural economics have their origins in the field of cognitive psychology. The Nobel laureate Herbert A. Simon is credited with being the first to formally suggest that decision makers or economic actors should be viewed as *boundedly rational*, bringing them closer to *Homo Sapiens*. Recall that this view is in contrast to the neo-classical model of an individual economic actor who is a perfectly rational being with an ordered set of fixed preferences. Simon offered an alternative model in which utility maximization was replaced with "*satisficing*" as opposed to "optimizing".[7] That is, we simplify our choices in order to adapt to our environment. For example, when looking to purchase new shoes, we will likely purchase the first pair of ten options that fits and satisfies our need without considering the other remaining options. Indeed, the other shoes that are not considered may be of higher quality, lower price, or better fit. Nonetheless, upon satisfying our

[7] Simon, "Rational Choice," 129.

need, we cease optimizing. As Simon points out, such a simple choice architecture requires neither a utility function nor a marginal rate of substitution between multiple wants.[8]

The work of Simon suggests that to be boundedly rational means to make decisions under the constraint of the human condition. Simply stated, there are limits to human cognitive abilities and the world is a complex place. When faced with decisions, individuals do not consider every available option nor make the best utility optimizing choice as neo-classical economics would suggest. People are driven by habits of thought, rules of thumb, and emotions. That is not to say that human behaviour should be judged as irrational. On the contrary, people are rational in the sense that they are goal-oriented and - usually - have reasons for what they do. It is just that rationality is reliant upon an individual's cognitive structure and the context in which the individual is placed.[9] Thus, rationality is "bound" by the framing of the human mind and its surroundings.

Building upon the ideas of Simon, Daniel Kahneman and Amos Tversky are often credited with being the founding fathers of modern behavioural economics. In 2002 Kahneman received the Nobel Prize in economics for his contributions to the field (If Tversky had not died in 1996, he would have shared the prize with Kahneman). Their research focused on three different streams with the collaboration of other scholars. These three streams are briefly introduced here and will be discussed in more detail later in the paper. The first stream explored the heuristics (i.e. rules of thumb) that people use along with the various biases to

[8] Simon, "Rational Choice," 138.
[9] John et al., *Nudge, Nudge, Think, Think*, 12.

which they are prone while performing judgement under uncertainty, such as when making predictions or evaluating evidence.[10]

The second stream was prospect theory, which presents a model of choice with loss aversion under both risk and riskless choice.[11] The core of the three-part theory states that perception (e.g. of gains and losses) is reference dependent. For example, Kahneman presents the following problem: "Two persons get their monthly report from a broker: A is told that her wealth went from 4M to 3M. B is told that her wealth went from 1M to 1.1M. Who of the two individuals has more reason to be satisfied with her financial situation?"[12] Standard utility theory would be concerned with the final absolute outcome (having 3M) while prospect theory highlights the relative loss, suggesting that the woman whose wealth increased would be more satisfied. Secondly, the concept of diminishing sensitivity is best described as "the subjective difference between $900 and $1,000 [being] much smaller than the difference between $100 and $200."[13] Although the difference between the two amounts is $100, the latter comparison represents a doubling of the initial amount from $100 to $200, making the change from $900 to $1000 appear far less significant while still maintaining a change of $100.

Third, loss aversion suggests that when faced with risk, losses have a greater impact than gains of equal value.[14] People are approximately twice as averse to a loss as to accepting a gain of equal value.[15] An extension of loss aversion is the *endowment effect* which suggests that

[10] Kahneman, "Maps of Bounded Rationality," 1449.
[11] Ibid.
[12] Kahneman, "Maps of Bounded Rationality," 1456.
[13] Kahneman, *Thinking, Fast and Slow,* 282.
[14] Ibid.
[15] Gintis, "Beyond Homo Economicus," 315.

it is more important for people to retain what they already have than to gain something extra.[16] J. Knetsch is often credited with clearly demonstrating loss aversion with his widely cited 1989 "coffee mugs and chocolate bars" experiment.[17] Knetsch provided half of the study participants with one candy bar per person and the other half with one coffee mug per person of approximately the same value as the chocolate bars. The subjects could then trade their commodities amongst each other. The experiment demonstrated that the preference for the mug over the candy bar varied from 10% to 89%, depending only on which of the items the person was given first prior to the trade. The subjects most often did not want to part with the item they first began with.

Lastly, Kahneman and Tversky focused on framing effects and their implications for rational actor models. To demonstrate this, consider the following two statements: 1) "the odds of survival one month after surgery are 90%"; and 2) "mortality within one month of surgery is 10%."[18] Despite communicating the same level of risk, the first statement appears to be much more preferable. The framing effect suggests that equivalent descriptions lead to different choices by changing the relative *salience* of different aspects of the issue at hand.[19]

Kahneman offers a useful model of two thought systems to explain the underlying cognitive elements of bounded rationality. Using terms initially proposed by the psychologists Keith Stanovich and Richard West, Kahneman refers to the two illustrative systems of cognition as System 1 and System 2:

[16] John et al., *Nudge, Nudge, Think, Think*, 14.
[17] Kahneman, Knetsch and Thaler, "Experimental Tests of the Endowment Effect," 1329.
[18] Kahneman, *Thinking, Fast and Slow*, 88.
[19] Kahneman, "Maps of Bounded Rationality," 1458.

> *"System 1* operates automatically and quickly, with little or no effort and no sense of voluntary control. *System 2* allocates attention to the effortful mental activities that demand it, including complex computations. The operations of System 2 are often associated with the subjective experience of agency, choice, and concentration."[20]

Using Kahneman's System 1/System 2 illustration, we can conceptualize *Homo Economicus* as operating exclusively with System 2. System 1 can be understood to be the intuitive system, and System 2 the rational system. Most often, System 1 is in control. It is the "effortlessly originating impressions and feelings that are the main sources of the explicit beliefs and deliberate choices of System 2."[21] The various operations that System 2 can perform all have one common feature, which is that they require attention and are disrupted when that attention is drawn away. Some examples include bracing for the start of a race, counting the occurrences of the letter *a* in a page of text, or comparing two washing machines for overall value.[22]

Typically, System 1 and System 2 interact in harmony. System 1 operates automatically and System 2 is in the background in case it is called upon. In Kahneman's own words, "System 1 continuously generates suggestions for System 2: impressions, intuitions, intentions, and feelings. If endorsed by System 2, these will turn into beliefs and voluntary actions."[23] When System 1 is faced with difficulty, System 2 steps in to support more effortful thought. In short, most of what we do originates in System 1, but System 2 takes over when things become difficult, trumping System 1.[24]

System 1 accurately models familiar situations, often makes correct short-term predictions, and its reactions to challenges are quick and appropriate. However, System 1 has

[20] Kahneman, *Thinking, Fast and Slow*, 20-21.
[21] Kahneman, *Thinking, Fast and Slow*, 21.
[22] Kahneman, *Thinking, Fast and Slow*, 22.
[23] Kahneman, *Thinking, Fast and Slow*, 24.
[24] Ibid.

biases and systematic errors that it is prone to making in specific circumstances. System 1 is prone to interpreting questions differently than they are asked, and it has little understanding of logic and statistics.[25] Furthermore, System 1 cannot be turned off. If a person is shown a word on a screen in a familiar language, they *will* read it - unless their attention is completely focused elsewhere.[26]

In sum, we can see that behavioural economics reveals systematic errors which the seemingly perfectly rational actor (*Homo Economicus*) of neo-classical economics makes. Although changes in prices and incomes determine many of our actions and models of supply and demand have power and "neat" explanatory value, these theoretical models can only take us so far. The implication of this finding is not that conventional economics has somehow failed us, but that there is room for improvement to achieve an understanding of economic behaviour that is closer to that of human (*Homo Sapiens*) behaviour.

PART II: Key Principles

To demonstrate how to improve the unit of analysis beyond *Homo Economicus* towards the more accurate and thus more useful *Homo Sapiens*, a survey of three key behavioural factors is presented below. Including those discussed above, over twenty-five "behavioural failures" have been identified as relevant to economic decision-making.[27] For the purposes of this paper, however, only the three most relevant to the household recycling case study in Part III will be

[25] Kahneman, *Thinking, Fast and Slow*, 25.
[26] Ibid.
[27] Shogren and Taylor, "On Behavioural-Environmental Economics," 39.

discussed in detail. The effects of bounded rationality that will be discussed can be summarized by three findings that people:

1. Prioritize what their attention is drawn to;
2. Have a preference for the status quo;
3. Care about how others think of them.

1) Heuristics and Biases

Arising from the interplay between System 1 and System 2 come rules of thumb that people use throughout their busy and complicated lives to efficiently comprehend what is happening around them. These rules of thumb come into play whenever a judgment must be made, whether it is about a person's age or about the distance between two cities. People use rules of thumb because they are simple and most of the time they are quick and useful. Yet, rules of thumb lead to systematic biases. Two of the most notable heuristics and biases are *anchoring* and *availability*.

Anchoring occurs when people "consider a particular value for an unknown quantity before estimating the quantity."[28] It is one of the most reliable and robust results of experimental psychology. To illustrate anchoring consider the following experiment in which university students were asked two questions: A) How happy are you? B) How often are you dating? When asked in this order (A and then B) the correlation between the two questions was very low (0.11). However, when the question order was reversed (B and then A) the correlation increased significantly to 0.62. Being first prompted by the dating question resulted in the

[28] Kahneman, *Thinking, Fast and Slow*, 119.

students "anchoring" their happiness to when they were last on a date.[29] Anchoring is not simply a curiosity of academic experiments. Anchors play a prominent role in the relationship between the final sale price and the asking price of real estate, establishing financial damage claims in legal disputes, or any other activity that involves comparison or negotiation.

Availability bias is also referred to in the literature as the *framing effect* or *salience*. It is this bias which is the subject of interest in this paper. Availability bias indicates that our behaviour is significantly influenced by what our attention is directed to, what is novel, and what seems relevant to us.[30] We are bombarded on a daily basis with stimuli and as a result we filter out much of the information as a coping mechanism. Thus, people are more likely to register stimuli such as flashing lights, items on sale, and snappy slogans.[31] The key to the effectiveness of these stimuli is their simplicity. As Dolan et al. state, "…our attention is much more likely to be drawn to things that we can understand – things that we can easily 'encode'."[32] Such stimuli often relate directly to our personal experiences rather than things that are presented in an abstract manner.[33] Simply stated, only information that is readily on hand and is easily understood will be significant enough to instigate a particular response or change in behaviour.

A behavioural experiment conducted in 2006 in the U.S. convincingly demonstrated and quantified the effects of tax salience on consumer behaviour. Neo-classical economic theory assumes full optimization by economic actors, treating changes in tax the same way as price

[29] Thaler and Sunstein, *Nudge*, 24.
[30] Dolan et al., "Influencing Behaviour," 266.
[31] Dolan et al., "Influencing Behaviour," 269.
[32] Ibid.
[33] Ibid.

changes.[34] Contrary to the neo-classical view, Chetty et al. demonstrate that inattention (i.e. imperfect optimization) has a considerable effect on taxation due to its non-transparent nature in practice. The experiment took place in a grocery store where prices on goods excluded a sales tax of 7.3%. If a good was subject to the sales tax, it was added to the price at the register. The experiment sought to test if consumers underreacted to the sales tax because it was not included in the posted price. To test this hypothesis, 750 products had additional labels included next to the product price, showing the full cost once the tax was included. By including the tax on the label (making it salient), rather than at the point of sale resulted in an 8 percent decrease in the quantity sold and total revenue from the treated group of products over the duration of the experiment. To further strengthen this evidence, the study revealed that over a 30-year period, posted state taxes on alcoholic beverages reduced their consumption significantly more than taxes added at the point of sale.[35]

2) Status Quo Bias

People have a tendency to take whatever option requires the least effort and offers the path of least resistance. In many cases this means that people stick to their present situation. Dubbed the "*status quo bias*" by William Samuelson and Richard Zeckhauser in 1988, this phenomenon again contradicts the rational actor model. Under the neo-classical economic model, economic actors actively choose among choices in line with their defined preferences. Only preference-relevant features of the available choices factor into the actor's decision. Neither the order in

[34] Chetty, Looney and Kroft, "Salience and Taxation," 1145.
[35] Chetty, Looney and Kroft, "Salience and Taxation."

which the choices are presented nor any additional labels should affect an individual's choice.[36] In reality there is always a "do nothing" possibility. Numerous real world experiments have clearly demonstrated a strong tendency amongst decision makers to exhibit a status quo bias (i.e. to do nothing). Furthermore, as the number of choices increases, there is a stronger relative bias favouring the status quo.[37]

Some of the best examples of status quo bias and default options have been demonstrated in the field of financial behaviour. A 1986 study conducted by TIAA-CREF, which manages pension plans for many U.S. professors revealed that more than half of TIAA-CREF members made no changes.[38] Over the course of member professors' careers, only 28 percent of participants made any changes to their pension contribution allocation (20 percent made one change and 8 percent made more than one change).[39] The same study also tellingly revealed that many married participants who joined when they were single still had their mothers listed as their beneficiaries.[40]

Status quo bias makes the manipulation of default options very effective. Business models of some firms are entirely dependent upon the reliability of the status quo bias. Automatic renewals of magazine subscriptions, monthly donations to charities, or the pre-selected "Yes, I wish to receive emails concerning future product updates" option on many websites are just a few of many common examples. The potential large-scale impact of defaults in the policy arena is clearly demonstrated by the widely cited 2003 Johnson and Goldstein study of default opt-in or opt-out settings for organ donation consent on driver's licence application forms. The study

[36] Samuelson and Zeckhauser, "Status Quo Bias in Decision Making," 8.
[37] Ibid.
[38] Thaler and Sunstein, *Nudge*, 34.
[39] Samuelson and Zeckhauser, "Status Quo Bias in Decision Making," 31.
[40] Thaler and Sunstein, *Nudge*, 35.

revealed that amongst the examined European countries, the four countries that had opt-in organ donation had an average donation rate of 15%, while the seven countries that had opt-out (i.e. presumed consent) programs had an average consent rate of 98%.[41]

A significant appeal of focusing on default options in a wide array of policy areas is that they can maximize benefits for citizens by influencing behaviour without restricting individual choice.[42] Thaler and Sunstein's widely lauded 2008 book *Nudge: Improving Decisions About Health, Wealth, and Happiness* is largely predicated on this point. In their terms, the use of defaults seeks to "nudge" citizens towards socially optimal choices while never taking away their freedom to choose otherwise. For example, a U.S. Fortune 500 corporation changed the default from active to automatic enrollment in an effort to increase the 401(k) pension participation rate amongst their employees. The changed enrollment scheme not only significantly increased participation, but also eliminated most of the previous differences in participation due to income, sex, and race.[43] In recognition of the benefits of defaults, effective as of 2012 the U.K. Pension Act has been changed to automatically enroll employees while permitting the opportunity to opt-out.[44]

3) Norms

Social and cultural norms can be defined as "the behavioural expectations, or rules, within a society or group, or alternatively a standard, customary, or ideal form of behaviour to which

[41] Johnson and Goldstein, "Do Defaults Save Lives?," 1338.
[42] Thaler and Sunstein, *Nudge*, 5.
[43] Madrian and Shea, "The Power of Suggestion."
[44] Dolan et al., "Influencing Behaviour," 269.

individuals in a social group try to conform."[45] Behaviour is influenced by social norms because individuals take their cues from what others do. Furthermore, individuals use their perception of norms as a standard against which they compare their own behaviour.[46]

Conformity can be a deliberate strategy because an individual may obtain pleasure from behaving like those around them. However, evidence suggests that individuals following conformist behaviour do not demonstrate awareness of having been influenced by others.[47] Secondly, social norms can lead to behaviour that is not "rational". A useful illustration of this is provided by Latane and Darley who demonstrated that the presence of inactive people strongly reduced the probability that a subject would act in a dangerous situation. In the presence of inactive peers, subjects reported smoke filling a room only 10 percent of the time, while reporting the dangerous situation 75 percent of the time when encountering the smoke alone. Seeing others remain passive led the subjects to conclude that the situation was not dangerous.[48] When this *chameleon effect* is scaled up, the impact of social norms on behaviour amplifies its potency because social norms induce a positive feed-back loop in behaviour. Where the norm is more widely adhered to by members of a group, the more everyone wants to adhere to that norm.[49]

Dolan et al. draw out four main lessons about norms.[50] First, if a norm is socially desirable, it should be publicized. As Linkenbach and Perkins reported in a 2003 study on seatbelt use in Montana, 85% of respondents to a survey reported using seatbelts while their

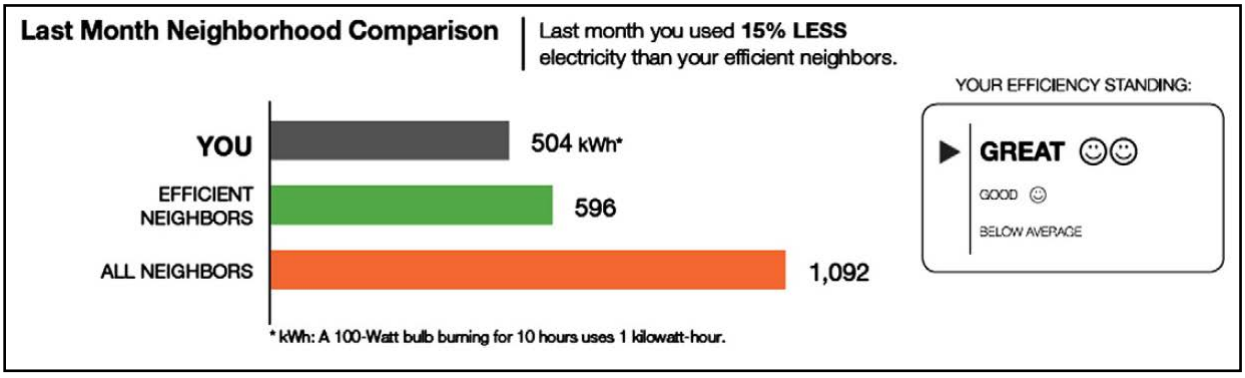
[45] Dolan et al., "Influencing Behaviour," 268.
[46] Clapp and McDonnell, "The relationship of perceptions of alcohol promotion and peer drinking."
[47] Chartrand and Bargh, "The Chameleon Effect," 894.
[48] Latane and Darley, "Group Inhibition," 215.
[49] Burke and Payton-Young, "Social Norms," in Dolan et al., "Influencing Behaviour," 268.
[50] Dolan et al., "Influencing Behaviour," 268.

perception was that only 60% of other citizens did so. After a "Most of us wear seatbelts" media campaign was launched the self-reported use of seatbelts significantly increased.[51] Similarly, perceptions among university students grossly overestimate how pervasive alcohol abuse is within the student population.[52]

Second, the norm should relate to the target audience as much as possible. In recycling, a study by Robert B. Cialdini reported that when a hotel room contained a sign asking guests to reuse their towels, 35 percent did so. When the hotel implemented social norms by stating that most guests at the hotel reused their towels at least once during their stay, compliance increased to 44 percent. When the sign said that most previous occupants of that specific room reused their towels, 49 percent of guests also reused.[53]

Third, norms may need reinforcing. In 2008 the U.S. energy company OPower began sending Home Energy Reports to customers of its partner utilities. The Home Energy Reports were included with the household's energy bill and presented a neighbourhood comparison of energy consumption (See Figure 2) to nudge consumers to use less energy using social norms.

Fig. 2 ([54])



[51] NSNI, "Most of us wear seatbelts."
[52] Perkins, *The Social Norms Approach to Preventing School and College Age Substance Abuse*, 8-9. in Thaler and Sunstein, *Nudge*, 67.
[53] Cialdini, "Crafting Normative Messages," 107.
[54] Allcott, "Social Norms and Energy Conservation," (2011) 1084.

The Home Energy Reports were sent out on a quarterly basis and a bimonthly basis to different treatment groups along with information on how to reduce energy through immediate actions such as turning off lights in unused rooms and through long-term smart purchases of energy saving appliances and home renovations. However, the effectiveness of the quarterly intervention decayed in the months between energy use reports and increased again upon receipt of the next report.[55] The bimonthly treatment groups in the study showed a 2.2% decrease in power usage while the quarterly group's power usage decreased by 1.7%.[56] Thus, norms appear to be effective, but their pressure must be ongoing.

Fourth, norms can backfire when people hear that others are performing worse than they are. When households were given information about their relative energy consumption in an earlier version of the OPower study, those who consumed above average amounts of electricity reduced their used, but those who were already below average increased their consumption until an intervention was devised to prevent this *boomerang effect*.[57] A simple intervention included a hand-drawn smiley face (☺) for those below the average neighbourhood power usage or sad face (☹) for those above the average. A more refined version of this feedback was later implemented which can be seen above in Figure 2. In an updated review of the study in 2011, Hunt Allcott still found the mean impact across the treatment groups to be a 2% reduction in energy use by households, but argued that the boomerang effect was not mitigated by the descriptive norm of the smiley/sad face. Rather, an unknown factor such as the energy conservation tips or another aspect of the comparative

[55] Allcott, "Social Norms and energy Conservation," (2009) 3.
[56] Allcott, "Social Norms and Energy Conservation," (2011) 1087.
[57] Schultz et al., "The Constructive, Destructive, and Reconstructive Power of Social Norms," 431.

norm was responsible. Such mixed findings suggest the boomerang effect and potential mitigating factors require further experimental inquiry.

PART III: Case Study
Learning from the Behavioural Success of Municipal Curbside Recycling

The 1990s are described by David Folz as the "decade of recycling".[58] The national recycling rate in the United States increased from 9% in 1989 to 28% in 1996 – a dramatic increase suggesting robust popular support.[59] Most notable in this statistic is the increased prevalence of curbside recycling programs where residents put out separate containers of recyclable materials such as plastic, glass, aluminium and paper along with their regular waste for regular (e.g. weekly) collection in front of their dwelling by the municipality. In 1988 there were approximately 1000 municipal curbside recycling programs in the U.S. This number increased to nearly 5000 by 1992 and to just over 9000 by 1999.[60] The most current data on municipal solid waste (MSW) disposal methods in the U.S. and Canada dates from 2005 and 2004, respectively. As of these dates the U.S. recycled 24% and composted 8% of its MSW, while Canada recycled 27% and composed 13% of its MSW.[61]

MSW has emerged as a major concern in the effort to reduce climate altering greenhouse gas (GHG) emissions. The World Bank estimates that post-consumer waste accounts for nearly 5% (1,460 Mt CO_2 equivalent) of total world-wide GHG emissions.[62] Minimizing waste in a life-cycle context can have significant benefits for reducing GHG

[58] Folz, "Municipal Recycling Performance," 336.
[59] Ibid.
[60] Jenkins et al., "The determinants of household recycling," 295.
[61] World Bank, "*What a Waste*," 87-88.
[62] World Bank, "*What a Waste,*" 29.

emissions. According to the U.S. Environmental Protection Agency (EPA), methane (CH_4) from landfills represents 12% of total global methane emissions and has a Global Warming Potential 21 times greater than CO_2.[63] Organic biomass decomposes anaerobically in a landfill (as opposed to aerobically when composted), producing landfill gas composed of methane (typically 50%), CO_2 and other gasses.[64]

GHG emissions from MSW can be easily reduced.[65] For example, within the EU the rate of GHG emissions from waste has declined from 69 Mt/yr to 32 Mt/yr from 1990 to 2007.[66] Materials in MSW represent what is left after the extraction of raw materials, manufacturing of products, transportation of products to markets, use by consumers, and finally waste management. By recycling waste materials, they are used in place of virgin inputs in the manufacturing process rather than being disposed of as waste. Additionally, the recycling of paper results in increased capacity for more carbon sequestration by forests that are not cut down.[67] According to the U.S. EPA, appropriate solid waste management methods can affect one or more of the following aspects of the life-cycle of MSW to reduce GHG emissions:

1. Energy consumption (e.g. combustion of fossil fuels) associated with manufacturing, transporting, using, and disposing of products;
2. Non-energy related emissions such as CO_2 from manufacturing processes;
3. Methane emissions from landfills;
4. CO_2 and nitrous oxide (N_2O) emissions from waste incineration; and
5. Carbon sequestration through man-made or natural carbon removal from the atmosphere (e.g. trees or storage in geological formations).[68]

[63] EPA, *Solid Waste Management and Greenhouse Gases*, 5.
[64] World Bank, "*What a Waste,*" 30.
[65] Ibid.
[66] ISWA, *Waste and Climate Change*, 4.
[67] EPA, *Solid Waste Management and Greenhouse Gases*, 32.
[68] EPA, *Solid Waste Management and Greenhouse Gases*, ES-4.

Multiple studies and Gallup polls in the U.S. during the 1980s revealed high levels of stated concern among respondents about environmental topics such as acid rain, air pollution and water quality.[69] However, despite the prevalence of these stated pro-environmental attitudes, adoption rates for sorting and separating household waste remained very low.[70] With the low prevalence of MSW recycling prior to the 1990s, what factors caused the rate of recycling by households to rapidly increase within a decade?

The rapid increase in the U.S. and Canadian MSW recycling rate during the 1990s to approximately 25% by the end of the decade - where the data suggests it has remained until present – can be attributed to widespread access to structured recycling programs such as curbside pick-up programs. As Linda Derksen and John Gartrell reported in their 1993 study on the social context of recycling, the most important determinant of recycling behaviour is "access to a structured, institutionalized program that makes recycling easy and convenient."[71]

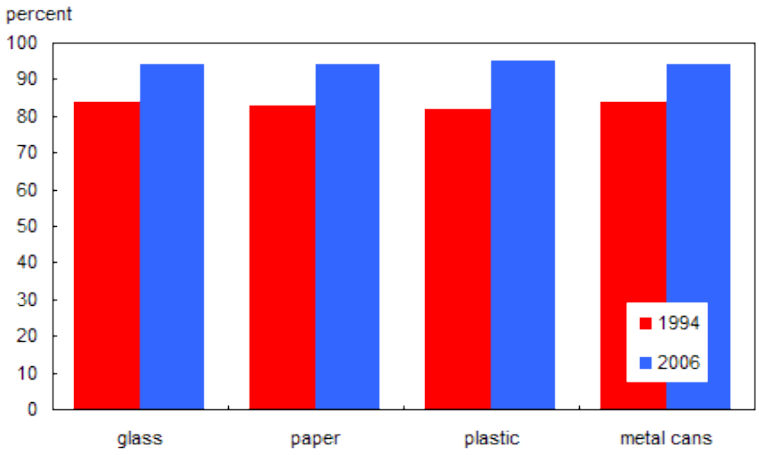
Current data available from Statistics Canada supports Derksen and Gartrell's conclusion. By 1994 approximately 67% of Canadian households had access to recycling programs for the four major recyclables (glass, paper, plastic and metal cans). By 2006 the average access rate increased to approximately 93%.[72] However, beyond the obvious lowering of the access barrier, of interest is the considerable utilization rate increase amongst households with access to recycling programs. It is this second aspect of the increase in recycling rates that suggests the influence of behavioural factors beyond the greater supply of recycling programs. Of the Canadian households that had access to recycling programs in 1994, approximately 84% used

[69] Derksen and Gartrell, "The Social Context of Recycling ," 434.
[70] De Young, "Some Psychological Aspects of Recycling," 436, in Derksen and Gartrell, "The Social Context of Recycling ," 434.
[71] Derksen and Gartrell, "The Social Context of Recycling," 439.
[72] Statistics Canada, "Recycling in Canada," Chart 2.

these programs to at least some extent. As of 2006 the average utilization rate was 97% with a provincial min/max utilization of 88% and 99% (see Figure 3).[73] What can explain the increased utilization rate amongst households with access?

Fig. 3 ([74])

Percent of Canadian households with access to recycling programs that used them, 1994 and 2006



Source: Environment Accounts and Statistics Division, Households and the Environment Survey, 1994 and 2006.

The increase in the recycling rate between 1994 and 2006 can be understood as follows:

Change in recycling rate = (change in access) + (change in utilization given access)

Since 93% - 67% = 26% (change in access) and 97% - 84% = 13% (change in utilization given access), we can see that the overall recycling rate increased by 39% with increased access accounting for 2/3 of the change and increased utilization accounting for 1/3 of the change.

If utilization rates remained unchanged from 1994 to 2006, growth in recycling could easily be attributed solely to increased access to recycling programs. However, going beyond

[73] Statistics Canada "Recycling in Canada," Table 2.
[74] Statistics Canada, "Recycling in Canada," Chart 3.

this explanation, the above result using Canadian *Households and the Environment Survey* data indicate that 1/3 of the rise in the recycling rate is not explained by the conventional paradigm of supply "meeting" the demand for recycling programs. Thus, when controlling for access to recycling programs, greater rates of household recycling suggest that recycling behaviour (i.e. taste and preference) has been influenced by factors other than supply and demand. Supporting this hypothesis, the 2007 *Households and the Environment Survey* revealed that 28% of respondents answered in the affirmative when asked "Aside from being good for the environment, why do you/does your household recycle? Is it...because everyone in your area participates?"[75] Although social norm pressure is not an all-encompassing explanatory force, just over one quarter of respondents self-reporting to be affected by social norms suggests that this factor is not insignificant. The conventional (i.e. neo-classical) explanation for the increase in recycling rates can provide an adequate but incomplete answer (e.g. 2/3) to the question of why recycling rates have increased so rapidly during the 1990s and continued to rise.

The most interesting result from the Derksen and Gartrell study was that of those who had access to recycling programs, individuals who expressed themselves to be *unconcerned* about environmental issues recycled at similarly high levels as those who expressed concern for the environment. Those who were concerned recycled when given an opportunity and recycled more items than others, but more importantly, those who were unconcerned also participated in a recycling program that was available but not mandatory. Despite expressing little or no demand for recycling programs, unconcerned individuals nonetheless began to recycle. This behaviour further suggests an explanation beyond the scope of the neo-classical

[75]Statistics Canada, "Households and the Environment Survey 2007," Variable RC_Q07D.

supply/demand model. Thus, the study demonstrated that what the authors called "social context" was "sufficient to produce the desired behaviour, while pro-environment attitudes simply enhanced the effect of context on recycling."[76]

Derksen and Gartrell confirmed the earlier studies of Vining and Ebreo from 1990[77] and Oskamp et al. from 1991, suggesting that the convenience of curbside recycling programs likely contributes to their success. Furthermore, they suspect "highly visible, widespread, and socially desirable nature of the program meant that on a neighbourhood basis, the norm for recycling was probably changed."[78] Indeed, the findings of Oskamp et al. strongly support the suspicion of Derksen and Gartrell. Using telephone interviews in Ontario, California the Oskamp study investigated the relationship between utilization of curbside recycling and demographic variables (e.g. age, education, income, home ownership, etc.), knowledge of environmental conservation, general pro-ecological attitudes, and behavioural variables such as past recycling habits and recycling by friends and neighbours.[79]

Using a multivariate analysis to test predictor variables for recycling behaviour, the Oskamp study found recycling by friends and neighbours to be the second strongest predictor variable after single-family home ownership (note that curbside collection was largely available only to single family homes).[80] Of the surveyed households, 40% indicated that their participation in the recycling program was highly visible to their neighbours due to the brightly coloured recycling bins used for collection.[81] In line with the argument generally presented in

[76] Derksen and Gartrell, "The Social Context of Recycling," 439.
[77] Vining and Ebreo, "What Makes a Recycler?"
[78] Derksen and Gartrell, "The Social Context of Recycling," 440.
[79] Oskamp et al., "Factors Influencing Household Recycling Behaviour," 500.
[80] Oskamp et al., "Factors Influencing Household Recycling Behaviour," 515.
[81] Oskamp et al., "Factors Influencing Household Recycling Behaviour," 514.

this paper, the Oskamp study concludes that the predictive value of friends and neighbours recycling suggests that "social influence could be used effectively as a stimulus to recruit more participants in curbside recycling programs."[82]

Despite the above conclusions, the studies presented above stop short of explicitly developing their findings using the formalized concepts and language used today in the field of behavioural economics. With nearly twenty years of hindsight and developments in the discipline, the implications of studies such as the one conducted by Oskamp et al. and Derksen and Gartrell clearly suggest that the explanatory abilities of present-day behavioural economics can be applied to at least in part explain the increased utilization of recycling programs by households throughout the United States, Canada, and other OECD countries.

As the data presented indicates, curbside recycling programs are now ubiquitous and are largely taken for granted. Rapid and large-scale adoption by households should be seen as a mark of success. Simply stated, curbside recycling has become the norm. Access and more importantly average utilization rates by households in excess of 95% in Canada achieved within approximately 15 years on a national scale is no small feat. When viewed through the lens of behavioural economics and the three concepts covered in Part I of this paper, the factors of success of curbside recycling programs become visible.

The key behavioural factors which have promoted the expansion of curbside recycling are *salience*, *defaults/habits*, and most notably *norms*. Identifying these factors that contributed to establishing curbside recycling as a norm may be valuable for further expansion of household recycling and composting and other environmental policies. The convergence of

[82] Oskamp et al., "Factors Influencing Household Recycling Behaviour," 517.

these three elements along with more conventional policy implementation measures enables the rapid acceleration of recycling program utilization and the sustained presence of these programs.

It is useful to return briefly to the conclusion of Derksen and Gartrell that the most important determinant of recycling participation among both environmentally concerned and unconcerned households is access to a structured and institutionalized recycling program. Initially this conclusion appears to be obvious, but it becomes quite profound when considered from the perspective of default setting and the disruption, change and reforming of waste disposal habits of households. More importantly, it is the interaction and mutual reinforcement of these individual components that matters.

The implementation of a municipal curbside recycling program changes the default of households from “don’t recycle with the option to recycle” to “recycle with the option not to recycle”. As the earlier discussion on defaults and organ donation indicated, such a simple change can have powerful results. Particularly when recycling receptacles are initially provided to households (e.g. the “blue box” for plastics, metals and glass, and the “black box” for paper) free of charge by their municipality, this default is crucially combined with the existing habit of placing household waste on the curb for weekly pick-up. Thus, the default is changed to the preferred pro-social option, but it does not disrupt the underlying habit of “taking out the trash on Monday night.” Households have a minimal disruption to their routine with the notable exception of having to deposit certain materials in a different receptacle.

The act of sorting household waste and placing it in a uniquely coloured “blue box” for collection on a regular schedule along with the mildly unpleasant task of handling pungent

waste for disposal makes the act of household recycling highly salient. The act of disposing of household waste is easily understood and most importantly it directly relates to our personal experience. “Taking out the trash” is a basic routine that virtually all households take part in. When respondents are questioned about their concern for environmental issues on a survey, this concern is likely to be general and abstract. However, when these same individuals are provided with an organized recycling program that is easily incorporated into their household routine of waste disposal, the act of recycling suddenly becomes very “real”. Furthermore, as Derken and Gartrell found, even those who are unconcerned with environmental issues but who follow the same habit are influenced by the presence of a default voluntary recycling program. Just as those who do not concern themselves with participating in organ donation, the latter group of households participates in recycling at least in part due to the mere presence of a recycling program.

Behavioural change is effective only if the relevant elements that we wish to change are salient to individuals and households.[83] For this reason curbside recycling has likely become so common at least in part because curbside recycling programs are easy to understand, very tangible, and are incorporated into the existing and ubiquitous waste disposal routines of households. Nonetheless, the social norm element of curbside recycling is quite likely its strongest behavioural factor and the reason for sustained growth in program utilization by those who have access.

In line with the conclusion reached by Derksen and Gartrell, social norms within neighbourhoods are likely the key behavioural element responsible for high levels of

[83] Dolan et al., “Influencing Behaviour,” 269.

participation by those who do not express concern about environmental issues (i.e. don't express demand). Curbside recycling as a highly visible behaviour exerts significant perceived social pressure on non-participants by their neighbours to "put their bin out".[84] Recall that as Burke and Payton-Young point out, as the *chameleon effect* of social norms increases, it generates a positive feed-back loop in behaviour that increases the intensity of adherence to the norm. In the case of curbside recycling the positive feed-back is provided by surrounding neighbours who participate in the recycling program.

A recycling behaviour study conducted by Stewart Barr in Exeter in the south-west of England further supports the role of salience, habits and norms in the success of curbside recycling programs. The study comprised of a survey sent out in late 1999 to 981 randomly selected households in Exeter, which is a city of approximately 90,000 residents. At the time the city had a recycling rate of 23%, which was noted to be enviable in relation to other communities in England and Wales.[85]

The results of the Barr study indicated that recycling behaviour is predicted by relatively few variables. Matching the results of Derksen and Gartrell in Canada from nearly a decade earlier, very little influence was exerted by the environmental values of respondents. Again the availability of a curbside program played a prominent role among what Barr calls "situational factors" that also included access to "local waste knowledge", which referred to the extent to which individuals were aware of what could and could not be recycled, and larger dwelling size.[86] In the category of predictive psychological variables, awareness and acceptance of the

[84] Oskamp et al., "Factors Influencing Household Recycling Behaviour," 514.
[85] Barr, "Strategies for Sustainability," 231.
[86] Barr, "Strategies for Sustainability," 235.

norm to recycle were shown to be significant factors contributing to recycling rates. Acceptance of the recycling norm (i.e. knowing that others were recycling) was the strongest individual predictive variable (0.24) of a willingness to recycle.[87]

The additional benefit of a curbside program was to increase the perception of convenience and the reduction of effort required to recycle. Barr concludes that the key factors were access to the program (default change), norm change, convenience (habit) and simplicity (salience).[88] Thus, high levels of pro-social recycling behaviour were exhibited when convenience was maximized, non-habitual effort minimized, and social norms activated.

Household waste recycling generally now appears to be an accepted behaviour that expanded most rapidly in communities with well organized and easy to understand curbside recycling programs to become a norm. Since collections are undertaken regularly on specific days, there is an instant awareness of a norm to recycle by households, making curbside recycling as common as it is today.[89] The Barr study furthermore reinforces the reality that no single factor is solely responsible for the durable success of curbside recycling. A multitude of codependent institutional and behavioural factors are uniquely brought together by the curbside approach that other program designs such as central drop-off points do not achieve. The result is a recycling program design that is greater than the sum of its parts.

[87] Barr, "Strategies for Sustainability," 234.
[88] Barr, "Strategies for Sustainability," 235.
[89] Barr, "Strategies for Sustainability," 238.

Curbside Food-Waste Collection: A Canadian Perspective

Although curbside recycling programs for paper, metal, plastic and glass have been around for approximately two decades, compost (i.e. organic food waste) curbside collection has only been available more recently. Traditionally, composting has and continues to be done privately by households in their backyards, but municipal compost collection in Canada has been increasing in major urban centers such as Edmonton, Toronto, Ottawa, Hamilton, and more recently in Vancouver and Gatineau. From 2000 to 2004, the amount of organic waste composted through institutionalized collection programs in Canada increased by 70% to 1.7 million tonnes. Two-thirds of this volume was generated by the residential sector.[90] In 2006, 27% of Canadian households disposed of food and yard waste by means of either backyard composting or curbside collection (see Figure 4). Of those who participated in any composting, the average utilization rate for curbside collection for food waste was 30% and 38% for yard waste. However, the data shows significant max/min variance among provinces ranging from zero to 89%, diminishing the usefulness of utilization rates at the national level.

As Figure 4 illustrates, with the exception of PEI and Nova Scotia which had very high total composting rates (91% and 69%, respectively), a considerable majority of Canadian households did not compost or have access to curbside organic waste collection at the time of the survey. Furthermore, the exceptionally high proportion of composting households that did so privately (See column C) indicates that households composted only on a voluntary basis, likely for gardening purposes.

[90] Statistics Canada, "Is composting organic waste spreading?"

Fig. 4 Canadian Household Participation in Backyard Composting and Curbside Organics Collection, 2006[91]

Percent	A) Total households composting[1]	B) Kitchen waste composting[2]	C) Bin, pile or garden[3]	D) Collected curbside[3]
Newfoundland and Labrador	21	88	90	F
Prince Edward Island	91	95	24	89
Nova Scotia	69	95	41	73
New Brunswick	32	87	53	55
Quebec	13	76	85	11[E]
Ontario	34	85	67	36
Manitoba	23	76	93	F
Saskatchewan	27	79	94	F
Alberta	22	71	90	7[E]
British Columbia	30	76	94	6
Canada	**27**	**82**	**73**	**30**

Legend:
1. Includes all households.
2. As a percentage of the households composting.
3. As a percentage of the households composting kitchen waste.
E = Use with caution
F = Too unreliable to be published (treated here as zero)

As columns A and D show, the high percentage of compost collected curbside in PEI and Nova Scotia strongly support the finding that access to an institutionalized curbside program leads to a high participation rate by households as was found in the Edmonton and Exeter case studies.

As suggested previously, in provinces with low or no access to curbside collection (which exhibit low overall compost rates) an overwhelming majority of households that compost appear to do so for their own purposes. This factor suggests that the difference between the low total composting rate of approximately 25% in provinces without curbside collection and provinces with curbside collection is composed of households that only compost due to the

[91]Statistics Canada, "Is composting organic waste spreading?" Table 3.

default presence of a curbside collection program irrespective of their positive or negative attitude towards composting.

The presented early trends in curbside composting in Canada indicate very similar if not identical behavioural patterns found with the recycling of conventional materials such as paper and plastic. Therefore, lessons learned from established recycling programs can be used to accelerate the utilization of composting programs and likely improve the utilization of recycling programs in general.

Behavioural Approaches to Increasing Household Composting Rates

Because curbside collection programs for food waste are relatively new, there may be potential for behavioural nudges to accelerate uptake by households and simultaneously increase participation in the recycling of conventional materials such as plastic and paper where curbside programs are already available. Using a number of recycling case studies, this section presents several new approaches that can be used to establish policy options and best-practices for increasing household composting uptake using behavioural methods. The following field experiments were originally used for the recycling of conventional materials such as plastic, paper and glass, but can easily be adapted for the purposes of curbside composting. As the Canadian composting data suggests, the same approaches can be used for composting as are used for conventional materials.

Studies of door-to-door canvassing ("doorstepping") and feedback indicate that they are both more effective than simply providing informational literature. However, these approaches may have limited effect in areas where recycling participation rates are already high (over 60

percent of households).[92] In their contaminant (unrecyclable waste incorrectly disposed of in recycling receptacles) study in the U.K., Timlett and Williams concluded that of their three tested approaches (door-to-door canvassing, reward incentives, and feedback cards), reward incentives and feedback were the most effective in reducing contamination. As can be seen in Figure 5, both approaches reduced contamination by approximately 50%.

Fig. 5 ([93])

Impact on recycling scheme set out and proportion of households setting out contaminating materials

(%)	Set out		Contamination		Contamination reduction	
	Pre	Post	Pre	Post	Overall	Proportional
Doorstepping	61.0	57.2	43.7	43.6	0.1	0
Incentives	69.9	74.9	60.3	29.1	31.2	51.8
Feedback	53.8	53.7	36.1	18.9	17.2	47.6

The incentive program used an intensive approach with green (no contamination), yellow (some contamination), or red stickers (heavy contamination) being attached to bins on a monthly basis. Households that achieved three green stickers in four months were eligible for various coupons valued at approximately £25. The stickers were accompanied by feedback forms to explain what materials are recyclables and households that repeatedly received red stickers were targeted for doorstepping.[94] The feedback approach used cards on which contaminant materials were checked off along with explanatory text. The cards were then placed in the mailboxes of the households, including those that did not set out any recyclables.[95] Note that the feedback cards did not contain comparative information unlike the OPower feedback letters.

[92] Timlett and Williams, "Public participation and recycling performance in England," 632.
[93] Timlett and Williams, "Public participation and recycling performance in England," 629.
[94] Timlett and Williams, "Public participation and recycling performance in England," 628.
[95] Ibid.

Timlett and Williams conclude that of the three programs feedback was the most effective approach to reducing contamination since it achieved an almost identical result as the incentive approach while also being the most cost effective by a wide margin as can be seen in Figure 6. The cost of the incentive program would be prohibitively expensive for most municipalities with a per-household cost of £11.40, while the feedback cards could likely be integrated into existing recycling program budgets with a per household cost of only £0.50.

Fig. 6([96])

Cost of implementing campaign per 5000 household project delivery area

Project element	Doorstepping (£)	Incentives (£)	Feedback (£)
Incentive reward	0	28,000	0
Printed materials	300	5000	300
Promotional materials	1000	1000	0
Project management	600	5000	600
Monitoring	4000	5000	500
Doorstepping	5000	5000	0
Feedback	0	5000	800
Data input & analysis	3000	3000	300
Total	13,900	57,000	2500
Cost per household in the project area	2.78	11.40	0.50
Total number of households that showed a positive behaviour change	303	1958	831
Cost per changed household	46.91	29.11	3.01

Costs are indicative only and are based on in-house project delivery, using "doorstepper" staff costing £10.40 per hour and project management staff costing £15.60 per hour.

Of interest is the impact of the approaches on set out rates, which are also presented in Figure 5. Only the incentives approach made an impact, increasing bin set out by 5%. However, the authors point out that in follow-up responses only 13% of households stated that the chance of a reward was their motivating factor.[97] Since the feedback and doorstepping programs had no impact on set out rates, one can presume that these aspects of the incentive program were not the driving force behind the 5% increase in overall recycling. If we accept that the reward was not a strong motivator, only the coloured sticker element of the program

[96] Timlett and Williams, "Public participation and recycling performance in England," 631.
[97] Timlett and Williams, "Public participation and recycling performance in England," 632.

remains. The green, yellow and red stickers are highly visible to neighbours, suggesting that the connotation of disapproval or approval associated with these identifiers and their visibility may have had a norm-based impact on the set out rate. If the sticker element was implemented independently, the associated material and logistical and administrative costs would likely be comparable to the feedback card program.

In a 2009 study John et al. introduced an OPower inspired feedback letter for increasing food-waste collection in Oldham Council of Greater Manchester on a street-by-street basis. The sample included 318 streets with 9,082 households. The streets were randomly divided into two groups of 159 streets each: the treatment group (5,009 households) and the control group (4,073 households). Participation rates were measured in August 2009 to establish a baseline before the trial began, and one week after the cards were distributed in both September and October. Cards delivered to each household in the treatment group provided feedback on the performance of their street compared to the average for the neighbourhood. The feedback cards stated: "Did you know: X per cent of homes on A street recycle their food waste. The average for the area is Y per cent." Included was a smiley face (☺) or a sad face (☹) depending on whether the street was above or below the neighbourhood average. The card concluded with the message that, "With your help your street could become the best recycling street in Oldham." along with information on how to participate in the curbside food waste recycling.[98]

Accounting for a 1% drop in participation rate in the control group (51.5% to 50.6%) and a 2% (48.1% to 50.1%) increase in the treatment group after the second feedback card was delivered, the study concluded that the trial had an effect of raising the short-term

[98] John et al., *Nudge, Nudge, Think, Think*, 50.

participation rates by 3%.[99] Interestingly, the study noted that a boomerang effect negatively affected those who already participated, discouraging them from carrying on. Unfortunately, the study did not provide a numeric value to the negative boomerang effect in the treatment group.

Although the study demonstrated a positive behavioural impact, the short length of the trial did not provide enough time-series data to establish a conclusive and robust result. Interestingly, the feedback cards used by John et al. compared the recycling rate of entire streets as opposed to individual households. Performing feedback studies with both group and individual performance treatment groups should be conducted to verify if these two approaches yield significantly differing results. The larger group approach appears to place emphasis on small group cohesion while the individual approach increases the spotlight effect of being individually compared to ones immediate neighbours. In principle, the second approach applies greater norm pressure, which suggests a stronger effect on set out rates. However, any effectiveness variation should be confirmed through studies to verify or disprove this hypothesis.

The last approach to be discussed in this section is the block leader method used by Shawn M. Burn in a behavioural experiment in Claremont, California to increase participation in the citywide curbside recycling program. The randomized field experiment consisted of two treatment groups and one control group. The first treatment group had residents who recycled to voluntarily become block leaders within their respective street areas and delivered communications and recycling bags to non-recycling neighbours. The second treatment group

[99] John et al., *Nudge, Nudge, Think, Think*, 51.

only had communication material and recycling bags left at the front doors of non-recycling homes. The control group had no intervention. [100]

The text of the communications material included a description of how to participate in the recycling program as well as a normative component emphasizing community support for the program and describing the social consequences of current waste disposal behaviour.[101] The block leaders were given the addresses of non-recyclers and necessary materials to give to these households along with a verbal explanation of the importance of recycling, the ease of participation, and the types of recyclable materials.[102]

Presented in Figure 7, the results of the 10-week experiment demonstrated a considerable recycling behaviour improvement in the block leader group, where participation increased to an average of 58% over the duration of the experiment. In contrast, the average participation within the control group remained at a low 20%. The 'door only' group improved to 38%.

[100] Burn, "Social Psychology and the Stimulation of Recycling Behaviors," 618.
[101] Burn, "Social Psychology and the Stimulation of Recycling Behaviors," 619.
[102] Burn, "Social Psychology and the Stimulation of Recycling Behaviors," 620.

Fig. 7 ([103])

Percentage of Homes Recycling After Treatment

	Condition		
	Block leader ($n = 41$)	Door only ($n = 68$)	Control ($n = 102$)
Overall	58	38	20
WEEK			
1	23	3	4
2	32	10	2
3	25	13	6
4	25	18	0
5	23	12	6
6	29	7	0
7	28	13	3
8	42	15	2
9	34	13	6
10	23	13	2
Weekly mean	28	12	3

Note. "Overall" category refers to percentage of homes that recycled one or more times.

By providing social recognition and encouraging behaviour that other people are following in the neighbourhood, the block leader approach reinforced a strong local norm to recycle. A key aspect of the experiment's success was likely the local recruitment of block leaders. Those who visited non-recycling households were not unfamiliar municipal workers or students assisting with the experiment, but local residents who may have been familiar neighbours.

Burn notes that during the study the city of Claremont calculated that if 50% of citizens within the city recycled, it would result in additional monthly revenues of $9,200 and an additional $2,400 per month in avoided landfill costs while implementing a block leader program would cost only a small fraction of these amounts.[104] Thus, the Burn study indicates that raising utilization rates where there is already access to recycling programs can be done

[103] Burn, "Social Psychology and the Stimulation of Recycling Behaviors," 623.
[104] Burn, "Social Psychology and the Stimulation of Recycling Behaviors," 624.

effectively using a community focused behavioural approach that can also offer net savings for municipalities.

Part IV: From Experiments to Policy

Feedback and comparative social norm pressures are the two dominant themes that permeate the three case studies from the previous section. Thus, to improve the utilization of curbside composting programs, the above findings suggest a combination of policy tools (*feedback*, *performance comparison* and *block leaders)* should be used by local governments to build upon the existing behavioural mechanisms of *salience*, *defaults/habits*, and *norms*.

The best components of each behavioural method should be combined to maximize effectiveness. First, the red-yellow-green stickers used by Timlett and Williams are a notable idea that can be combined with general feedback because the stickers help with generating at least perceived social pressure on households that do not recycle or contaminate their recycling receptacles. Feedback and neighbourhood comparison cards (such as the ones used in the John et al. study) that are delivered to households are not publicly visible since they are placed in mailboxes and are only viewed by members of the household. Therefore, if the coloured stickers are also attached to receptacles by collection crews, household performance will be visible and increase the salience of recycling performance.

Second, Burn's block leader method appears to be more effective than the doorstepping method used by Timlett and Williams for the reason that block leaders are neighbourhood residents who volunteer for the position, while unknown city workers were used in the case of

doorstepping. The block leaders help to reinforce social norms within their small neighbourhood community, while municipal workers only anonymouslyprovide information.

Nonetheless, behavioural methods are not the only options available for increasing program utilization. When applying behavioural economics to environmental policy – or any policy field – behavioural methods should not be seen as an approach to wholly replace traditional regulatory measures and market-based incentives. For example, Woodard et al. offer very useful traditional approaches that can be combined with behavioural interventions for dramatically increasing the effectiveness of recycling programs.

Using UK household recycling data and trends, Woodard et al. point out that many households are accustomed to having their waste collected on a weekly basis (habit). Firstly, they suggest that the public perception of waste collection is that of a system dominated by waste with an additional recycling service. In order to increase recycling rates, this perception needs to be altered to make the public consider recycling to be the dominant element of municipal waste management.[105] Secondly, to increase salience, recycling collection vehicles should be visibly differentiated from waste collection vehicles to enhance public trust that their recyclables will be properly sorted and not end up in landfills.[106]

Some UK municipalities (including Exeter) have been attempting to stimulate this change by reducing the frequency of waste collection to a bi-weekly schedule while maintaining recycling services on a weekly schedule and increasing the range of recyclable materials that are accepted for collection. In 2000, areas where the scheme was in operation achieved an

[105] Woodard, Bench and Harder, "The development of a UK kerbside scheme using known practice," 118.
[106] John et al., *Nudge, Nudge, Think, Think*, 44.

average recycling rate of 48%. The two municipalities with the highest recycling rates in the UK at the time, Daventry (42%) and Eastleigh (32%), used similar systems.[107]

In similar efforts undertaken more recently in Portland, Oregon in the U.S. the municipality reduced the amount of food scraps in household waste by 44% through spacing out waste collection to a bi-weekly basis while maintaining weekly compost collection.[108] However, since the change came into effect in the fall of 2011 the recycling firm that is contracted for recycling collection has reported a significant increase in the contamination of recycling receptacles with unrecyclable or non-compostable waste.[109]

The previously discussed Timlett and Williams study on contamination in the U.K. suggests that the problem of improper waste disposal can be significantly reduced by using behavioural approaches in a similar fashion just as they can be applied to increasing general program utilization. By combining structural approaches such as bi-weekly collection with behavioural approaches, municipalities can increase the overall effectiveness of the recycling program by both increasing overall utilization and reducing contamination.

The combination of methods to address the recycling, composting and receptacle contamination suggests that the behavioural approach should be used to address what behavioural economist Sendhil Mullainathan refers to as the "last mile problem" of conventional policy measures.[110] It can be understood as the problem of increasing the effectiveness of conventional policies and of programs that are already in place. Because many

[107] Ibid.
[108] Yardley, "Cities get so close to recycling ideal, then can smell it."
[109] Yardley, "Cities get so close to recycling ideal, then can smell it."
[110] Mullainathan, "Solving social problems with a nudge."

regulatory approaches are often base upon the assumptions of the rational actor model, they do not account for behavioural failures and thus do not achieve their full potential.

Changing waste collection schedules to a bi-weekly basis is a novel approach to increase the diversion of waste from landfills and to change the public perception of recycling to be seen as the primary method of waste management. Yet, the Portland experience offers a glimpse of how the effectiveness of this program can significantly be improved through the use of behavioural methods to reduce contamination. Thus, behavioural interventions should be integrated into the "tool box" of policy makers and be applied appropriately throughout the policy design process alongside conventional policy tools. Behavioural insights should be brought into the policymaking mainstream and not be treated as curiosities. When appropriate, behavioural insights should be used to maximize the effectiveness of the policy under consideration but not dominate process.

The best examples of how behavioural economics has so far been integrated into environmental policy come from the U.K. - largely thanks to the creation of the Behavioural Insight Team (BIT) within the Cabinet Office of Prime Minister David Cameron. [111] In addition to administering a number of behavioural experiments, BIT has published several reports detailing their progress and provided overviews of their projects. These reports notably include the *MINDSPACE: Influencing Behaviour Through Public Policy*[112] discussion paper and the 2011 *Behaviour Change and Energy Use*[113] report. Lastly, in the summer of 2011 the U.K. House of Lords Science and Technology Select Committee conducted an inquiry and published their

[111] Wintour, "David Cameron's 'nudge unit'."
[112] U.K. Cabinet Office, *MINDSPACE: Influencing Behaviour Through Public Policy*.
[113] U.K. Cabinet Office, *Behaviour Change and Energy Use*.

findings in a public report entitled *Behaviour Change*[114], which investigated the applicability of non-regulatory interventions.

In line with the findings of this paper, the primary point of the Select Committee was that "non-regulatory as well as regulatory measures used in isolation are often not likely to be effective and that usually the most effective means of changing behaviour is to use a range of policy tools, both regulatory and non-regulatory."[115] One of the underlying reasons for this conclusion was that the government's preference for non-regulatory approaches encouraged officials to exclude regulatory measures when designing policies to change behaviour.[116] The conclusion of the House of Lords reinforces the argument that behavioural approaches should be an integrated component of the policy-making process while also not being placed on a pedestal.

The focus of BIT with regard to environmental policy has understandably been focused on reducing energy use in the U.K. to decrease GHG emissions. Nonetheless, their choice of behavioural interventions closely matches those used in the recycling case study. BIT has been working with the U.K. Department of Energy and Climate Change (DECC) along with OPower and First Utility, a major electricity distributor in the U.K., to implement comparative power consumption feedback to U.K. households.[117] In 2011 DECC also commissioned a research report on presenting energy consumption benchmarks on energy bills to further refine comparative presentations of energy use.[118] Throughout 2012, a trial on comparative energy use feedback is currently being conducted to establish baseline data that will be used with the

[114] U.K. House of Lords, *Behaviour Change*.
[115] U.K. House of Lords, *Behaviour Change*, 69.
[116] U.K. House of Lords, *Behaviour Change*, 36.
[117] U.K. Cabinet Office, *Behaviour Change and Energy Use*, 20.
[118] DECC, *Empowering Households.*

intent of expanding the program beyond the pilot stage. BIT states that the data will be available in 2013 in time to inform a U.K.-wide roll-out of smart meters.[119] A component of the new smart meter program will also be a real-time energy use display intended to increase the salience of energy use through live feedback inside households to encourage lowering energy use.[120]

The insights about *salience*, *defaults/habits* and *norms* gained from recycling are clearly being applied by BIT and DECC in their energy use trials. These three behavioural methods have a recurring presence because many environmental externalities result from common and habitual behaviours such as waste disposal and the use of electricity, the consequences of which are largely unseen by the public. If these externalities can be made salient and the associated habits can be altered and then sustained through the power of social norms, existing regulatory structures can become more effective at addressing negative environmental externalities associated with routine human behaviour.

Awareness of systematic behavioural failures and the use of appropriate behavioural interventions will lead to better policy design by improving upon conventional approaches. The fundamental issue of routine behaviour that leads to non-salient negative externalities can be directly addressed by integrating behavioural factors into the mainstream environmental policy design process. Environmental policy that accounts for *Homo Sapiens* can be tailored more closely to real-world behaviour and will likely offer benefits at a fraction of the cost of merely expanding existing approaches that face the problem of diminishing marginal returns. For example, behavioural interventions that follow the OPower model have been shown to cost

[119] Cabinet Office, *Behaviour Change and Energy Use*, 20.
[120] DECC, "Energy Consumers."

2.5¢ per kilowatt-hour (¢/kWh) saved, compared to average costs of other efficiency programs that range from 1.6¢ to 6.4¢/kWh.[121] If such a program was scaled to the national level within the U.S., CO_2 emissions from electricity generation could be reduced by 0.5% while *saving* $165 per metric tonne of CO_2 reductions.[122] Nicholas Rivers notes that in the short run, such reductions in energy use would require a 10% to 20% rise in electricity prices.[123] In comparison, wind power, carbon capture and storage for coal plants, and hybrid vehicles are estimated to respectively cost $20, $44, and $15 per metric tonne of CO_2 abated.[124] As the numerous examples presented throughout this paper have demonstrated, the impacts of behavioural interventions range in degree, but their cost effectiveness is consistently favourable in relation to price-based approaches.

Lastly, a general challenge faced by all branches of behavioural economics is how to expand small field experiments into large-scale behavioural interventions.[125] Because behavioural interventions are a new addition to the tool box available to policy makers, an inherent difficulty is the lack of applied research necessary to formulate long term evidence-based policies to change behaviour.[126] Both the U.K. House of Lords Select Committee and the Cabinet Office agree in their reports that since behavioural interventions are largely a new policy frontier, the lack of field evidence requires applied research (i.e. experiments) and the establishment of rigorous evaluation standards.[127]

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[121] Allcott and Mullainathan, "Behavior and Energy Policy," 1204.
[122] Ibid.
[123] Rivers, "How should behavioural economics influence energy and environmental policies?" 4.
[124] McKinsey & Company, *Reducing U.S. Greenhouse Gas Emissions: How Much at What Cost?* in Allcott and Mullainathan, "Behavior and Energy Policy," 1204.
[125] Allcott and Mullainathan, "Behavior and Energy Policy," 1205.
[126] U.K. Cabinet Office, Government *Response*, 3.
[127] Ibid.

Fortunately, in both cases of recycling and electricity use, the institutions that will benefit from intervention designs are directly involved in conducting the field experiments. Municipalities permit researchers to conduct interventions using their actual curbside collection programs and utilities provide their electricity distribution grids with hundreds of thousands of actual households. Such a model has promising implications for the expansion of behavioural economics in the policy field since the threshold to full-scale implementation is lower than when experiments are only conducted in a controlled laboratory environment.

Conclusion

The design of environmental policy has traditionally emphasized correcting market failures with command-and-control regulation or market-based incentives. As this paper has argued, there are a number of "irrational" factors (e.g. salience and habits) that can be understood as "behavioural failures" in a similar sense as market failures are understood. Behavioural economics suggests that the rigid neo-classical unit of analysis (*Homo Economicus*) traditionally used for designing policy should be relaxed to introduce a more complete conception of the economic actor as *Homo Sapiens* for policymakers to better address behavioural failures. As this paper has demonstrated, the behavioural failures that result from the figurative interaction of Kahneman's System 1 and System 2 have measurable impacts on the recycling behaviour of individuals that have helped shape the rapid expansion of curbside recycling program utilization and established recycling as a social norm within approximately a decade beginning in the early 1990s.

When policy design takes into account what can be best described as the System 1 and System 2 model of decision-making, a more complete picture of the behavioural mechanics that result in negative environmental externalities can be seen. By raising the salience of these behavioural mechanics to policymakers, their resulting externalities can thus be better addressed through policy design that integrates both conventional and behavioural approaches to achieve a more effective result than either could attain individually.

By mainstreaming behavioural methods and including them in the policy "tool box", behavioural failures associated with habits or salience can be counteracted or integrated as active components of environmental programs. Nonetheless, behavioural methods should by no means overtake traditional regulatory approaches. Indeed, in many cases such an approach would be wholly inappropriate. Some present the case that those areas of environmental policy and regulation which are dominated by firms are best left to traditional regulatory measures and market-based solutions.[128] The primary role of behavioural methods should instead be to address the "last mile problem" by increasing the effectiveness of conventional policy approaches pertaining to individual consumer and household choices that have non-salient environmental externalities.

The three behavioural approaches discussed individually serve useful roles in making environmental economics and policy more robust. However, when multiple behavioural factors interact simultaneously their influence can be greater than the sum of their parts as has been demonstrated through the sustained increase in household utilization of curbside recycling programs. Due to the common and habitual nature of household waste disposal, behaviour

[128] Rivers, "How should behavioural economics influence energy and environmental policies?" 7.

change is effectively changed because recycling can easily be integrated into the existing routines of households. Driving the sustained change is the self-reinforcing social norm created through recycling by neighbours, which generates social pressure for individual households to continue recycling. The above findings on recycling behaviour are consistently seen throughout the case studies performed predominantly in the U.K., U.S. and Canada. Furthermore, the most recent census data from Canada demonstrate similar trends in curbside composting seen in the early stages of recycling programs. This similarity offers an opportunity to use the lessons learned from recycling programs to accelerate composing program utilization and simultaneously improve the associated curbside recycling programs.

More broadly, recycling behaviour indicates that behavioural economics can make a valuable contribution to addressing the many environmental externalities which result from common and habitual behaviour such as the use of electricity. The environmental consequences of such routine behaviour for the most part do not burden and remain unseen to most users. The greatest potential of behavioural economics lies in making the consequences of routine behaviour more salient and to support the development of positive social feed-back loops that sustain pro-environmental behaviour. By integrating behavioural methods into policy design, environmental policies especially in areas of household energy conservation and efficiency can improve their effectiveness. With environmental programs that utilize behavioural methods under development in the U.K., further real-world results will be available within the coming years to evaluate the performance of behavioural economics in the field of environmental policy.

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