Recycling: social norms and warm-glow revisited

Andrew Abbott, Shasikanta Nandeibam, Lucy O'Shea

Abstract

We examine the role of social norms and warm-glow in a theoretical framework and establish that improving the quality of recycling facilities, for example through kerbside collection, will elicit more recycling effort if warm-glow is present. Drawing on the literature, we model the role of social norms with reference to age profile, ethnicity and geographical location of the reference group. Using English local authority data, we show that a social norm for recycling does exist. We find the expected relationship between the quality of kerbside provision and recycling activity if the household derives warm-glow from the activity, however it is insignificant. Amongst the control variables we find evidence that multifamily dwellings recycle less.

Keywords: intrinsic motives, recycling, social norms, warm-glow.

JEL classification: O18; Q58; R11; R15

1. Introduction

Traditionally, the economics literature on the theory of incentives has focused entirely on the relative price effect of economic instruments (Fehr and Falk, 2002). It is widely accepted that desirable behaviour can be promoted by making monetary rewards/punishments contingent on performance (see e.g. Callan and Thomas, 1997; Jenkins, 1993; Hong, 1999; Hong et al., 1993; Sidique, et al., 2010). More recently there is increasing recognition that individuals are not solely concerned with monetary pay-offs, and non-monetary levers may be used to induce desirable actions (e.g. Frey, 1999). Such interventions appeal to the Psychological literature, which gives prominence to the role of non-pecuniary drivers of pro-environmental behaviour, such as the different norms of behaviour – social, moral, legal, as well as altruism, warm-glow and eco-centrism (Barr et al., 2001; De Young, 1996).[1] Pro-environmental behaviour in general, and recycling in particular, has provided a fertile area in which to examine such motives. Recycling can be individually costly, in terms of the opportunity cost of time, and provides an apparently low pay-off in terms of individual environmental benefit and yet individuals still choose to recycle even in the absence of any monetary incentive. Recent attempts to incorporate psychological determinants of recycling behaviour within an economic framework include Brekke et al., 2003, 2007, 2010; Hage et al., 2009; Halvorsen, 2008.[2] The issues raised in this paper have not only been confined to research traditions within Economics and Psychology. For example, contributions within Sociology have grappled with the

[1] Barr et al. (2001) do not use the term warm-glow. In their discussion of the intrinsic motive to recycle it is clear that this is what they are referring to. However, in their empirical analysis the intrinsic motive to recycle captures both enjoyment and belief on the part of the respondent of the efficacy of their action and so does not represent warm-glow alone.

[2] In the wider context non-monetary motives have been examined in a variety of contexts such as volunteering (Meier and Stutzer, 2008); the labour market (Akerlof, 1982); tax compliance (Graetz and Wilde, 1985), common pool resources (Ostrom, 2000), public goods (Palfrey and Prisbey, 1997), charitable donations (Andreoni, 1990; Atkinson, 2009).

47 notion of norms (Gibbs, 1965) and their evolution over time (Bendor and Swistak,
48 2001). Within the wider context of waste management, the geographic scale at which
49 industrial recycling should take place (Lyons, 2007) and issues of civic duty and
50 identity and how they relate to recycling behaviour have been addressed within the
51 geography literature (Riley, 2008).

52 The move towards considering non-monetary motives and potential
53 interventions that take account of the myriad of reasons why people behave the way
54 they do is also reflected in the policy context. For example, in 2010, the UK
55 government set up the Cabinet Office Behavioural Insights Team whose remit is to
56 *'find innovative ways of encouraging, enabling and supporting people to make better*
57 *choice for themselves'*.[3] As well, in its recent review of waste policy, the central
58 government expressed the intention of removing the ability of local government to
59 fine households for presenting their waste incorrectly or on the wrong day. Current
60 legislation in the UK specifically rules out charging households on a per unit basis for
61 the waste they generate.[4] However, the current government are very much in favour
62 of rewarding households for recycling, e.g. through vouchers that can be redeemed for
63 goods at local shops.[5] Other countries are also trying to better understand behaviour
64 with a view to reducing household impact on the environment (OECD, 2008).

65 We aim to examine further the underlying motives to recycle and contribute to
66 the literature through incorporating social preferences into an economic framework.[6]
67 Section 2 describes the primary non-monetary motives underlying pro-environmental
68 behaviour such as recycling. Section 3 discusses the potential interaction between

[3] http://www.cabinetoffice.gov.uk/behavioural-insights-team, accessed 16/11/12.
[4] http://www.defra.gov.uk/environment/waste/local-authorities/controlled-waste-regs/, accessed 19/11/12
[5] http://www.bbc.co.uk/news/10251696, accessed 19/11/12
[6] This does not imply that other motives are not potentially important but we concentrate on those we consider to be key in the context of recycling.

motives and government interventions. Section 4 presents the theoretical model and generates a set of testable hypotheses. Section 5 presents the econometric model, the data used for estimation and estimation results, while section 6 provides concluding remarks.

2. Warm glow and social norms

Our reference points for warm-glow are Deci (1971) in the Psychology literature and Andreoni (1990) from the Economics literature. Accordingly, an individual can derive enjoyment from an activity independent of any consideration of outcome.[7] Clark et al. (2003) define 'warm-glow' as the personal satisfaction arising from an activity independent of its impact. Although De Young (1996) does not use the term warm-glow, it is akin to the intrinsic satisfaction an individual enjoys from being actively involved in an activity. He states, that although certain forms of behaviour bring personal contentment and may focus on issues outside the self, nevertheless the 'proximate mechanism is self-interest' (De Young, 2000, p. 516). De Young (1996) argues that it is intrinsic rather than extrinsic motivation that is the primary motivator to act in a particular way and that the former has a longer term effect on behaviour.

Social norms are shared perceptions of ideal forms of behaviour to which individuals try to conform (Burke and Young, 2011; Ostrom, 2000). Fishbein and Ajzen (1975) state that awareness and acceptance of a social norm is likely to modify behaviour accordingly. Biccheri (2006) further refined the notion of social norms, arguing that the two necessary conditions for standards of behaviour to qualify as social norms are that (i) a sufficiently large proportion of the population recognises

[7] Other contributors that have defined warm-glow in the same way as Andreoni include Palfrey and Prisbrey (1997) who state that, independent of how much it benefits others, the act generating 'warm-glow' increases the individual's utility by a fixed amount.

93 the particular modes of behaviour and can identify the situations to which they apply
94 and (ii) individuals are predisposed towards complying with them. Predisposition
95 towards compliance is in turn dependent on the degree of conformity amongst the
96 population and the level of expectation that the individual conforms. These latter two
97 conditions rely on the beliefs that an individual holds about what other people actually
98 do (descriptive norms) and what other people expect him/her to do (injunctive norms).
99 Thørgersen (2008) finds support for the idea that these beliefs are complementary to
100 each other and each has to be present to a sufficient degree for cooperative behaviour
101 occur. Injunctive norms are assumed to influence behaviour because of others' ability
102 to exert sanctions in the event of non-compliance (Thørgersen, 2008). However,
103 sanctions are not always required (Biccheri, 2006; Elster, 1989). Either social norms
104 become internalised so that they do not require an external sanction mechanism or, in
105 the light of the discussion above, the degree of conformity amongst the population
106 and the level of expectation are sufficiently high for compliance without the need for
107 the threat of external sanctions.

108 The observation that households recycle, even in the absence of monetary
109 incentives to do so, suggests that there are some other motives at work. Kinnaman
110 (2006) suggests that this motive has to do with warm-glow and notes that not only do
111 households recycle but they are even willing to pay for the opportunity to recycle.[8]
112 Berglund (2006) illustrates this desire to recycle by measuring the difference between
113 the opportunity cost of time spent recycling, given by the net hourly wage, and the
114 stated willingness to pay for someone else to carry out the activities involved in

[8] In some countries, e.g. the UK there is no charging allowed for recycling or residual waste collections and funding comes from government sources. Consequently, households perceive the marginal cost of all units of waste disposed after the first as zero (Callan and Thomas, 2006). Thus, there is no monetary incentive for households to minimize waste production or to increase its recycling rate.

recycling. Since individuals appear to derive private benefit from recycling they are willing to pay less for someone else to do it.

Other contributions from the economics recycling literature, have tended to link social norms and warm-glow together. Halvorsen (2008) assumes that warm-glow is derived from adherence to social and moral norms so that norms and warm-glow are inseparable. Brekke et al. (2003) identify warm-glow with a positive self-image and self-image depends on the degree to which individuals believe their behaviour is socially responsible. The benchmark for socially responsible behaviour is a moral ideal, endogenously determined by the individual as that effort which maximises social welfare if everyone acted like them. In Brekke et al. (2007; 2010), the benchmark is a social rather than a moral norm and so is determined exogenously and a positive self-image or warm-glow depends on the gap between an individual's level of recycling and the social norm. In Brekke et al. (2007; 2010) the existence and acknowledgement of a social norm can impose a burden on the individual. So, although increasing the level of recycling increases warm-glow along the lines of Andreoni (1990), an increase in perceived responsibility decreases warm-glow. Thus, if this perceived responsibility, as reflected in the social norm, is kept fixed then 'duty orientation is behaviourally indistinguishable from a warm-glow model' (Brekke et al., 2010, p. 766). Although Hage et al. (2009) adopt the approach of linking self-image to social norms there is no mention of warm-glow in their model.

3. Policy – crowding out/crowding in

The policy relevance of identifying and assessing underlying motives to behave in particular ways derives from potential interactions between external interventions – monetary and non-monetary – and these motives. The interaction between

non-monetary motives and external interventions can render certain policies less effective (crowding-out) and others more effective (crowding-in) (Frey and Jegen, 2001). Thus, understanding the interaction between non-monetary motives and external policy instruments - whether they act as substitutes or complements (Bowles and Hwang, 2008) - is critical to successful policy implementation. The literature suggests that excluding consideration of non-monetary motives can lead to unexpected results. In a seminal experiment, Deci (1971) established the existence of intrinsic motivation to perform a task and found that monetary payments contingent on performance reduced the intrinsic motivation to carry out the task. Non-contingent monetary payments left intrinsic motivation intact, whereas positive verbal feedback increased intrinsic motivation. Frey and Oberholzer-Gee (1997) in a study on willingness to accept siting of a nuclear facility within a community found that the offer of monetary compensation actually reduced the proportion of people willing to accept the facility and their willingness did not increase with the size of the compensation. These results have been explained by Bowles (2008), who argues monetary incentives are framed in such a way as to induce self-interest as a response. We can also refer to this as a relative price effect, where individuals choose the response that is more financially rewarding. The self-determination effect or over-justification effect, occurs when an individual's own interest in performing the activity is discounted because they are given an external reason for doing something they would have done anyway (Rotter, 1966; Thøgersen, 2003). With a payment, individuals have no way of demonstrating their willingness to accept change or perform an activity for reasons other than monetary ones. Thus, these effects move in opposite directions and the overall effect will depend on which one dominates. Such motivational crowding-out not only reduces the effectiveness of policy but may

reduce activity below the pre-policy level. To correct for this, the government has to offer a higher payment than would otherwise be the case (Thøgersen, 2003). Also, the erosion of intrinsic motivation tends to be permanent because once a payment is introduced the activity is no longer performed when payment is withdrawn. To illustrate this, Deci (1971) provides the example of a boy cutting the lawn for his father. Once the father agrees to pay for the lawn to be cut, the boy is no longer willing to do it without payment. It appears that crowding-out is much more likely with monetary incentives (Bowles 2008; Thøgersen 2003). In the case of non-monetary interventions, Deci's (1971) experiments suggest that non-monetary interventions can either leave intrinsic motivation intact or increase it.

4. The Model

We take a different approach to conceptualising social norms and warm-glow to that taken by Brekke et al. (2003) and Halvorsen (2008). Following Andreoni (1990) and Deci (1971), we define warm-glow as purely intrinsic. According to Thøgersen (2003), pro-social behaviour is carried out to 'attain some separable outcome' (Ryan and Deci, 2000; p.71) such as peer approval and so, is an extrinsic motivation (Hornik et al., 1995). We will also consider the role of the public good motive, which is characteristic of Andreoni's (1990) altruistic individual. In our model altruism is reflected through concern for the environment because it impacts on others' welfare.

We address the role of these three motives: social norms; warm-glow and environmental concern in the framework of a household utility maximisation model put forward by Kinnaman and Fullerton (1999). In addition, we incorporate a set of household socio-economic characteristics, as suggested by the literature. In this framework, the household has to trade off the utility it derives from a number of

sources: consumption x_{it}; environmental quality G_t; time spent recycling t^R_{it} and peer approval pa_{it}. Thus, the household's utility function is given by

$$U_{it} = U(x_{it}, G_t, t^R{}_{it}, pa_{it}; SEV_{it}), \quad (1)$$

where subscripts *i* and *t* refer to households and time respectively. $U_x > 0$; $U_{xx} < 0$; $U_G > 0$; $U_{GG} < 0$; $U_{pa_{it}} > 0$; $U_{pa_{it}\,pa_{it}} < 0$.[9] Socio-economic characteristics SEV_{it} include age, income, education, number of individuals in the household, type of the household dwelling etc.

The constraints facing the household relate to time and income. Assuming the amount of time spent working is fixed, the opportunity cost of time spent recycling is lost leisure. Total time available to the household is normalised to 1, so that

$$1 - T^w_{it} = t^R{}_{it} + L_{it}, \quad (2)$$

where T^w_{it} and L_{it} is the time spent at work and leisure respectively.[10] Assuming that the price of the composite good is normalised to 1 and the wage rate is exogenously given as *w*, we can write the household's budget constraint as:

$$x_{it} = w(1 - t^R{}_{it} - L_{it}) \quad (3)$$

The relationship between environmental quality and recycling is captured through the simple function:

$$G_t = g\sum_{i=1}^{n} R_{it} \quad (4)$$

Incorporating environmental quality into the utility function reflects general concern for the environment or altruism. This expression reflects the substitutability between households' recycling activities in generating a particular level of environmental quality. Ceteris paribus, welfare is higher the better the environmental quality and to

[9] U_x is the first derivative of the utility function with respect to *x* and U_{xx} is the second derivative with respect to *x*. The same holds for the other three arguments of the utility function.
[10] Thus $1 - T^w$ is equivalent to LT_h in Halvorsen's (2008) model.

212 the extent that an individual household cares about others' welfare it cares about the
213 environment.

214 Following the modelling approach of Andreoni (1990), warm-glow is accounted
215 for by inserting time spent recycling directly into the utility function. Warm-glow is
216 defined as $U_t^R > 0$ and we assume that diminishing returns can set in with more and
217 more time spent recycling i.e. $U_t^R{}_t^R < 0$; Thus, individuals derive utility from the
218 recycling activity or process itself, whereas the effect on utility of the recycling level
219 (outcome of the activity/process) is through the other arguments included in the utility
220 function: environmental concern, impact on consumption of *x* and attainment of peer
221 approval through adherence to a recycling norm. We might think of it as first and
222 second-order effects of time spent recycling on utility, where warm-glow is a first-
223 order effect.

224 A key factor in driving up recycling rates is the kerbside scheme (Abbott et al.,
225 2011; Oskamp et al., 1991; Vining and Ebreo, 1990). Kerbside policy provides a
226 convenient way of considering how policymakers can affect household's recycling
227 behaviour through the activation and maintenance of the social norm to recycle and
228 providing an outlet for, or indeed enhancing, the experience of warm-glow from
229 recycling. We have seen that Deci (1971) found that non-monetary interventions
230 could crowd-in intrinsic motivation. Also, De Young (1996) and Thøgersen (2003)
231 refer to the ability of interventions to increase intrinsic motivation through enhancing
232 individuals' perceived competence and sense of autonomy in carrying out particular
233 activities. The provision of kerbside facilities could be viewed as one such
234 intervention. Households may find it easier to recycle because kerbside collection
235 takes place at frequent intervals so that they become familiar with what types of
236 materials are recyclable. Their learning process is facilitated by information

campaigns, which are accommodated more easily and made more effective through a kerbside scheme. By facilitating visibility of recycling efforts, kerbside collection increases norm awareness, a key factor required for norm compliance (Bicchieri, 2006; Elster, 2009).

Figure 1 illustrates the links between kerbside policy and the household's response.

FIGURE 1 NEAR HERE

It would be difficult to test whether the kerbside scheme crowds-in intrinsic motivation or warm-glow as we would need to be able to observe the level of warm-glow before and after the intervention. However, we can test whether warm-glow exists or not. Just as monetary interventions can give rise to two effects: a relative-price effect and an over-justification effect, we can think of kerbside provision giving rise to two effects. We call these two effects an efficiency effect and a warm-glow effect. We can model the recycling activity in the following way:

$$R_{it} = \theta\left(t^{R}{}_{it}, q^{k}{}_{it}\left(s_{it}, fr_{it}, m_{it}\right)\right)x_{it} \qquad (5)$$

where θ captures the efficiency of conversion of the consumption good x_{it} to recyclables and will depend on the time spent recycling t^{R}_{it} and the quality of kerbside provision $q^{k}{}_{it}$. $q^{k}{}_{it}$ depends on the interaction between the size of the container s_{it}, frequency of collection fr_{it}, and the number of materials collected m_{it}. We assume diminishing returns to both time spent recycling and the quality of kerbside provision $\theta^{R}_{t} > 0$, $\theta^{R}_{t}{}^{R}_{t} < 0$ and $\theta^{k}_{q} > 0, \theta^{k}_{q}{}^{k}_{q} < 0$. We also assume that increasing the quality of kerbside increases the marginal efficiency of time spent on the activity so that $\theta^{R}_{t}{}^{k}_{q} > 0$.

Ignoring the role of the social norm for the moment and assuming an interior solution we get the usual condition that the optimal time spent recycling t^{R*} is defined

where the marginal cost of time spent recycling (forgone consumption of x) is equal to the marginal benefit in terms of environmental concern and warm-glow respectively:

$$\frac{\partial U}{\partial x}\frac{\partial x}{\partial t^R} = \frac{\partial U}{\partial G}\frac{\partial G}{\partial R}\frac{\partial R}{\partial t^R} + \frac{\partial U}{\partial t^R}, \tag{6}$$

where we have dropped the subscripts for notational simplicity.

Within our framework there are only two possible responses to an increase in the quality of kerbside provision. An improvement in the quality of provision should cut down the time required to recycle a given amount. This is the efficiency effect. But, since time spent recycling generates utility *per se* the household can respond to an improvement in kerbside provision by increasing the time spent on recycling. This is the warm-glow effect. The overall effect of quality of kerbside provision on time spent recycling will depend on which of these two effects dominates. We can deduce that if the household does not derive any warm-glow from recycling, the only outcome would be a decrease in time spent recycling following an improvement in kerbside provision. However, if the overall effect is positive we can infer the presence of warm-glow. Even in the case where we observe an overall decrease in time spent recycling, if that reduction is less than what we would expect in the absence of warm-glow we can still infer the presence of warm-glow. We can test this analytically by differentiating (6) w.r.t. q^k to get an expression for the overall effect of kerbside quality provision on time spent recycling, $\frac{\partial t^{R^*}}{\partial q^k}$. Thus, if $\frac{\partial t^{R^*}}{\partial q^k} > 0$ the warm-glow effect dominates the efficiency effect and we can unambiguously state that warm-glow is present. Even if $\frac{\partial t^{R^*}}{\partial q^k} < 0$, we can still test the presence of warm-glow using the time elasticity of kerbside quality, $\frac{\partial t^{R^*}}{\partial q_k}\frac{q^k}{t^{R^*}}$. This measures the degree of

284 responsiveness of time spent recycling to an improvement in kerbside quality. An
285 absolute value of time elasticity of kerbside quality less than one indicates that
286 reduction in time spent recycling does not fully offset the rise in kerbside quality,
287 indicating the presence of warm-glow. Given certain conditions (equations (3), (4),
288 (5); warm-glow is intrinsic satisfaction independent of impact and diminishing
289 marginal returns for x, G and t^R) we can establish that $\frac{\partial t^{R^*}}{\partial q_k} < 0$. [11] However, without
290 specific functional forms we cannot rule out $\left|\frac{\partial t^{R^*}}{\partial q_k}\frac{q^k}{t^{R^*}}\right| < 1$.

291 Turning to peer approval, it is by complying with the social norm that the
292 household obtains peer approval which generates utility. The social norm is defined as
293 an average level of recycling for households within a reference group, $R_{i.}$ As in Azar
294 (2004), who examines the norm for restaurant tipping, we also make the assumption
295 that although the social norm represents some kind of average behaviour, the
296 household's influence on the norm is negligible, i.e. there are no role models. Thus
297 the norm can be treated as exogenous. In the theoretical model, the role of the social
298 norm is incorporated in either one of two ways. Adopting a threshold approach we let
299 the peer approval effect, pa_{it} equal 1 if the household recycles above a certain level
300 defined by the norm and zero if below. So:

301 $$pa_{it} = \begin{cases} 1 & \text{Rit} \geq \overline{\text{R}}_i \\ 0 & \text{Rit} < \overline{\text{R}}_i \end{cases} \qquad (7)$$

302 Thus, the household enjoys peer approval if its recycling is above the norm expressed
303 as $\overline{R}_i$, which denotes the average recycling level for the reference group for i. If the
304 household's recycling falls below the norm, the household does not obtain peer
305 approval. Thus, the household's utility level with peer approval is higher than without.

[11] Workings are available from authors on request.

Thus, we can rewrite constraint (5) to take account of the existence of the norm as follows:

$$R_{it} = \theta\left(t^{R}{}_{it}, q^{k}{}_{it}(s_{it}, fr_{it}, m_{it})\right)x_{it} \geq \overline{R}_i$$
$$R_{it} = \theta\left(t^{R}{}_{it}, q^{k}{}_{it}(s_{it}, fr_{it}, m_{it})\right)x_{it} < \overline{R}_i \qquad (5')$$

We can think of the household optimising under two sets of conditions on its recycling level and whichever yields the highest utility will be the chosen option.

Alternatively, the relationship between a social norm for recycling and peer approval can be characterised as $pa_{it} = \varphi\left(R_{it} - \overline{R}_i\right)$ with $\varphi'(z) > 0$ when $z < 0$ where $z = R_{it} - \overline{R}_i$ and $\varphi'(z) \geq 0$ when $z > 0$. This way of modelling the influence of a social norm is similar to the approach taken by Azar (2004). In his case, behaviour converges to a norm reflecting the idea that no one wants to tip above or below the norm. In our case, we do not think that analogy holds so closely since if a household is recycling above the norm it is unlikely that they would respond by recycling less so as to conform to the norm. However, the rate of response might differ depending on whether the household is above or below the norm, i.e. $\varphi''(z) > 0$ when $z < 0$ but $\varphi''(z) \leq 0$ when $z > 0$. Thus, peer approval rises at an increasing rate below the norm but if the household's recycling rate is above the norm, peer approval rises at a decreasing rate.

Incorporating the effect of the social norm we can approach it either by the household maximising the utility function subject to (3), (4) and (5′) with the household choosing whichever level of time spent recycling gives it the highest utility. Alternatively, assuming separability between peer approval and the other arguments of the utility function we get (dropping subscripts):

$$U = U(x, G, t^{R}) + \varphi\left(R - \overline{R}\right) \qquad (1')$$

329 So (6) becomes

330 $$\frac{\partial U}{\partial x}\frac{\partial x}{\partial t^R} = \left(\frac{\partial U}{\partial G}\frac{\partial G}{\partial R} + \varphi'\right)\frac{\partial R}{\partial t^R} + \frac{\partial U}{\partial t^R} \qquad (6')$$

331 where φ' is the first derivative.

332

333 **5. Empirical model and results**

334 In the empirical model, we capture the role of peer approval implicitly through
335 adherence to a social norm. We would expect that the higher the social norm to
336 recycle, the higher the recycling level. It also emerged from the theoretical model that
337 if by improving the kerbside scheme we observed an increase in time spent recycling
338 we could deduce that warm-glow is present. Finally, we expect concern for the
339 environment to increase recycling.

340 We use data on household recycling volumes and determinants from a panel of
341 317 English local authorities, over the period 2006Q2 to 2008Q4.[12] A local authority
342 is the form of sub-central government in the UK, which has responsibility for
343 environmental policy as well as other government activities. While individual
344 household data might be preferable, particularly when modelling intra-governmental
345 variation in household recycling, such a dataset was not available to us. However, we
346 are able to analyse the variation in recycling across all the regions of one country.
347 These variations in recycling performance are wide and significant (Abbott et al.,
348 2011). Moreover, we can ascertain the importance of recycling policy, which is an
349 important driver of the kerbside quality variable defined in (5).[13]

[12] This dataset which formed one of the outputs from ESRC project 'Examining variation in recycling across UK' (RES-000-22-3738) is available from the UK ESDS archive.

[13] Surveys attempt to elicit from the respondent how they feel about an activity using a ranking scale to reflect strength of agreement with a particular statement such as '*I find recycling is a pleasant activity in itself*' (e.g. Halvorsen, 2008; p. 513). The use of surveys enables better targeting of relevant questions, however it is not without its drawbacks. As well as being limited in geographical coverage, a

Our econometric model is thus:

$$r_{it} = \beta_0 + \beta_1 y_{it} + \beta_2 ht_i + \beta_3 heq_{it} + \beta_4 kq_{it} + \beta_5 sn_i + \beta_6 gsp_i + \beta_7 urb_i + \varepsilon_{it} \quad (8)$$

Where r_{it} is the log of recycling volume per capita for local authority *i* at time period *t*, *y* denotes the log of median household income (constant prices); *ht* is a proxy for housing type (the proportion of the housing stock accounted for by flats); *heq* indicates the proportion of the population with a higher education qualification; *kq* is a measure of kerbside quality, defined as the ratio of recycling capacity (size of container × no. of materials) to the length of time between collections. According to our theory we can unambiguously assert that warm-glow is present if an increase in the quality of kerbside provision increases the time spent recycling. In the interpretation of β_4 due to the absence of data on time spent recycling, we make the link between recycling volume and the time spent recycling.[14] In the theoretical model, adherence to the social norm implies peer approval, which generates utility for the individual. In the empirical model, we focus on how the existence of a social norm, which we denote as *sn*, affects recycling behaviour. Specifically, *sn* is defined through the mean recycling volume of a reference group of local authorities and so measures the responsiveness of the recycling volume of a particular local authority to its reference group. Reference groups are defined according to socio-economic characteristics or locality. Earlier examples of how norms can be culture and age dependent include Stoodley (1959) and Neugarten et al. (1965), respectively. In education, Summers and Wolfe (1977) and Henderson et al. (1978) found that other

---

potential inconsistency between actual and stated preferences can arise, with stated preferences an unreliable predictor of actual behaviour (Barr et al., 2001; Cummings et al., 1995; Fox et al., 1998; List and Shogren, 1998; Neill et al., 1994). In the recycling literature, the unreliability of self-reporting of recycling behaviour is documented in Corral-Verdugo (1997) and Obregon-Salido and Corral-Verdugo (1997).

[14] The assumption being that the more time spent recycling the greater the recycling volume. Over some range this is a reasonable assumption, although diminishing returns are likely at some point.

371 things being equal, performance of students was better if their fellow students were
372 high achievers. Thus, the influence of age related norms on individual behaviour has
373 been studied in other contexts. The importance of locality in shaping norms has been
374 examined by Fornara et al. (2011). The idea put forward there is that individuals
375 living in close proximity to each other (not confined to within household) will behave
376 more alike than those living far apart. This effect, they argue is stronger when the
377 behaviour under consideration, e.g. recycling has a place-specific basis. Oskamp et al.
378 (1991) also found a similar result although the variable examined grouped recycling
379 by friends and neighbours together and so is not specifically related to social
380 relationships derived from sharing the same space. Perry and Williams (2007)
381 highlighted differences in recycling activities among different ethnic groups with
382 British Indians being more likely to participate in a recycling scheme than their White
383 British counterparts. Using age, ethnicity and location as the defining variable, local
384 authorities are divided into 4 categories in each case. [15] For example, we separate the
385 age distribution of all UK authorities into quartiles and then for the sub-group of
386 authorities in the same age quartile we calculate the mean recycling volume, thus sn_i
387 $= \overline{R}_j$, where j refers to the jth quartile of local authorities. For each local authority,
388 we therefore have a reference group whose recycling performance acts as the social
389 norm for that authority. For a full list of the definitions and sources used see
390 Appendix I. Appendix II includes the descriptive statistics of the variables used for
391 estimation.
392 We capture concern for the environment through the variable *gsp,* which
393 denotes the area of green space per capita. We expect that the larger the per capita

[15] We did test for the importance of social norms through using information, which related local authorities to each other on the basis of average incomes and educational attainment but the social norm variable was not significant.

green space area, the more aware individuals are of their natural environment and this will pre-dispose them towards pro-environmental behaviour, such as recycling. The link between place and behaviour has been examined in Cialdini et al. (1990) where the absence (presence) of litter makes further littering less (more) likely. The role of place in shaping pro-environmental behaviour is also addressed in Stedman (2002) and Uzzell, Pol and Badenas (2002). Since the effect on recycling from the volume of green space could also be dependent upon the degree of urbanisation, we also add as a further control the percentage of population living in an urban area, *urb*. The degree of urbanisation could impact upon recycling volumes since more urbanised areas are likely to be more densely populated, and as a result are more likely to be closely located to drop-off kerbside recycling facilities. This reduces the effort of non-kerbside recycling, which should raise recycling volumes.

Our choice of additional control variables is motivated by the literature. Income has been shown to have both positive and negative effects on recycling volumes. For example, those earning higher income may have a higher opportunity cost of time, so the volume of recyclable material will fall (Sidique et al., 2010), whilst the literature has also suggested higher earners can afford to pay for a better environment (Berglund and Söderholm, 2003; Owens et al., 2000; Terry, 2002). Ambiguous results on the role of income may also stem from different choices of the dependent variable. For example, if the recycling rate is chosen, which is defined as volume of recycling divided by volume of waste, the effect of income can have differential impacts on the numerator and the denominator. Sidique et al. (2010) speculate that higher incomes result in higher consumption, therefore generating greater waste and thus leading to a lower recycling rate. Another possible explanation, distinct from the time element of sorting out waste is the link between income and purchasing patterns. Basing their

419 analysis on the opportunity cost of time argument, Saltzman et al. (1993) find that
420 purchasing patterns shift away from goods with a higher recyclable content. However,
421 it could be that higher earners have greater financial flexibility and so can use their
422 discretion to purchase goods with a higher recyclable content (alluded to in Callan and
423 Thomas (2006)). However, this explanation has yet to be tested in the literature given
424 the difficulty of obtaining data on household budgetary allocations (Yang and Innes,
425 1997).

426 Housing type (*ht*) is proxied by the proportion of the authority's housing stock
427 that is flats. Evidence would suggest that households dwelling in flats are less likely to
428 recycle or recycle in lower quantities, partly because of their more limited space to
429 store recyclable materials and generally because of their poorer provision of kerbside
430 collection (Barr et al., 2001; Woodruff, pers. comm.). Consequently, we anticipate
431 that $\beta_2 < 0$. Education has also been demonstrated to be important, with recycling
432 behaviour positively related to the level of educational attainment (Callan and
433 Thomas, 1997; Duggal et al., 1991; Hong et al., 1993; Judge and Becker, 1993;
434 Reschovsky and Stone, 1994). Thus, in authorities where a greater proportion of the
435 population has a higher education qualification, the volume of recycling should be
436 higher. Thus we anticipate that $\beta_3 > 0$. Following on from our discussion above, $\beta_4 >$
437 0 indicates the presence of warm-glow. We expect $\beta_5 > 0$ indicating a positive
438 relationship between the social norm and individual household recycling behaviour.
439 $\beta_6 > 0$ confirms the hypothesis that higher environmental awareness stimulated
440 through closer proximity to green spaces increases recycling. Finally, $\beta_7 > 0$ since
441 more urbanised areas are likely to have a higher population density and are likely to
442 benefit from greater proximity to recycling facilities.

443 The results of estimating (8) are presented in table 1. We use a random effects
444 panel estimator given that the variables *ht* and *heq* are time-invariant, and we are
445 interested in their impact beyond all other individual effects, which would be
446 unobservable. We present three models that differ in the definition of social norm
447 used. Model (1) uses the age profile of authorities to define the social norm; model (2)
448 uses the ethnic profile, while (3) uses the regional average recycling performance.[16]
449 TABLE 1 NEAR HERE
450 Overall, the signs of the control variables are as expected. The variable *ht* is
451 statistically significant in two of the three models and the estimated coefficient is
452 negatively signed. Local authorities with a higher proportion of their housing stock
453 accounted for by flats are expected to have a lower recycling volume per capita. Our
454 proxies for the social norm variable are found to have a statistically significant effect
455 on recycling variable in all three cases and the estimates have a positive sign,
456 implying that the improved recycling performance of a reference group raises the
457 individual recycling volumes of individual local authorities. This effect is strongest
458 vis-à-vis age and ethnicity rather than through a regional influence. So perhaps the
459 recycling volume of peer groups with similar socio-economic characteristics are more
460 important than a regional influence. Interpretation of the warm glow effect from the
461 econometric results is not so straightforward. Although we find a positive relationship
462 between kerbside quality and recycling volumes (reflecting time spent recycling),
463 which would indicate the presence of warm-glow, it is not significant. The area of
464 green space has a statistically significant effect and is positively signed in all three
465 cases, though the magnitude of the estimated coefficient would imply a slight effect
466 on recycling volumes.

[16] England is separated into nine regions, which form the highest tier of sub-national division. The regions are: East Midlands, East of England, Greater London, North East England, North West England, South East England, South West England, West Midlands, Yorkshire and the Humber.

6. Conclusion

This paper re-examines the role of motives in determining recycling behaviour. Sticking to the definition of warm-glow provided by Andreoni (1990) and others, we provide what we believe to be is a novel approach to detecting its existence within a theoretical framework. Within that framework we also offer two ways of modelling the influence of social norms on recycling behaviour. Using random effects estimation, the roles of social norms, warm-glow and environmental concern are analysed, based on English local authority data on recycling volumes and kerbside provision. The empirical results generally confirm the hypotheses generated by the theoretical model: there is a social norm effect and the peer effect is stronger with relation to age and ethnicity rather than locality. Environmental concern is also found to be significant, albeit the effect is slight. The empirical analysis failed to establish a significant relationship between warm-glow and recycling.

These results suggest that in the context of household recycling it may be more attractive to policymakers to rely on social norms rather than other measures to guide behaviour. By doing so, the burden of monitoring and enforcement can be shifted from the regulator to the community. Thus, for a given level of monitoring and enforcement effort, decentralisation may reduce costs and be more effective. Thus, rather than mandating levels of recycling, the government can use measures to activate the social norm. The kerbside scheme is one such measure since by making recycling efforts visible amongst neighbours it promotes and sustains the social norm to recycle (Oskamp et al., 1991; Vining and Ebreo, 1990).

Kreps (1997) states that if economic incentives are to complement intrinsic incentives they should emphasise the voluntary nature of the desired behaviour. To

492 date, policymakers in many countries have relied almost entirely on non-monetary
493 incentives to increase recycling. In the future, should policy-makers turn to monetary
494 incentives to drive up recycling rates further, their design of monetary incentives
495 should take account of the non-monetary drivers affecting pro-environmental
496 behaviour, such as recycling.

497 Relating our findings to the literature, we note that our empirical results
498 conform to those obtained elsewhere, although interpretations differ. For example,
499 Hage et al. (2009) report that while the coefficient on the social norm variable shows
500 that it has a limited effect on household behaviour, the variable relating to the
501 perception of others' recycling efforts, which is estimated separately, is an important
502 driver in how much the individual recycles. Although Halvorsen (2008) does not
503 interpret warm-glow in the same way as we do, he does find that improving the
504 quality of kerbside is statistically significant in increasing household recycling.

505 Finally, given our dataset, it has proved difficult to empirically capture warm-
506 glow as well as we would like. Hence, future research will be directed at augmenting
507 the dataset with information on time spent recycling. In addition, although we have
508 suppressed the effect of x on recycling in the empirical model, future work will
509 involve establishing the relationship between households' purchasing and recycling
510 behaviour. As Yang and Innes (1997) state there is insufficient data on household
511 consumption patterns and Saltzman et al. (1993) have shown that there is a link
512 between the two through the income effect.

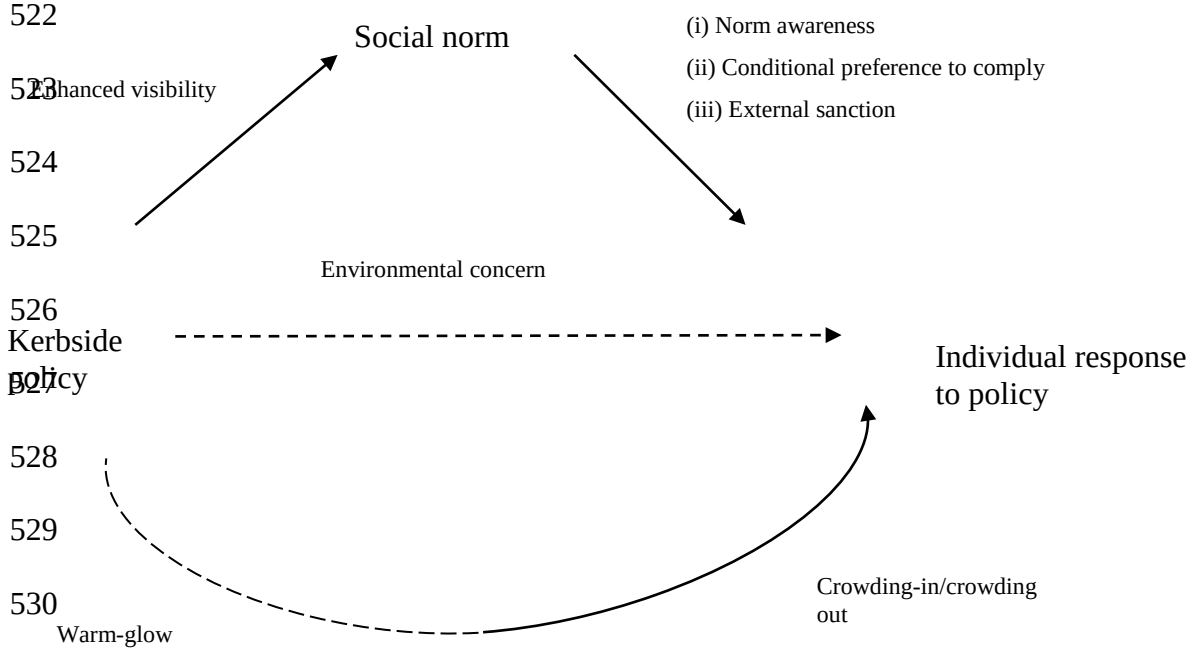
513

514 **Acknowledgements**

515 The empirical work in this paper is based on a database which was created with
516 funding from the ESRC (grant no. RES-000-22-3738) for which, we are very grateful.

We are also grateful to the anonymous referees whose comments have substantially improved the paper.

Figure 1 Kerbside policy and response channels



Note: solid lines indicate a direct link, e.g. kerbside policy may create a norm through visibility of recycling activity. Dashed lines indicate that warm-glow and environmental concern may or may not be present. If warm-glow is present, evidence suggests that crowding-out can occur.

542 **Appendix I: Data and sources**

543

Variable	Description	Source
r	log of dry recycling per capita	www.wastedataflow.org
y	Log of median household income in constant prices	Office for National Statistics
ht	Proportion of the housing stock that is flats	Office for National Statistics
heq	Proportion of the local authority population that has a primary degree	Office for National Statistics
sn	Social norm variable. Defined by the average recycling volume of a reference group of local authorities, which comes from the quartile the authority belongs to. The reference group is defined with respect to 1. Age profile. The proportion of the local authority's that is aged 65 or older; 2. Ethnicity. The proportion of the local authority's population that is white; 3. The region of the UK which the local authority belongs to.	www.wastedataflow.org & Office for National Statistics
gsp	Log of green space per capita	Office for National Statistics
kq	Quality of kerbside provision. Defined as: $\frac{size\ of\ container \times number\ of\ materials}{length\ of\ time\ between\ collections}$ where 1. size is 8 = Wheeled bin 241+ litres; 7 = Wheeled bin 181-240 litres; 6 = Wheeled bin 120-180 litres; 5 = Wheeled bin<120 litres; 4 = Kerbside box >50 litres; 3 = Kerbside Box 35-50 litres; 2 = Kerbside Box <35 litres; 1 = for all other methods of collection.	www.wastedataflow.org

	2. Number of materials are given as: 4 = if 4 or more materials are collected; 3 = if 3 materials are collected; 2 = if 2 materials are collected; 1 = if 1 material is collected; 3. Length of time between collections, where: 5 = less frequently than monthly 4 = monthly 3 = fortnightly 2 = Weekly 1 = more frequent than weekly	
urb_i	Percentage of the local authority population that lives in an urban area	Office for National Statistics

544

Appendix II: Descriptive statistics of the data series

Variable	Mean	Standard deviation			Minimum	Maximum
		overall	between	within		
r	-3.834	0.289	0.265	0.118	-5.281	-2.781
y	10.094	0.145	0.144	0.026	9.769	10.749
ht	17.166	13.922	14.177	-	3.41	89.48
heq	19.177	6.463	2.866	5.823	9.69	48.25
kq	7.027	3.418	1.656	3.006	0	17.616
sn (age)	-3.797	0.041	0.041	-	-3.859	-3.708
sn (ethnicity)	-3.795	0.072	0.072	-	-3.963	-3.719
sn (regional)	-3.886	0.143	0.145	-	-4.143	-3.560
gsp	0.312	1.641	0.631	1.519	-4.040	3.589
urb	66.854	34.851	35.253	-	0	100

Notes: for each series we have 1887 observations and 317 local authorities, with a mean number of observations of 5.95.

Table 1: Estimation results

Variable	(1)	(2)	(3)
constant	-1.515	-0.959	-2.172
	(-1.04)	(-0.61)	(-1.49)
y	0.204	0.143	0.032
	(1.86)	(1.38)	(0.30)
ht	-0.003*	0.0006	-0.005*
	(-2.77)	(0.39)	(-3.09)
heq	0.0008	0.0008	0.0005
	(1.60)	(1.60)	(1.15)
kq	0.001	0.001	0.001
	(1.10)	(1.16)	(0.99)
sn	1.147*	1.141*	0.487*
	(3.42)	(4.02)	(2.87)
gsp	0.005*	0.005*	0.003
	(2.48)	(2.41)	(1.74)
urb	0.0002	-0.0003	-0.0003
	(0.40)	(-0.65)	(-0.61)
R^2	0.044	0.076	0.065
no. of observations	1887	1887	1887

Notes: random effects estimates. * indicates significance at the 5% level. Social norm is defined separately for models 1 to 3, using the average recycling volume of a reference group of local authorities. In Model (1) the social norm is defined using the age profile of the authority; Model (2) uses the ethnic profile; while (3) uses the average of the UK region to which the local authority belongs.

References

Abbott, A., Nandeibam, S., O'Shea, L., 2011. Explaining the variation in recycling rates across the UK. Ecological Economics 70, 2214-2223.

Akerlof, G.A., 1982. Labor contracts as partial gift exchange. Quarterly Journal of Economics 84, 488-500.

Akerlof, G.A., Kranton, R.E., 2005. Identity and the economics of organizations. The Journal of Economic Perspectives 19, 9-32.

Ando, A., Gosselin, A., 2005. Recycling in multifamily dwellings: does convenience matter? Economic Inquiry 43, 426-438.

Andersson, M., von Borgstede, C., 2010. Differentiation of determinants of low-cost and high-cost recycling. Journal of Environmental Psychology 30, 402-408.

Andreoni, J., 1990. Impure altruism and donations to public goods: a theory of warm-glow giving. The Economic Journal 100, 464-477.

Atkinson, A.B., 2009. Giving overseas and public policy. Journal of Public Economics 93, 647-653.

Azar, O.H., 2004. What sustains social norms and how they evolve? The case of tipping. Journal of Economic Behaviour and Organization 54, 49-64.

Barr S., Gilg, A.W., Ford, N.J., 2001. A conceptual framework for understanding and analysing attitudes towards household-waste management. Environment and Planning A 33, 2025-2048.

Barr, S., Ford, N., Gilg, A., 2003. Attitudes towards recycling household waste in Exeter, Devon: quantitative and qualitative approaches. Local Environment 8, 407-421.

Barr, S., 2007. Factors influencing environmental attitudes and behaviours: a UK case study of household management. Environment and Behaviour 39, 435-471.

Bendor, J., Swistak, P., 2001. The evolution of norms. American Journal of Sociology 106, 1493-1545.

Berglund, C., Söderholm, P., 2003. An econometric analysis of global waste paper recovery and utilization. Environmental and Resource Economics 26, 426-456.

Berglund, C., 2006. The assessment of households' recycling costs: the role of personal motives. Ecological Economics 56, 560-569.

Biccheri, C., 2006. The grammar of society, Cambridge: Cambridge University Press.

Brekke, K.A., Kverndokk, S., Nyborg, K., 2003. An economic model of moral motivation. Journal of Public Economics 87, 1967-1983.

Brekke, K. A., Kipperberg, G., Nyborg, K., 2007. Reluctant recyclers: social interaction in responsibility ascription, Memorandum No 16/2007, Department of Economics, University of Oslo.

Brekke, K. A., Kipperberg, G., Nyborg, K., 2010. Social interaction in responsibility ascription: the case of household recycling, Land Economics 86, 766-784.

Bowles, S., 2008. Policies designed for self-interested citizens may undermine 'the moral sentiments': evidence from economic experiments, Science 320, 1605-1609.

Bowles, S., Hwang, S.-H., 2008. Social preferences and public economics: mechanism design when social preferences depend on incentives, Journal of Public Economics 92, 1811-1820.

Bruvoll, A., Nyborg, K., 2004, The cold shiver of not giving enough: on the social cost of recycling campaigns, Land Economics 80, 539-549.

Burke, M. A., Young, H. P., 2011. Social Norms, in: Benhabib, J., Bisin, A., Jackson, M.O. (Eds.), The Handbook of Social Economics. North-Holland, Amsterdam, pp. 311-338.

Callan, S., Thomas J., 1997. The impact of state and local policies on the recycling effort. Eastern Economic Journal 23, 411-423.

Callan, S., Thomas, J., 2006. Analyzing demand for disposal and recycling services: a systems approach. Eastern Economic Journal 32, 221-240.

Cialdini, R. B., Reno, R. R., Kallgren, C. A., 1990. A focus theory of normative conduct: recycling the concept of norms to reduce littering in public places, Journal of Personality and Social Psychology 58, 1015-1026.

Clark, C. F., Kotchen, M.J., Moore M.R., 2003. Internal and external influences on pro-environmental behaviour: participation in a green electricity program. Journal of Environmental Psychology 23, 237-246.

Corral-Verdugo, V., 1997. Dual 'realities' of conservation behaviour: self-reports vs. observations of re-use and recycling behaviour. Journal of Environmental Psychology 17, 135-145.

Cummings, R.G., Harrison, G.W., Rutström, E.E., 1995. Homegrown values and hypothetical surveys: is the dichotomous choice approach incentive-compatible? American Economic Review 85, 260-266.

Deci, E. L., 1971. Effects of externally mediated rewards on instrinsic motivation, Journal of Personality and Social Psychology 18, 105-115.

DETR, 2000. Waste Strategy 2000, Department of the Environment, Transport and the Regions, The Stationary Office, London.

DEFRA, 2011. Government Review of Waste Strategy in England 2011, Department for environment, food and rural affairs.

De Young, R., 1996. Some psychological aspects of reduced consumption behaviour: the role of instrinsic satisfaction and competence motivation. Environment and Behaviour 28, 358-409.

De Young, R., 2000. Expanding and evaluating motives for environmentally responsible behaviour. Journal of Social Issues 56, 509-526.

Duggal, V.G., Saltzman, C., Williams, M.L., 1991. Recycling: an economic analysis. Eastern Economic Journal 17, 351-358.

Elster, J., 1989. Social norms and economic theory, Journal of Economic Perspectives, 3, 99-117.

Elster, J., 2009. Norms, in: Hedström, P., Bearman, P., (eds.), The Oxford Handbook of Analytical Sociology. Oxford University Press, Oxford, 195-217.

Fehr, E., Falk, A., 2002. Psychological foundations of incentives, European Economic Review 46, 687-724.

Fishbein, M., Ajzen, I., 1975. Belief, attitude, intention and behaviour: an introduction to theory and research, Addison-Wesley, Reading, M.A.

Fornara, F., Carrus, G., Passafaro, P., Bonnes, M., 2011. Distinguishing the sources of normative influence on proenvironmental behaviours: the role of local norms in household waste recycling. Group Processes and Intergroup Relations 14, 623-635.

Fox, J.A., Shogren, J.F., Hayes, D.J., Kliebenstein, J.B., 1998. CVM-X: Calibrating contingent values with experimental auction markets. American Journal of Agricultural Economics 80, 455-465.

Frey, B.S., 1999. Economics as a science of human behaviour: towards a new social science paradigm, Springer.

Frey B. S., Oberholzer-Gee, F., 1997. The cost of price incentives: an empirical analysis of motivation crowding-out. American Economic Review 87, 746-755.

Frey, B. S., Jegen, R., 2001. Motivation crowding theory, Journal of Economic Surveys 15, 589-611.

Gibbs, J. P., 1965. Norms: the problem of definition and classification. American Journal of Sociology 70, 586-594.

Graetz, M.J., Wilde, L.L., 1985. The economics of tax compliance: facts and fantasy. National Tax Journal 38, 355-363.

Hage, O., Söderholm, P., 2008. An econometric analysis of regional differences in household waste collection: the case of plastic packaging waste in Sweden. Waste Management 28, 1720-1731.

Hage O., Söderholm P., Berglund, C., 2009. Norms and economic motivation in household recycling: empirical evidence from Sweden. Resource and Conservation Policy 53, 155-165.

Halvorsen, B., 2008. Effects of norms and opportunity cost of time on household recycling. Land Economics 84, 501-516.

Henderson, V., Mieszkowski, P., Sauvageau, Y., 1978. Peer group effects and educational production functions. Journal of Public Economics 10: 97-106.

Hong, S., Adams, R., Love, H., 1993. An economic analysis of household recycling of solid wastes: the case of Portland, Oregon. Journal of Environmental Economics and Management 25, 136-146.

Hong, S., 1999. The effects of unit pricing system on household solid waste management: the Korean experience. Journal of Environmental Management 57, 1-10.

Hornik, J., Cherian, J., Madansky, M., Narayana, C., 1995. Determinants of recycling behaviour: a synthesis of research results. The Journal of Socio-Economics 24, 105-127.

Jenkins, R., 1993. The economics of solid waste reduction: the impact of user fees. New Horizons in Environmental Economics Series, first ed. Edward Elgar Publishing Ltd.

Jones, S., 1984. The economics of conformism, Basil Blackwell, Oxford.

Judge, R., Baker, A., 1993. Motivating recycling: a marginal cost analysis. Contemporary Policy Issues 11, 58-68.

Kinnaman, T., 2006. Policy watch: examining the justification for residential recycling. Journal of Economic Perspectives 20, 219-232.

Kinnaman, T., Fullerton, D., 1999. The economics of residential solid waste management, NBER Working Paper Series, Working Paper 7326.

Kreps, D. M., 1997. Intrinsic motivation and extrinsic incentives. The American Economic Review 87, 359-364.

List, J.A., Shogren, J.F., 1998. Calibration of the difference between actual and hypothetical valuations in a field experiment. Journal of Economic Behaviour and Organisation 37, 193-205.

Lyons, D. I., 2007. A spatial analysis of loop closing among recycling, remanufacturing and waste treatment firms in Texas. Journal of Industrial Ecology 11, 43-54.

Meier, S., Stutzer, A., 2008. Is volunteering rewarding in itself? Economica, 75, 39-59.

Neill, H.R., Cummings, R.G., Ganderton, P.T., Harrison, G.W., M^{c}Guckin, T., 1994. Hypothetical surveys and real economic commitments. Land Economics 70, 145-154.

Obregon-Salido, F., Corral-Verdugo, V., 1997. Systems of beliefs and environmental conservation behaviour in a Mexican community. Environment and Behaviour 29, 213-235.

Neugarten, B. L., Moore, J. W., Lowe, J. C., 1965. Age norms, age constraints and adult socialization. American Journal of Sociology, 70, 710-717.

OECD, 2008. Promoting sustainable consumption – good practices in OECD countries.

Ostrom, E., 2000. Collective action and the evolution of social norms. Journal of Economic Perspectives 14, 137-158.

Oskamp, S., Harrington, M.J., Edwards, T.C., Sherwood, D.L., Okuda, S.M., Swanson, D.C., 1991. Factors influencing household recycling behaviour. Environment and Behaviour 23, 494-519.

Owens, J., Dickerson, S., Macintosh, D., 2000. Demographic covariates of residential recycling efficiency. Environment and Behaviour 32, 637-650.

Palfrey, T. R., Prisbrey, J. E., 1997. Anomalous behaviour in public goods experiments: How much and why? American Economic Review 87, 829-846.

Perry, G.D.R, Williams, I.D., 2007. The participation of ethnic minorities in kerbside recycling: a case study. Resources, Conservation and Recycling 49, 308-323.

Posner, R.A., Rasmussen, E.B., 1999. Creating and enforcing norms, with special reference to sanctions. International Review of Law and Economics 19, 369-382.

Reschovsky, J.D., Stone, S.E., 1994, Market incentives to encourage household waste recycling: paying for what you throw away. Journal of Policy Analysis and Management 13, 120-139.

Riley, M., 2008. From salvage to recycling – new agendas or same old rubbish. Area, 40, 79-89.

Rotter, J.B., 1966. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 80 (Whole No. 609).

Ryan, R.M., Deci, E.I., 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. American Psychologist, 55, 68-78.

Saltzman, C., Duggal, V.G., Williams M.L., 1993. Income and recycling effort: a maximisation problem. Energy Economics 15, 33-38.

Sidique, S., Joshi, S., Lupi, F., 2010. Factors influencing the rate of recycling: an analysis of Minnesota counties. Resources, Conservation and Recycling 54, 242-249.

Stedman, R. C., 2002. Toward a social psychology of place: predicting behaviour from place-based cognitions, attitude and identity, Environment and Behaviour, 34, 561-581.

Stoodley, B. H., 1959. A cross-cultural study of structure and conflict in social norms. American Journal of Sociology, 65, 39-48.

Summers, A., Wolfe, B., 1977. Do schools make a difference? American Economic Review, 639-652.

Terry, N., 2002. The determinants of municipal recycling: a time series approach. Southwestern Economic Review 29, 53-62.

Thørgersen, J., 2003. Monetary incentives and recycling: behavioural and psychological reactions to a performance-dependent garbage fee, Journal of Consumer Policy, 26, 197-228.

Thørgersen, J., 2008. Social norms and cooperation in real-life social dilemmas, Journal of Economic Psychology, 29, 458-472.

Tucker, P., 1999. Normative influences in household recycling. Journal of Environmental Planning and Management 42, 63-82.

Uzzell, D. Pol, E., Badenas D., 2002. Place identification, social cohesion, and environmental sustainability, Environment and Behaviour, 34, 26-53.

Van den Bergh, J.C.J.M., 2008. Environmental regulation of households: an empirical review of economic and psychological factors, Ecological Economics 66, 559-574.

Vining, J., Ebreo, A., 1990. What makes a recycler? A comparison of recyclers and non-recyclers. Environment and Behaviour 22, 55-73.

Yang, H., Innes, R., 2007. Economic incentives and residential waste management in Taiwan: a empirical investigation. Environmental and Resource Economics 37, 489-519.

Young, H.P., 1996. The economics of convention. The Journal of Economic Perspectives 10, 105-122.