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Patterns of household practice: An examination into the relationship between housework and waste separation for households in the United Kingdom

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Title: Patterns of Household Practice, An Examination into the Relationship between Housework and Waste Separation for Households in the United Kingdom



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Non-Technical Summary

In this paper I engage with very recent debates on recycling which suggest that everyday household practices such as cooking, tidying and cleaning are being modified to include various acts of everyday recycling within them. This is an important conceptualisation because it suggests that time spent on housework is likely to be an important determinant of recycling behaviour. It also substantiates the argument that recycling, not only adds to more traditional forms of unpaid domestic labour in the home, but potentially creates conflict amongst household members in terms of whose task it is. In the study I formally test the extent to which housework and waste separation are associated tasks. I find a modest association between waste separation and housework, confirming these behaviours are related in some manner. I then test whether waste separation tasks are likely to be unequally distributed into housework routines between men and women. For men and women who make independent decisions about housework, the association with housework is actually stronger for men, although women do more waste separation. With respect to men and women living together, where decisions on housework are some product of their relationship, waste separation is as likely if either the man or woman does more of the domestic work in the household.

Patterns of Household Practice
An Examination into the Relationship between Housework and
Waste Separation for Households in the United Kingdom

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Abstract

Although evidence suggests that households are doing more recycling, little is known about waste management practices within the home. How cleaned, sorted materials move from the point of consumption to the point of kerbside collection. Who does the work and in what ways if at all, it is integrated into other similar domestic tasks in the home? In this study I test the hypothesis put forward in two recent studies that as a domestic practice, waste separation is carried out, mostly by women, alongside other similar domestic routines such as food preparation, cooking and washing up. Using data collected between 2009/2010 from Understanding Society, a nationally representative survey of households in the United Kingdom, the association between waste separation and housework is examined for 2,312 men and women, living independently and 3,002 opposite sex, married or cohabiting couples.

Keywords: Recycling, Waste Separation, Gender, Domestic Housework

1.0 Introduction

In the United Kingdom recycling is largely a voluntary act, yet actively encouraged and supported by a number of different state interventions at local government and local authority level. These interventions include increasing the provision of kerbside collection, providing storage bins, collecting co-mingled waste, reducing the collection of non-recyclables to alternate weekly collection and importantly providing guidelines to householders on how to perform these practices (Timlett & Williams 2008). According to the Parliamentary Office of Science and Technology by the end of 2005 nearly all local authorities in England had schemes in place which allowed households to recycle the largest fractions of recyclable household waste (paper/cardboard and glass) and 79% of households were served by kerbside collection schemes. The Scottish Government and Northern Ireland Environmental Agency have laid out similar plans to increase domestic recycling by also using voluntary incentives (Donnelly 2010, Rogers 2006). All three Governments have set targets to increase domestic recycling to in the region of 50% of all waste by 2020 (Rogers, 2006). To achieve this councils are going to have to continue to find ways to encourage more households to participate as well as potentially expand the materials collected at kerbside. In the year 2010 to 2011 the proportion of household waste sent for recycling or reuse in England and Wales was 41.5% (an increase of 1.8% from previous year) (Lee 2010). In Scotland this figure was 37.2% (an increase of 2.1%) (Scottish Environment Protection Agency SEPA) and in Northern Ireland this figure was 39.7% (an increase of 1.2%) (Northern Ireland Environment Agency 2010).

1.1 Recycling and Housework

Although there has been a great deal of research into domestic household recycling over the last 30 years, much of this has concentrated upon the general types of householders

who participate and how much they do. It has also tended to concentrate on recycling as a distinctive green act or an act of greener consumerism. Interestingly, recycling has only more recently been conceptualised as a complex everyday social routine which shares many characteristics with other similar domestic practices (Oates & McDonald 2006, Barr & Gilg 2005). It involves routine daily acts that need to be performed in the home. For the homeowner, it is unpaid work which is likely to increase proportionally to the size of the home, the number of occupants and volume of consumption. It is also time consuming (Derksen & Gartrell 1993). It involves not only getting waste materials such as paper, food, glass and plastics to a point of collection, but a number of sequential tasks that need to take place in the home which further transform materials into recyclables (Timlett & Williams 2008, Barr & Gilg 2006, Martin, Williams & Clark, 2006, Oates & McDonald 2006, Guagnano, Stern & Dietz 1995, Derksen & Gartrell 1993). These include checking labelling, removing lids, emptying contents, rinsing, drying, sorting, separating and storing (Timlett & Williams 2008, Martin et al 2006).

Although there is limited research into precisely how these practices are performed in the home, a great deal of this work is likely to take place in the kitchen, alongside daily cooking and food preparation. For the average household, cooking and food related practices alone are estimated to generate as much as 60% of the household's annual waste in terms of waste food and food packaging (Parfitt 2002, Mintel 2010). This means that decisions as to what to compost, what to sort and separate and what to empty and wash out are likely to be made as meals are prepared, food is unwrapped and resultant waste composted, rinsed and separated or committed to landfill. It also suggests that these decisions are likely to be made by whoever performs these tasks in the home. In their study Oates & McDonald (2006) draw

similar parallels between housework and recycling not only in terms of cooking practices but also cleaning and tidying routines. Housework, they suggest is also a mechanism through which waste generated in other areas of the household is collected and sorted.

In support of the general association between housework and acts of waste separation, Barr & Gilg (2006) conclude from their research, that once the decision has been made by householders to recycle, related practices are assimilated into normal routines of behaviour. However, they go no further to suggest into whose domestic routines these practices become assimilated. This is important because if acts of recycling depend on how much time householders spend cooking and cleaning it could also depend on how domestic labour it is distributed in the household. If men and women differ in their propensity to assimilate this extra work, asking households to recycle more becomes a more complex and potentially contested social issue.

1.2 Who Does the Housework, Who does the Recycling?

Bianchi, Milkie, Sayer & Robinson (2000) describe housework as 'contested terrain'. Getting household work done they suggest involves cooperation, negotiation, and conflict among household members. Although households are doing much less housework than they were 20 years ago, on average women still do more than men especially when they live with a male partner (Office National Statistics 2006, Bianchi et al 2000, Sullivan 2000). There are three main theories on this division of non-paid labour which provide some insight into how associated behaviour such as waste separation might be distributed between men and women. The time availability theory suggests that time spent on housework is conditional upon the amount of time spent in the home as opposed to the labour market (Oates & McDonald 2006, Sullivan 2000, Bianchi et al 2000). Because women, especially once they have

children, are less likely than men to engage in full time work, they are also more likely to take on responsibility for keeping the home clean, cooking, washing clothes and doing other domestic activities associated with managing a home (Coverman 1985). According to this theoretical perspective, women are more likely to do associated practices only if they spend more time in the home doing housework compared to other household members. Given similar social and physical environments, such as living independently, working full time and having children this theory suggests men and women are as likely to incorporate acts of recycling and waste separation within what is their normal domestic routines.

The second theoretical perspective is the relative resources approach which is an extension of the time availability theory. Explaining the behaviour of couples who marry or cohabit, it suggests that the division of domestic labour is the product of some form of bargaining between partners. Their relative bargaining power is not equal but conditional upon the relative economic resources each partner brings to the relationship (Khan 2008, Oates & McDonald 2006). An associated theory suggests that this bargaining between the couple also has a social dimension, drawing on their relative expertise as either caring for children or expertise in the labour market (Bianchi et al 2000). The relative resources perspective suggests that the distribution of domestic labour between men and women living together is conditional on their mutual bargaining. It also suggests that the outcome of this bargaining, in terms of what housework is performed, is likely to be similar for men and women.

The third theoretical perspective is somewhat contrasting because it suggests that men and women vary considerably in their propensity to do certain acts of unpaid domestic labour. Housework is an enactment of gender such that it involves a playing out of traditional or non-

traditional views on the male/female domestic role (Fenstermaker, West, and Zimmerman 1991; West and Zimmerman 1987). The importance of this theory is that it suggests if acts of recycling are strongly associated with particular domestic tasks, a similar pattern of gendering could occur. Blair & Lichter (1991) find women are more likely to take charge of routine, daily, repetitive tasks such as cooking, shopping, cleaning, washing and tidying, acts which theoretically have a strong association with waste separation. They find, men on the other hand, spent a greater proportion of their time on less frequent outdoor tasks such as gardening and DIY. In a similar manner recycling and waste separation could be similarly distributed between men and women, especially when they live together. Women could be doing more of the daily waste separation and rinsing whilst men's contribution could be limited to less frequent tasks such as putting out bins and taking non-collectables to municipal waste disposal sites.

Drawing upon the vast amount of empirical evidence suggesting that women still take responsibility in the home for most of the core, daily repetitive chores Oates & McDonald (2006) hypothesise that women have an important role to play in household recycling because they are more likely to both initiate and sustain related daily practices. Drawing on this gender based theory of housework they suggest that acts such as rinsing out plastics, sorting and separating food packaging and storing waste are primarily female-led activities in most households. Testing this theory through an empirical study in Sheffield, they do find more women than men report initiating and sustaining household recycling (45% women compared to 16% men). However, just over a quarter of households (26%) said that recycling was a shared activity in their household. Although their research does not reject the idea that tasks may be somehow divided up according to gender, it does not strongly support the idea that domestic recycling is wholly female led unpaid work.

2.0 The Present Research

In this study I am concerned with the direct relationship between housework and waste separation which to date has not been empirically observed. There is no firm, reliable evidence to suggest that these acts are associated in any way. Hence a primary aim of this study is to formally test this relationship. Although Oates & McDonald make some attempt to measure gender differences in the context of the household and in terms of whose task it is to initiate and sustain related recycling behaviour, no account was made of the underlying mechanism which might explain this. If acts of waste separation are conditional on the distribution of housework it could be understood and explained by particular barriers and constraints known to moderate housework such as having children, working or being married (Bianchi et al 2000, Sullivan 2000, Coverman 1985). One of the most fundamental debates in the literature on domestic housework is the unequal distribution of labour between men and women. Although recent studies suggest that the gap in behaviour is closing, women still do a disproportionate amount compared to men (Bianchi et al 2000, Sullivan 2000). If housework is a mechanism through which households engage in recycling it is likely that women are also taking on a disproportionate amount of these tasks also. Historically studies dating back as far as McStay & Dunlap (1983) have found that women are far more likely to say they recycle than men. Although at the time this was theorised as being due to the disproportionate amount of time they spent in the home compared to men, the formal association between housework and recycling for men and women has never been compared. In this study therefore I address two basic but very fundamental research questions;

(1) Do people who do more housework, also do more waste separation?

(2) To what extent is this association different for men and women?

To fully address these questions, I concentrate on two distinctive household types. The first consists of adults living alone, with or without dependent children. The assumption I am making here is that in these households men and women independently are faced with the responsibility for running and managing a home. Subsequently they decide independently which domestic tasks are prioritised (including recycling) and how much time they are willing to allocate to them. The second household type I examine is women living with their male partners. The selection of this household type is based on established theory and a great deal of empirical research, suggesting that patterns of housework for men and women change significantly when they cohabit or marry. Whilst time spent on housework may be rationally distributed between them it could also be the product of many characteristics of the partnership including couple ideology, power-relations as well as time available (Bianchi et al 2000, Ferree 1991, Coverman 1985). Although these particular mechanisms are unobserved in this research, the outcome in terms of housework distribution within the partnership is observed. Households are identified according to which partner does the most housework. In structuring the research in this manner, I assume that whoever does more of the housework is more likely to make related decisions, particularly with respect to recycling. Although recent empirical research suggests that overall housework hours are increasing for men and decreasing for women, there is still evidence to suggest that when men and women cohabit, the woman is more likely to play the more active role in non-paid domestic labour (Bianchi et al 2000, Sullivan 2000). In coupled households although the majority of partnerships are likely to be female dominated in terms of housework, in this research these are compared to households which are more male dominated to see whether this has a significant effect on waste separation behaviour in the household.

2.1 Method

To specifically address the research questions for both household types I test the following two hypotheses;

H₀₁ The probability of waste separation is independent of the number of hours spent, each week on housework

H₀₂ Men and women are equally as likely to separate their waste materials for recycling if they increase the number of hours they spend each week on housework

H₀₁ suggests there is no association between acts of waste separation and acts of housework and this is tested on both household types using ordinary logistic regression. Initially the bivariate relationship between waste separation and housework is examined and this is followed by multivariate regression methods in which controls are used to account for differences in social and physical circumstances between men and women living independently and between households for couples. H₀₂ suggests that the association between waste separation and housework is the same for men and women. It is independent of who does the housework and consistent with time availability and the relative resources framework, men and women are as likely to incorporate it into their housework routines. The alternative finding would be that men and women vary in their propensity to include it in their normal weekly domestic routines.

The data used comes from Wave 1 Understanding Society which is an up to date and representative survey of 50,994 households within the United Kingdom. Wave 1 data was collected between 2009/2010. The sample of single occupant households (sample 1) is drawn from a random sample of 50,994 UK households of which 9,404 are single occupants living with or without dependent children. A further determinant for this sample is that only

households randomly interviewed between January and June 2009 were questioned upon their domestic labour routines. This means that only a proportion of the total number of single occupant households were asked about their housework behaviour (2,312) and this forms the first sample. In all modelling weights are used to adjust results according to the individual probability of being sampled. The second sample is derived from the 77,309 individuals who live in the sampled 50,994 households. Of these 37,489 are males over the age of 16 of which 14,713 are married and living with their spouses and 3,292 are cohabiting. These are matched with 39,820 females over 16 of which 14,733 are married and living with their spouses and 3,276 are cohabiting. From these, 18,005 females are matched with their male or female partners (they currently live with them). From this 17,871 opposite sex partnerships form the basis from which sample 2 is extracted. Within the survey behavioural questions are not asked by proxy, which reduces the sample available to 15,557 females and 13,464 males. Similarly use of the housework question reduces the sample further, with patterns of missing between partners resulting in a final sample size of 3,002 couples. To control for individual probability of being sampled, individual probability weights for the females with which male partners are living are used in all models using the couple data.

The dependent variable used in this study is daily rubbish separation (n=2,259 individuals, n=2,954 couples). Using a four point likert scale, where (1) always (2) usually (3) sometimes and (4) never, people are asked, "Do you separate your household rubbish into items that can be recycled through your normal rubbish collection?" This is a household level measurement which for both household types over 70% of respondents indicated (1) always. The heavily skewed distribution of this variable therefore makes it appropriate for conversion into binary format for analysis purposes such that (1) always (0) usually/sometimes/never. A

small number of respondents either answered 'don't know' or spontaneously indicated that they had 'no recycling facility through normal household collection' and these are dropped from further analysis.

Two independent variables are used. The first is housework hours ($n=2,312$ individuals, $n=3,002$ couples). All household respondents are asked, 'About how many hours do you spend on housework in an average week, such as time spent cooking, cleaning and doing the laundry?' The important point to note in the use of this variable is that childcare is not included in the operationalization of housework although indirectly the presence of children in the household will increase the volume of shopping, laundry, cleaning and tidying. For individuals living alone the mean number of housework hours is 10.25 hours per week with 75% of people doing between 5 and 14 hours. For people living independently housework hours are used as an absolute measure in its continuous form. For couples the mean is calculated from the sum of both male and female housework hours and is nearly 22 hours per week (std dev 12.56) with 75% of couples spending between 13 and 28 hours on housework. For couples two variables are constructed. The first is an absolute measure of total combined housework hours derived from the sum of the female and male partner's average weekly hours. This is used to initially to test the association with waste separation according to H_{01} but also as a control for variation between couples in terms of the number of hours spent when testing H_{02} . The second variable used is a relative measure of housework within the partnership to distinguish between couples in which the male, female or both do more housework. This is used to directly test H_{02} for couples. This measure is derived from total combined housework hours in the form of a dummy variable which distinguishes between three couple types (table 1).

A. Female and male partner do equal amounts of housework	197
B. Male partner does majority of housework	459
C. Female partner does majority of housework	2,346
N	3,002

Couple type A, are those in which the female and her male partner do equal amounts of housework between them (7% couples). Type B, are those in which the male partner does the majority of housework (15% couples). Couple type C (which is used as the reference category) those in which the female does the majority of housework (78%). This distribution, although consistent with studies that suggest in more coupled households women do more of the housework, it also supports the view that men are contributing (Bianchi et al 2000, Sullivan 2000, Gershany & Robinson 1988). In nearly a quarter of couples (22%) men actually do more or as much housework as their female partners. The second independent variable used is gender (n=2,312 individuals) which is used in the analysis of single occupied households only. Because sample 2 is constructed by matching females with their male partners there is no variable representing gender but housework hours are identified as gender specific.

In order to observe whether men and women are equally as likely to separate their waste for recycling if they do more housework a number of controls are used in the modelling which are known to confound this relationship. These are size of home, employment, age, education, marital status, parenthood and income (Bianchi et al 2000, Sullivan 2000, Coverman 1985). These are also used as controls for modelling the couple data since these are also likely to moderate the number of total hours spent on housework. Controls are also used for situational factors that are known to cause variation in recycling practices in general

between individual households. These are home ownership, household size and country of residency (Vining & Ebreo 1990, Oskamp, Harrington, Edwards, Sherwood, Okuda & Swanson 1991). The number of bedrooms in the property is used as a control for property size since this not only influences the amount of housework required it also is likely to have some impact on storage space available for recyclables (n=2,311 individuals, n=2,999 couples). In sample 1 (single occupants) 40% live in houses with 2 or more bedrooms and more females (43%) than males (35%). Within sample 2 (couples) 76% live in a property with more than 2 bedrooms. With respect to home ownership (n=2,305 individuals, n=2,995 couples), in single occupant household 50% of individuals own their own homes and 50% rent or other. In partnered households more than 75% live in properties that they own. For both single occupant and couples, variables are constructed to represent job status (n=2,311 individuals, n=3,002 couples). Within single occupant households a dummy variable is used distinguishing between (1) those who work either full time or part time, (2) those who are retired (3) those unemployed and (4) other which represents people in full time education, long term sick or disabled, on maternity leave, government training scheme, unpaid worker in family business or doing something else. In single occupant households 40% of individuals have a job (either full time or part time). 35% are retired and 8% unemployed. The remaining 17% are classified as 'other'. For couples a combined measure for job status is derived in order to control for differences between couples such that (1) neither partner works (25%) (2) Female only works (7%) (3) Male only works (18%) (4) Both partners work (50%). With respect to parenting a variable is used to represent the number of children in the household under the age of 16 (n=2,312 individuals, n=3,002 couples). In single occupied households, 82% of people do not have children living with them, 10% have 1 child and 8% have 2 children or more. For couples 60% have no children, 16% 1 child and 24% have 2 children or more. A binary variable is also

used to represent whether couples have either children over the age of 16 or other adults living with them (n=3,002). 22% of couples have either older children or adults living with them. Country of residency is used to control for differences between countries in the UK in terms of policy and provision of kerbside recycling (n=2,305 individuals, n=3,002 couples). This is used in the form of a dummy variable where (1) England (2) Wales (3) Scotland (4) Northern Ireland. For single occupant households age is used as a continuous measure in its standardised form (n=2,312 individuals, N=3,002 couples). The mean age is high (53.52 years, std. dev.19.65) with 75% of the sample between 37 and 70 years of age. For couples a single measure is derived in the form of the mean age of the couple and this is again used in its standardised form. The mean age for couples is lower (48.14 years, std. dev. 15.41) with 75% of the sample between 35 and 65. For both samples a variable is used to distinguish between those who are educated to degree level (n=2,311 individuals, n=3,002 couples). In single occupant households 17% have degrees. For couples a combined measure of education is derived such that (1) neither partner has degree (67%) (2) Female only has degree (9%) (3) Male only has degree (10%) (4) Both partners have degree (14%). With respect to income, a variable is derived from monthly gross equivalised household income to distinguish between households whose total income is below 60% of the mean (n=2,310 individuals (n=2,999 couples). For single occupied households, 37% of individuals are classified as being on low income. This rather high figure is probably due to sample 1 being over-representative of single parent families. For couples 22% are classified as being on low income. For couples only a dummy variable is constructed for marital status. 81% of couples are married (n=3,002). Finally the question on waste separation is answered by only one representative of the household, exposing results to unobserved variation according to who answered the question. This is accounted for by including a dummy variable as a control when modelling

couple behaviour, representing whether the female or male partner responded to this question on behalf of the household (n=3,002).

3.0 Results

In terms of frequency of waste separation behaviour, coupled households are more likely to separate their waste for recycling (79%) compared to people living alone (65%), (figure 1).

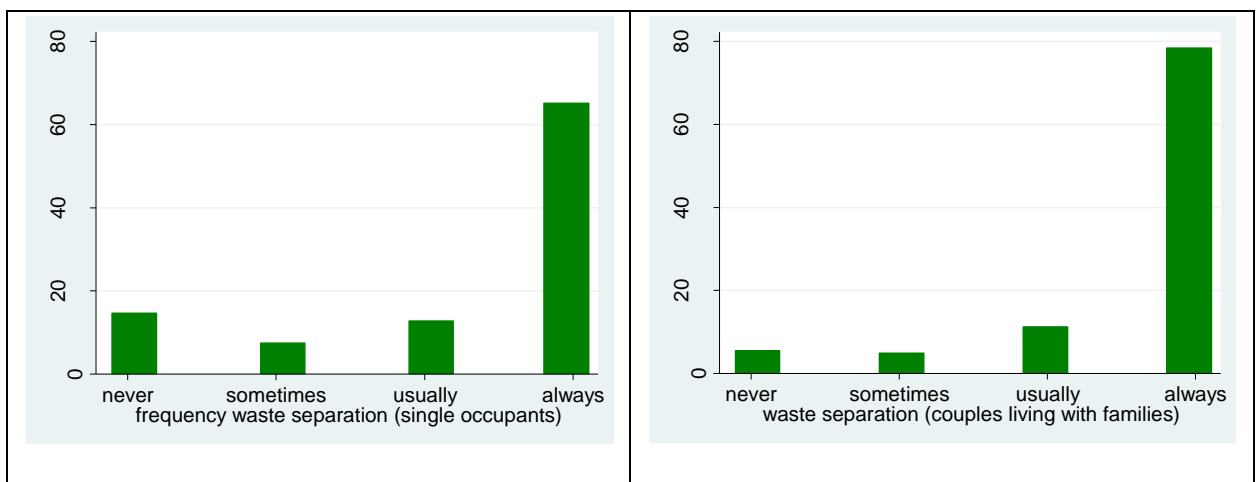


Figure 1 – Marginal distribution of waste separation behaviour (comparing males and females living independently and females cohabiting with male partners)

Within single occupant households, where waste separation is independently measured for men and women, more households run by women (69%) separate their waste compared to those run by men (58%).

Table 2

Examination of the relationship between housework and waste separation

	Individuals living independently	Opposite sex partners living together
Housework hours	0.0184** (0.0063)	0.0097* (0.0044)
N	2235	2926

An examination of the bivariate relationship between waste separation and housework hours (table 2) reveals that for individuals living independently a one hour increase in housework has a mildly positive effect upon waste separation. Similarly, for couples living together, a one hour increase in combined housework also has a moderate but positive effect. A Wald test for independence confirms that for both individuals and couples this relationship is not independent (individuals: $X^2 = 8.45$, $df=1$, $p>0.0036$, couples: $X^2 = 4.86$, $df=1$, $p>0.0275$). This provides some initial evidence to suggest H_{01} should be rejected.

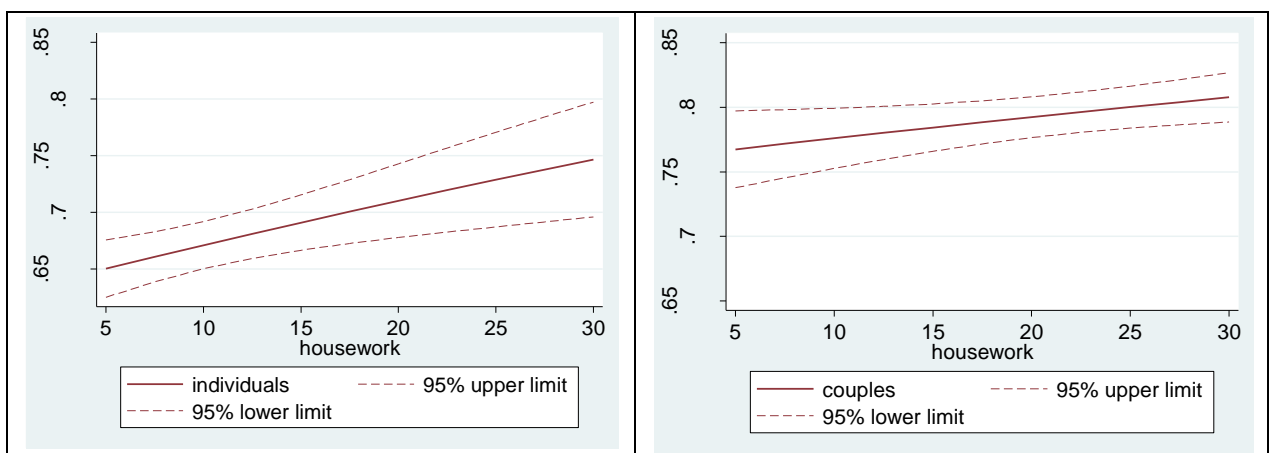


Figure 2 – Association between waste separation and housework (comparing men/women living independently with women cohabiting with male partners)

For comparative purposes predicted probabilities are estimated at values between 5 and 30 hours (figure 2). 75% of people living independently do between 5 and 14 hours of housework and for couples 75% do between 13 and 28 hours per week. Subsequently estimations are slightly more reliable for individuals at the lower end of the distribution and for couples at the higher end. Interesting although couples are more likely to separate their waste, for individuals living independently the association with housework is slightly stronger with a discrete change in housework from 5 to 25 hours producing an 8% overall increase in

the probability of waste separation. This compares to only a 3% increase for couples living together.

Table 3

Ordered logistic regression comparing the log odds of a 1 hour increase in housework hours on the probability of waste separation for men and women living in single occupant households.

	Model 1 (log odds)	Model 2 (log odds)
Main Effects		
Female	0.488** (0.10)	0.356** (0.110)
Housework	0.013* (0.01)	0.016* (0.007)
Children	-	-0.002 (0.108)
Home Ownership	-	0.105 (0.124)
Size of Home	-	0.338** (0.065)
Country (ref England)	-	-
Wales	-	0.002 (0.261)
Scotland	-	-0.914** (0.164)
Northern Ireland	-	0.257 (0.212)
Age (std)	-	0.821* (0.322)
Age2 (std)	-	-0.479 (0.341)
Has Degree	-	0.302* (0.152)
Low income	-	-0.124 (0.127)
Job Status (ref employed)	-	-
Unemployed	-	-0.461* (0.213)
Retired	-	0.135 (0.203)
Other	-	-0.011 (0.176)
Interacted Effects		
Female	0.714** (0.161)	0.454** (0.169)
Housework	0.033** (0.025)	0.025* (0.013)
Female x Housework	-0.028* (0.014)	-0.012 (0.015)
N	2,235	2,224

*denotes significant at 95% level confidence ** significant at 99% level confidence, robust standard errors in brackets

Table 3 examines the relationship between housework, waste separation and gender, for men and women living separately in single occupant households. Model 1 presents the direct effects of housework on waste separation as well as the interacted effects between gender and housework without controlling for situational and personal factors. It shows that the direct relationships between gender and waste separation and housework and waste

separation are significant. Converting the log odds to odds ratios suggests that women living alone are 1.61 times more likely to sort and separate their waste materials than men. This finding supports and adds to other empirical research studies that find women are more likely to engage in recycling related behaviours than men (Hunter, Hatch & Johnson 2004, Tindall, Davies & Mauboule 2003, McStay and Dunlap 1983). The relationship between waste separation behaviour and housework is modest in comparison with a 1 hour increase in housework increases the odds of waste separation by 1.01. This does, however, provide further support to suggest H_{01} should be rejected.

Estimating and plotting the discrete change in predicted probabilities from the main effects of housework hours from model 1 for men and women further suggests there is a significant gender difference for values of housework between 0 to 28 housework hours (figure 3).

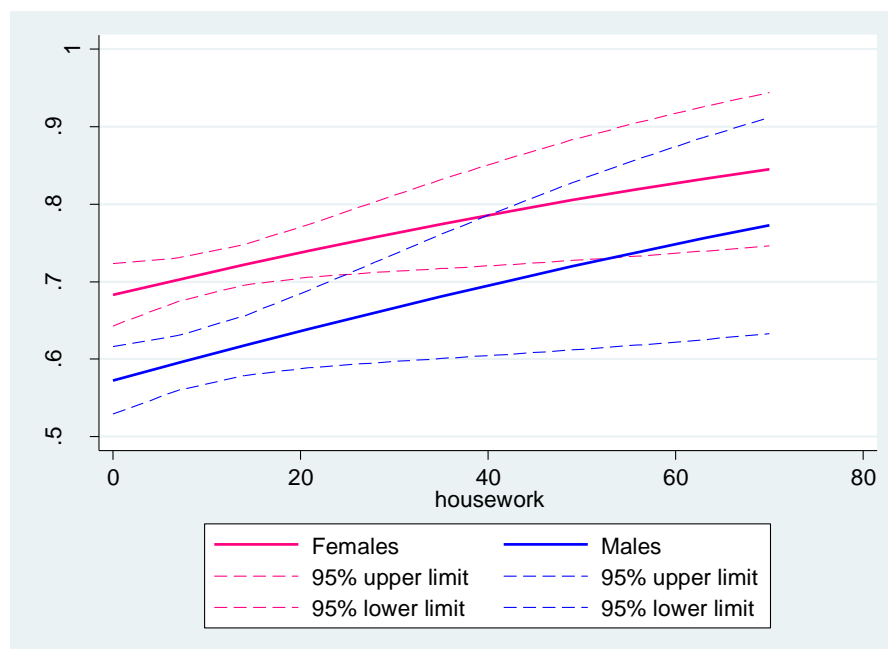


Figure 3 – Association between household waste separation and housework (comparing men and women living independently)

Testing these effects further by way of inclusion of an interaction term, between gender and housework hours, (table 3, model 1) further supports this finding. An increase in housework hours has a significantly different effect upon men and women and the negative value of the interaction term suggests the effect is larger for men. Computing gender differences in terms of discrete changes in predicted probabilities from the interacted effects in accordance with Scott Long & Freese (2006) and Xu & Long (2005) shows that for both men and women an increase in housework hours increases their probability of waste separation (table 4).

Table 4
Differences in predicted probabilities of waste separation for men and women (derived from interacted effects of gender and housework hours (model 1))

Average Hours/Week	Predicted Probability		Difference	95% CI (difference)
	Females	Males		
5	71%	57%	13%	[8.09, 18.25]
10	71%	61%	10%	[5.24, 14.28]
15	72%	65%	7%	[0.61, 12.36]
20	72%	69%	3%	[-4.53, 11.33]
25	73%	72%	1%	[-9.46, 10.53]

For men, however, this is a much larger effect. An increase from 5 to 25 hours housework increases their probability of waste separation by 15% compared to only a 2% increase for women. This difference is illustrated in figure 4 which clearly suggests housework hours are differently associated with waste separation behaviour for men compared to women.

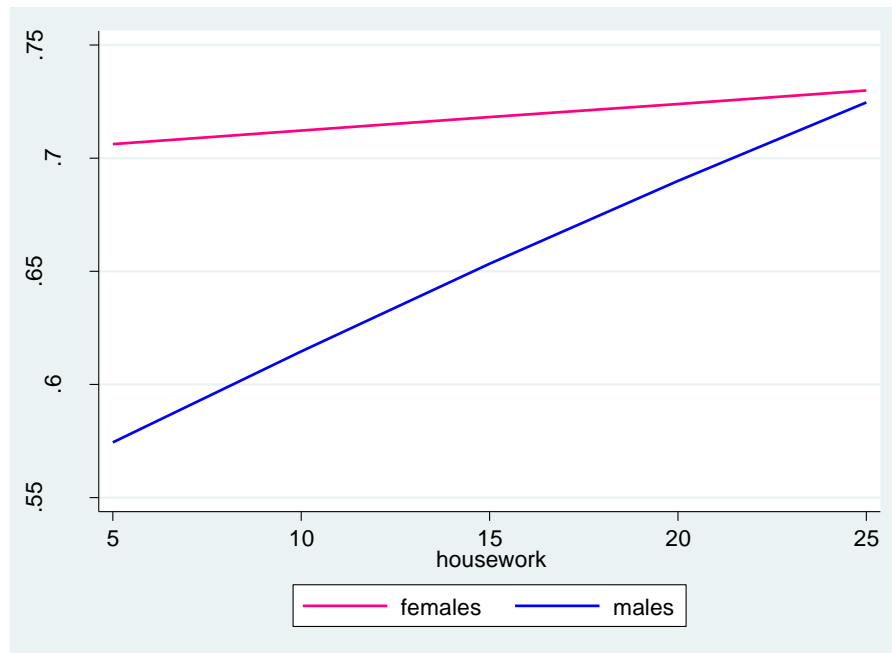


Figure 4 - Discrete change in conditional predicted probability of waste separation from 5 to 25 hours of housework (comparing males and females living independently)

This is an interesting finding since it contradicts the theory that women are more likely than men to assimilate waste separation into their normal domestic routines (Oates & McDonald, 2006). It also suggests H_{02} should be rejected. In order to ascertain whether the gender difference is significant across all values of housework hours the discrete change in the differences in predicted probabilities between males and females are plotted along with confidence intervals derived using the delta method (Zu & Long Scott, 2005) (figure 5).

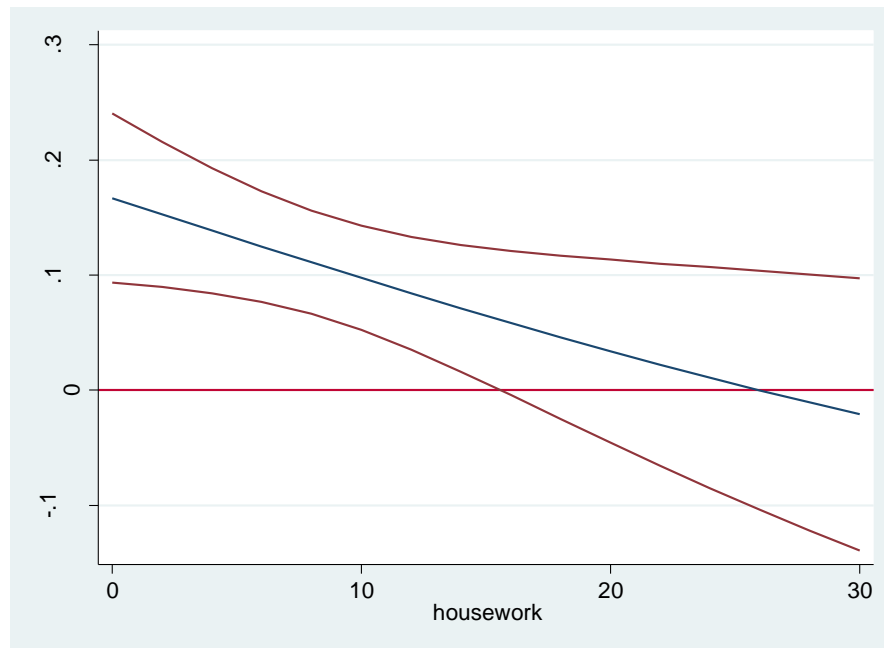


Figure 5 – Difference in predicted probability of waste separation between men and women living independently at discrete values of housework hours

What is observed is that at values of housework hours between 0 and approximately 16 hours the 95% confidence intervals for the discrete change in probability differences for men and women remain above 0 and are considered to be statistically significant (UCLA, 2012, Xu & Long, 2005). Although this provides further evidence to suggest H_{02} should be rejected, model 1 does not control for other factors which might moderate men and women's behaviour differently. In single occupant households, more women than men are likely to be single parents with children to look after and although childcare duties are not included in the operationalization of housework in this study, having children in the household adds to other domestic tasks, especially if single mothers still live in the ex-marital home. Table 3, model 2 presents the independent effects of housework hours and gender on waste separation behaviour when controlling for other personal and situational factors. What it shows is by adding the controls, the size of the effects of gender are reduced, whilst the size of the effects for housework hours are very slightly increased. Plotting the direct effects of housework

hours on waste separation behaviour separately for men and women from model 2, along with confidence intervals calculated using the delta method (Zu & Long, 2005) (figure 6) shows that the confidence intervals overlap at all values of housework hours, suggestive that this relationship is no longer significantly different for men and women when other factors are incorporated into the model. When the interaction between housework hours and gender is included, the interaction term itself is still negative but no longer significant.

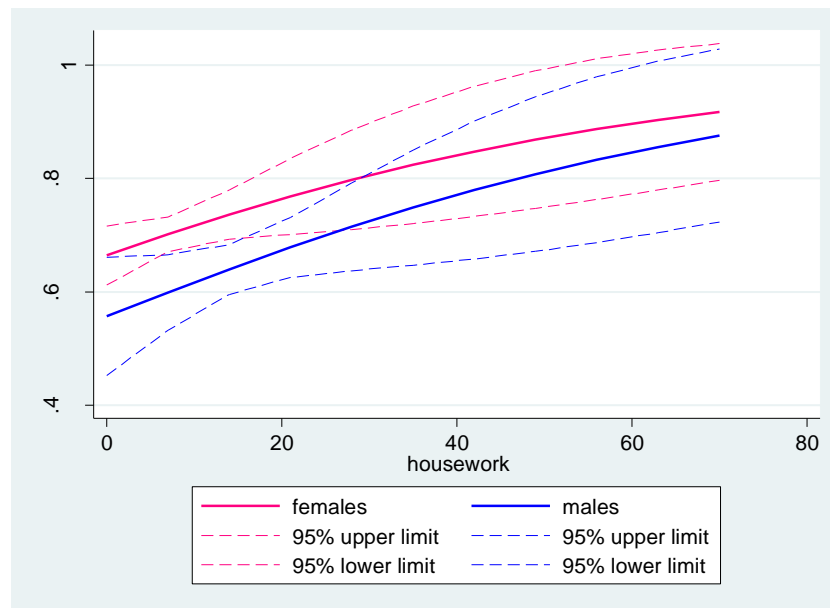


Figure 6 – Association between household waste separation and housework (comparing men and women living independently) controlling for personal and situational effects

Exploring this relationship further by comparing differences in the discrete change in estimated predicted probabilities from model 2 for the interacted effects of gender and housework hours (table 5) suggests that there are still significant gender differences between the effects of housework hours on waste separation between 0 and 20 hours of housework.

Table 5
 Predicted Probabilities from interacted effects of Model 2 (with controls)

Average Hours/Week	Predicted Probability		Difference	95% CI (difference)
	Females	Males		
5	70%	61%	8%	[8.09, 18.25]
10	71%	64%	8%	[3.19, 12.90]
15	72%	66%	7%	[2.53, 12.35]
20	74%	69%	6%	[0.35, 12.17]
25	75%	72%	3%	[-7.37, 13.91]

Interestingly, however, the effects of housework hours on the predicted probability of waste separation have reduced for men from 15% to 11%. In contrast for women adding the controls into the model increases the effects of housework hours on waste separation from 2% to 5%. This provides further support for the rejection of H_{02} in that the association between waste separation and housework is different for men and women. Interestingly, the directional difference in the moderating effect of the controls suggests that like women, waste separation behaviour in men may be similarly constrained by other demands on their domestic time.

Table 6

Ordered logistic regression comparing the log odds of a 1 hour increase in housework hours on the probability of waste separation for women living with their male partners

	Model 3 (log odds)	Model 4 (log odds)
Female housework (hours)	0.011* (0.005)	
Partner housework (hours)	0.008 (0.007)	
Combined Housework Hours	-	0.009* (0.005)
Share of Housework (ref female does more)		
Partner does more		0.014 (0.143)
Both do same amount		-0.059 (0.204)
Children	-	0.017 (0.063)
Other Adults	-	0.013 (0.133)
Home Ownership	-	0.704** (0.133)
Size of Home	-	0.0672 (0.073)
Country (ref England)	-	
Wales	-	-0.089 (0.237)
Scotland	-	-0.181 (0.182)
Northern Ireland	-	0.109 (0.193)
Low income	-	-0.313* (0.142)
Married	-	-0.031 (0.132)
Average Age Couple (std)	-	0.421** (0.082)
Education (ref neither have degree)	-	
Female degree	-	0.375* (0.177)
Partner degree	-	0.305 (0.193)
Both degree	-	0.402* (0.157)
Couple job status (ref neither)	-	
Female only has job	-	-0.406* (0.214)
Partner only has job	-	-0.396* (0.191)
Both have job	-	-0.412* (0.177)
Female Answer	0.1225 (0.974)	0.030 (0.101)
Interacted Effects		
Combined housework Hours	-	0.011* (0.005)
Share of Housework (ref female does more)		
Partner does more	-	-0.022 (0.254)
Both do same amount	-	0.626 (0.435)
Partner does more x combined	-	0.002 (0.011)
Both do same x combined	-	-0.035* (0.018)
N	2,926	2,917

*denotes significant at 95% level confidence ** significant at 99% level confidence, robust standard errors in brackets

Table 6 presents two models which examine the relationship between housework hours and waste separation behaviour for married or cohabiting couples living with their families. Model 3 looks at the independent effects of men and women's independent housework hours on waste separation and suggests for coupled households there is a weak relationship, significant only for female hours. Figure 7 plots the discrete change in predicted probabilities of waste separation at values between 5 to 25 hours of housework in separate graphs for females and males.

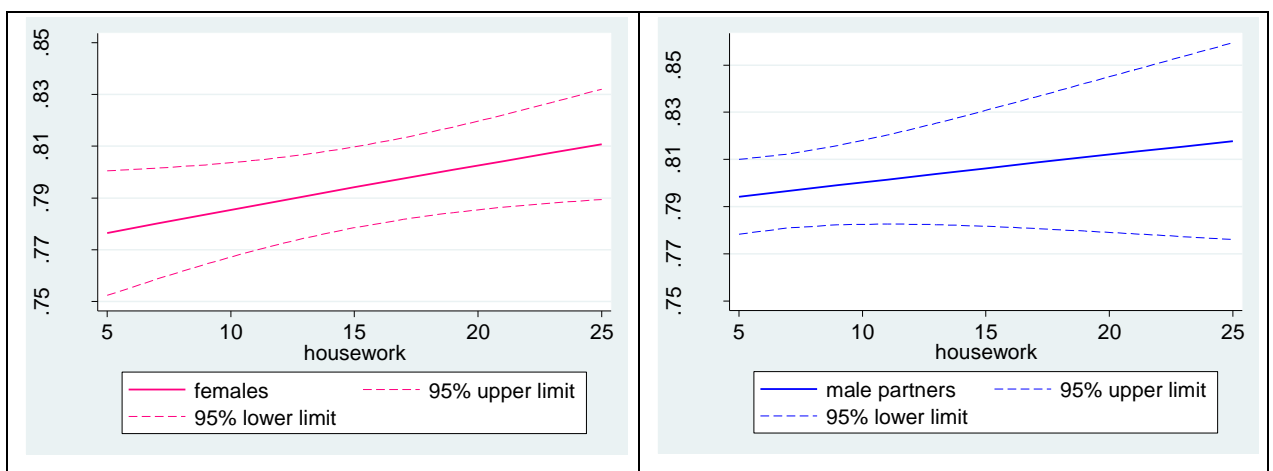


Figure 7 – Association between household waste separation and housework (comparing effects of housework hours for females and their male partners)

In contrast with earlier findings there appears to be only a very small difference in the rate at which waste separation increases with housework hours. In fact the discrete change in predicted probabilities for men and women is very similar, slightly higher for women (3.5%) than for men (2.4%).

Table 7 Predicted Probabilities from Model 3

Average hours/week	Predicted Probability [95% confidence intervals]	
	Females	Males
5	78% [75.23, 80.05]	79% [77.84, 81.00]
10	78% [76.72, 80.36]	80% [78.26, 81.80]
15	79% [77.85, 80.97]	80% [78.17, 83.08]
20	80% [78.55, 81.97]	81% [77.91, 84.51]
25	81% [78.94, 83.21]	82% [77.61, 85.94]

Comparing the estimated average predicted probabilities across all discrete values of housework hours (table 7) shows that at all values of housework hours the predicted probabilities are very similar. The probability of separating waste for men at lower values of housework hours is modestly higher than that for women (80% probability at 10 hours for men, compared to 78% probability for women). However, confidence intervals overlap which suggests any slight differences are not reliable enough to reject H_{02} . In contrast to males and females living separately there appears to be no significant differences between the effects of housework hours on waste separation behaviour for men and women who live with their opposite sex partners. H_{02} is therefore accepted.

Model 4 suggests that when controlling for other situational and personal factors, the effects of total combined housework on waste separation remain significant providing further support for the rejection of H_{01} . With respect to whether waste separation behaviour is dependent upon who in the partnership does the majority of housework model 4 (table 6) suggests there are no significant differences. Partnered households are as likely to separate waste materials for recycling if the male or female does the majority of housework or if the housework is equally shared within the partnership. This relationship is further explored by including an interaction between combined housework hours and couple type to see if this relationship changes according to how much time is set aside for housework within the

partnership. What the coefficients for the interaction term in model 4 (table 6) suggest is that an increase in housework hours has a significantly different effect on couples in which the female and male do equal amounts of housework compared to couples in which the female does more. This is further examined in Table 8 which shows the estimated probabilities of waste separation for each of the three couple types at 5 discrete values of housework hours.

Table 8

Predicted Probabilities from Model 4 (interacted model) showing discrete change in predicted probability of waste separation behaviour as total combined housework hours increases for partnerships in which (a) female and male share housework (b) female does more than male (c) male does more than female (reference category)

Average Hours/Week	Equal Hours	Female does more	Partner does more
5	84.81% [73.93, 91.66]	78.03% [74.37, 81.30]	77.85% [7074, 83.63]
10	83.23% [74.27, 89.51]	78.96% [76.13, 81.54]	78.97% [7338, 83.65]
15	81.52% [74.04, 87.21]	79.87% [77.66, 81.91]	80.05% [7544, 83.98]
20	79.68% [72.76, 85.20]	80.74% [78.89, 82.48]	81.09% [7679, 84.76]
25	77.70% [69.87, 83.96]	81.59% [79.72, 83.32]	82.09% [7745, 85.95]

What it shows is that a change in combined housework hours from 5 to 25 hours decreases the probability of waste separation for a couple who share the housework by 7%. In contrast for couples in which the female does more housework, the probability increases by 3.5% whilst the probability for couples in which the male does the majority of housework increases by 4.24%. Whilst the general trend appears to support findings for men and women living alone, with stronger association being when men are in charge of the housework, the differences are unlikely to be significant. Confidence intervals between the predicted probabilities for each couple type at all discrete values of housework hours overlap which means H_{02} cannot be reliably rejected. Interestingly at lower values of combined housework hours (5 to 15 hours per week), couples who share the housework have a higher predicted probability of waste separation than either of the other two couple types. This suggests that

contribution to housework may be an important determinant of waste separation when men and women cohabit but only for couples who less than 18 hours of housework per week.

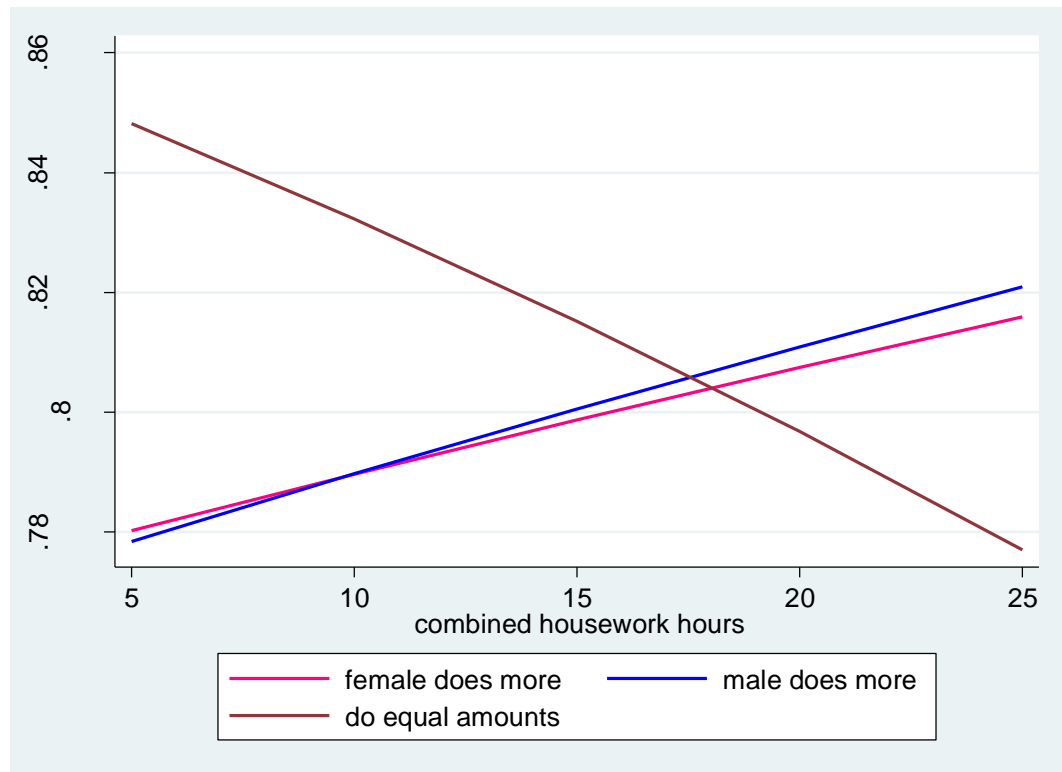


Figure 8 - Discrete change in conditional predicted probability of waste separation from 5 to 25 hours of housework (comparing couples in which female does more housework, males does more and couples who do equal amounts)

Figure 8 illustrates these overall effects, showing the differences in the effects of an increase in combined housework hours on the probability of waste separation for the three couple types. What it illustrates is that couples who share the housework have a higher predicted probability of waste separation which decreases as the number of housework hours they do between them increases. Whilst the overlap in confidence intervals between couple types in table 8 suggests these predictions should not be relied upon as statistically significant and H_{02} should be accepted, they certainly do not provide evidence to suggest that women

living with their male partners are more likely to assimilate waste separation into domestic routines which they manage, in fact again the opposite is almost implied.

4.0 Discussion

The distribution of housework hours in this study provides support for other studies which have found that housework hours vary between men and women who live alone and those who cohabit (Gupta 1999, Shelton 1992). Women living alone spend on average almost 12 hours per week on housework compared to 8 hours for men (figure 9).

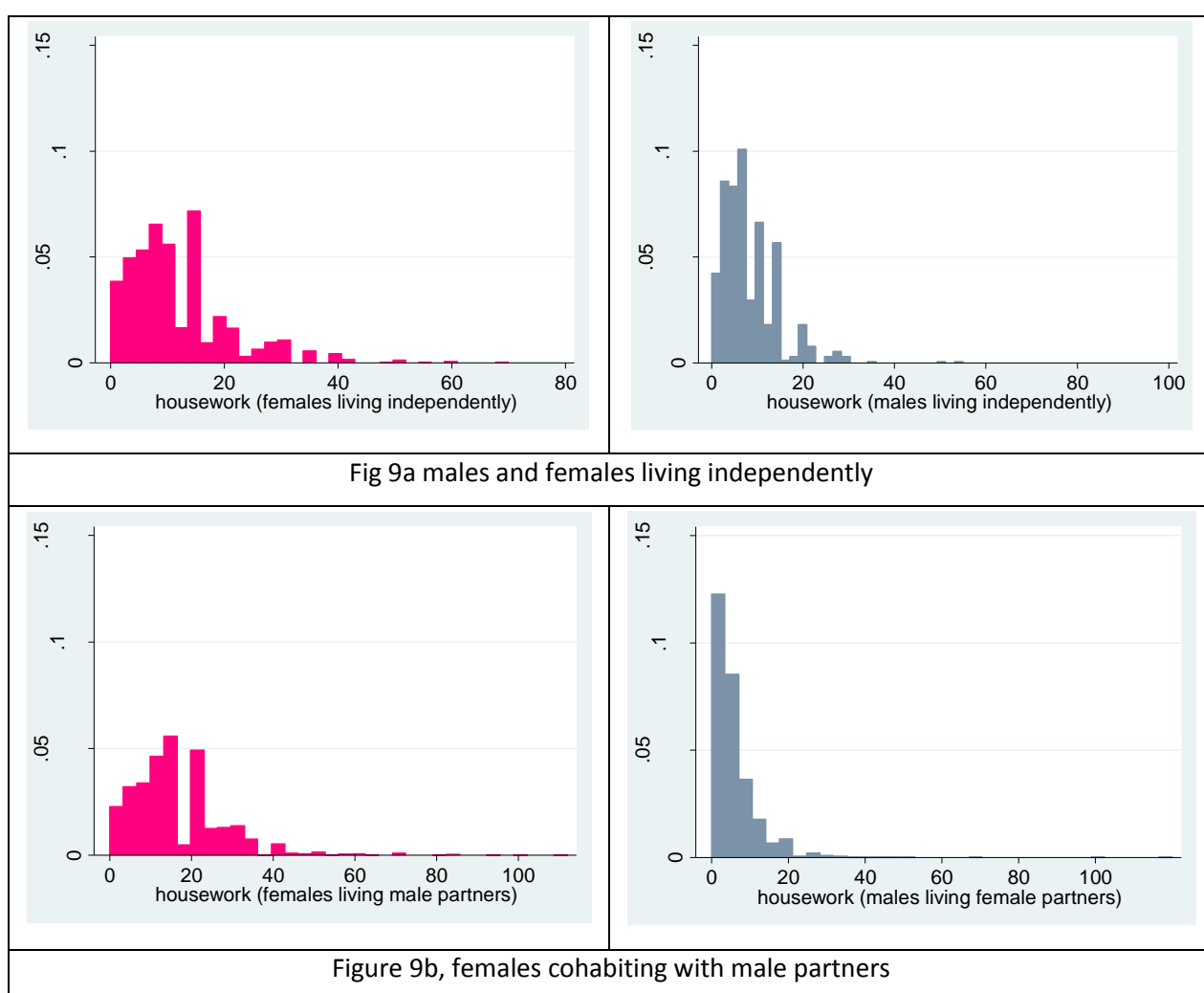


Figure 9 – Marginal distribution of weekly housework hours

In contrast females living with a male partner, spend on average 16 hours per week compared to 6 hours for their male partners. With respect to men and women living independently both H_{01} and H_{02} are rejected. There is a fairly modest but significant association between housework and waste separation. Although women living independently are 1.45 times more likely than men to separate their waste materials for recycling, this behaviour is also significantly less likely to be strongly associated with their normal domestic routines than men. For men a 20 hour increase in housework increases their probability of daily waste separation by 15% compared to only 3% for women and this discrete change is only very slightly moderated by the inclusion of the controls in the modelling. One possible explanation offered relates to the possibility of compositional differences in housework. Men may prioritise housework tasks differently to women, spending less time tidying and cleaning and more time on activities which directly generate waste for sorting and separating such as shopping, food preparation, cooking and washing up (which research suggests generates up to 60% of household waste). Differences between men and women not only in terms of the amount of housework but the types of housework have been observed and discussed within the broader literature for the last 20 years (Nordenmark & Nyman 2003, Sullivan 2000 Ferree 1991, Robinson & Godbey 1997, Gray, 1992). Although much of the research on domestic labour has been conducted with married couples, figures suggest that men are increasing the amount of time they spend doing all types of housework (Sullivan 2000). Most noticeably of relevance to this study, between 1975 and 1997 the time spent cooking and cleaning dramatically increased for men and decreased for women (Sullivan, 2000).

With respect to men and women living together as partners H_{01} is also rejected. There is a modest but significant association between the combined domestic housework hours of

men and women and waste separation behaviour. Couples who between them do more housework also do more waste separation. However, in comparing couple types, although there appears to be a very modest underlying trend which suggests the association between waste separation and housework varies according to the distribution of domestic labour within the partnership, differences are small and not significantly reliable to reject H_0 . Interestingly couples who share the domestic role are more likely to separate their waste at lower values of combined housework hours only. The association is also negative such that couples who between them share more housework do less waste separation. One possible explanation draws similarly on the idea of compositional differences in housework, but between couples also. In general people have been observed to prioritise certain domestic activities including food related practices such as shopping, cooking and washing up (Bianchi et al 2000, Sullivan 2000). These acts are likely to generate a high proportion of current kerbside domestic recyclable waste, which generally tend to offer ease and convenience to households wishing to recycle basic materials such as paper, cardboard, food waste and glass of which a great deal is generated in the kitchen. This is important because it suggests that kerbside collection could be a particular incentive to some households. My findings suggest these are not only couples who spend less time doing housework but also men living alone. A different explanation for the negative association for couples who share the housework can be drawn from the relative resources framework (Khan 2008). Couples who share the housework may be more evenly matched in their bargaining power and between them less willing to incorporate waste separation when the household generates more domestic work.

The idea that some recycling practices are likely to be assimilated into weekly domestic routine, put forward by Oates & McDonald (2006) and Barr & Gilg (2006) is generally

supported by this research. However, indications are that some housework tasks are likely to be more strongly associated than others. In this study, for two different household types (men and women living separately and living as partners with or without their families) a modest but significant association is observed between waste separation and housework. Guagnano et al (1995) and Derksen & Gartrell (1993) conclude in their studies that there are significant personal time costs to participating in recycling schemes and findings from this study not only support this idea but add weight to the conceptualisation of this time as non-paid domestic labour. Although local authorities are continuing to provide significantly improved infrastructure to make collection easier, my findings suggest that requiring clean, sorted materials adds to the domestic burden of the household. This is an important relationship to consider given households are on average spending less time on domestic labour and whilst there is some significant variation in this across the population, adding chores to the domestic burden is likely to be a further barrier to recycling for many household types. Working full time, having young children, being younger, owning your own home all affect the propensity to do housework (Bianchi et al 2000) and it could by association this also affects the propensity to sort and separate waste materials. As Elizabeth Shove (2009:17) points out 'time is a scarce resource that practices consume'. Bianchi et al (2000) find evidence in their study to suggest there is an overall de-investment in domestic labour in the USA, which they suggest can be attributed partly to replacement technology. Between 2005 and 2009 the number of households who owned dishwashers in the UK increased by 3.5% to over 36% of households (Mintel 2010). Although this suggests the majority of households still wash-up by hand, it also suggests a growing number of households are changing their practices. Asking people to wash out plastics and rinse bottles in order to prepare materials further towards recycling may be yet another barrier to household participation. In her

ethnographic study into recycling plastics McDonald (2006) observes an entirely local interpretation of what is recyclable based upon ease and convenience to the household with containers that were difficult to clean, contained sticky contents or difficult to remove lids being automatically discarded for landfill.

The notion also put forward by Oates & McDonald (2006) that women are more likely to assimilate waste separation into their weekly domestic routines cannot be supported by findings in this research, although it does support the idea that when men and women independently manage a household, waste separation is more likely in the female managed home. In their study Martin et al (2006) distinguish between what they call full recyclers, casual recyclers and non-recyclers. Even within the same local authority they find that less than one third of households (27%) recycle all five materials collected at kerbside. 55% of households recycle less than five and 17.5% nothing at all. Siegle (2006:21) similarly distinguishes between committed recyclers and what she defines as 'fair weather' recyclers, those who engage only with sorting easy rubbish that requires no rinsing and cleaning and can be put out directly for collection. Friends of the Earth (2010) suggest that in excess of 80% of total household waste is recyclable. This includes many materials not currently collected directly by kerbside schemes including textiles, clothing, wood, metal, batteries and electrical equipment. Whilst the data available for this study does not enable a distinction to be made in terms of what materials are recycled, it could be that women are more likely to be committed recyclers and sort and separate many other types of materials not directly associated with housework. With respect to couples, regardless of who is likely to be 'in charge' of the housework, the frequency of waste separation for the household is not significantly affected. Because waste separation is measured at the household level and

subsequently reported the same for everybody living in the household no further conclusions can reliably be made. However, some research suggests that women often maintain responsibility for a task even though their male partner is contributing (Gray 1992, Windebank 2001) so it could be that as Oates & McDonald (2006) suggest, women play a more dominant role in waste separation practices in multi-occupant households. What is certainly required is a much more detailed study of waste separation and recycling practices within larger, multi-occupant households to determine how responsibility is allocated, how tasks are performed and the extent to which all household members are actively involved in this sustainable practice.

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