

An examination of determinants influencing the desire for and frequency of part-day and whole-day homeworking

Hebba Haddad, Glenn Lyons and Kiron Chatterjee

Centre for Transport & Society

University of the West of England, Bristol

Frenchay Campus

Coldharbour Lane

Bristol BS16 1QY

Corresponding author

Hebba Haddad

Centre for Transport & Society

University of the West of England, Bristol

Frenchay Campus

Coldharbour Lane

Bristol BS16 1QY

Hebba.Haddad@uwe.ac.uk

Phone: 0117 32 82316

Fax: 0117 32 83899

Abstract

This paper presents findings and analysis based upon the third wave of a national longitudinal survey in the UK which is examining part-day homeworking and comparing it with whole day homeworking. Survey results confirm earlier findings that there is a higher incidence, amongst full-time paid employees, of part-day homeworking than whole-day homeworking. The paper then separately examines determinants of the desire to part-day homework and whole day homework and determinants of the reported frequency of part-day homeworking and whole day homeworking. The determinants considered are socio-demographic characteristics of the respondents and belief statements relating to homeworking. Four statements are found to be relevant to desire to part-day and to whole-day homework: avoiding interruptions at work; avoiding wasted time in traffic; other household members appreciating the employee homeworking; and working longer hours. A similar comparison concerning actual frequency of homeworking finds that employer support is relevant for both homeworking practices, with part-day homeworking being associated with avoiding interruptions at work and whole day homeworking frequency also being associated with commute struggle. For both forms of working practice, the belief statements are better able to explain desire to homework (more) than to explain frequency of homeworking. This is perhaps not surprising given the variability of work patterns at the level of the individual that can occur from week-to-week. The better performance of desire models for whole day homeworking compared to those for part-day homeworking suggest that other factors are at play that remain to be identified in future examination of part-day homeworking.

Key words: Teleworking, telecommuting, homeworking, part-day homeworking

1. Introduction

Teleworking has been a field of interest to policymakers and researchers for many years. Such longevity for some has, it seems, brought a sense of avenues of enquiry and possibility having been exhausted. However, representing as it does interactions between social and work practices and work-related travel, the phenomenon of teleworking, the forms it takes and the societal roles it can perform continue to evolve.

Ongoing work by the authors (Lyons et al, 2006; Lyons and Haddad, 2008) is examining a specific form of teleworking, namely part-day occasional homeworking by full-time paid employees, which has hitherto received very little attention. This form of working practice has, arguably, increased in significance with the continuing emergence of a knowledge economy workforce faced with a need for or attraction towards time-space flexibility. The authors' preceding work has shown an apparent higher incidence of part-day homeworking compared to whole-day homeworking amongst full-time paid employees, based on UK data. Part-day homeworking may prove to be an important consideration in relation to transport policy. In contrast to whole-day homeworking where a pair of commute trips is *removed* on a given day, part-day homeworking has the potential for one or both of the commute trips to be *moved* in time (Haddad and Lyons, 2008). The implication is that this may be, or could in future contribute to, spreading of peak period traffic.

VST (varied spatio-temporal) working: Part-day homeworking

In this and earlier papers, part-day homeworking is referred to as *varied spatio-temporal (VST) working* which is defined as being when *at least 30 minutes of continuous work takes place at home and in the usual workplace in any given day.*

‘H’ working is used as a shorthand to refer to whole-day homeworking. Most of the previous (transport) literature has concerned itself with ‘H’ working, with some exceptions considering telecentres (e.g. Bagley and Mokhtarian, 1997). Earlier work by the authors has revealed that the incidence of VST working (part-day homeworking) and the numbers of people VST working is twice as high as for H working (Lyons et al, 2006). Qualitative research has further shown that VST working can be more spontaneous in nature than H working with it enabling adaptations to be made to the working schedule to fit into other activities conducted during the day. It has also been suggested that there can be restorative benefits (Kaplan and Kaplan, 1989; Kaplan, 2001) associated with commuting from work to home on VST working days where the individual leaves the workplace ‘early’ to then continue working at home (Lyons and Haddad, 2008).

Such findings suggest that there may be differences in the factors governing desire/opportunity to VST work and its actual practice compared to those for H work. The purpose of this paper is to explore this suggestion using empirical data from the UK collected in Spring 2007.

The paper is organised as follows. The next section places into context the current study and approach – by way of citing recent relevant literature and drawing upon earlier work (focus groups) within this study which were undertaken to inform the design of the online survey. Section 3 describes the sample and data. Section 4 presents the results and discussions of the analyses. Concluding remarks are provided in Section 5.

2. Background and current research

Previous research into teleworking has examined its societal (macro) level effects such as those on travel, traffic and congestion (e.g. Mokhtarian, 1998; Nilles, 1993; Cairns et al, 2004) and pollution (e.g. Handy and Mokhtarian, 1996; Nilles, 1993). Research has also examined the individual (micro) level aspects of teleworking – such as the determinants and effects of teleworking relating to individuals. Determinants (such as constraints, facilitators and drivers) for individuals to adopt or continue teleworking include their work situation, family life, travel time, commute cost, health, crime avoidance, leisure and independence and ideology (e.g. Mokhtarian and Salomon, 1997; Beasley et al, 2001). These can affect *preference* or desire to telework and/or affect telework *behaviour* itself (Mokhtarian and Salomon, 1997).

We briefly discuss below some of the associated issues of measurement in teleworking research. We then introduce, with reference to relevant literature and to insights gained from focus groups undertaken to inform survey design (Jones and Lyons, 2005), a series of 16 5-point (strongly disagree to strongly agree) Likert-scale belief statements which form the basis for the analysis in this paper.

Measurements of homeworking: preference, choice, opportunity, frequency

In this area of research there exist a variety of ways of measuring the prevalence of teleworking – preference, choice, opportunity, frequency and behaviour. The language used, often to describe the same thing, can be confusing at times, making it a challenge to easily compare previous papers. What is consistent and generally agreed upon, is that there are disparities between *wanting* to telework and *actually* doing so. For example, Mokhtarian and Salomon (1995) found that 88 per cent of their non-representative sample (almost exclusively information workers, and all government

employees) had a desire to telework and only 13 per cent actually did so. Meanwhile, recent figures in the UK suggest that 83 per cent of full-time employees consider it would not be possible for them to work at home (DfT, 2005).

Mokhtarian and Salomon (1996b) discuss various approaches in measuring the dependent variable in the context of telecommuting. Such measurements can be binary: e.g. ‘would/would not like to telework’; or ‘does/does not telework’.

However, other research has adopted discrete measures using ordered data (e.g. Popuri and Bhat, 2003; Walls et al, 2006) – measuring the extent to which a person wants to practice or practices homeworking. Further, when considering behaviour, some researchers have suggested that information on telework frequency captured using a diary instrument and reference week is a more precise and therefore reliable measure of behaviour than that of asking people to recall amounts of teleworking retrospectively (e.g. for the last month) (Popuri and Bhat, 2003; Walls et al, 2006).

This current paper examines desire and behaviour for H and VST working using discrete (scale) measures. Two statements in the survey were used to measure respondents’ desire to H and VST work: “*I would like to work at home (more)*” and “*I would like to have (more) days where I do some work at the workplace and some work at home*”. The latter statement was a new addition to wave three of the survey. The inclusion of ‘(more)’ in the statements is to accommodate those who are already practicing homeworking. It is important to acknowledge that, strictly speaking, the first of these statements does not refer only to H working¹ though it is to this statement which later analysis of desire to H work will refer.

¹ The statement ‘I would like to work at home (more)’ leaves scope for it to be interpreted more broadly by respondents than ‘I would like to have (more) days when I do not travel to the workplace but work solely at home for the full day’. However, in the context of survey design, individuals’ attention was focused, in terms of homeworking, on the distinction between whole day and part day homeworking. Further, the two related belief statements are presented to the respondent on the same screen, thus reinforcing an implied distinction. Nevertheless, the authors concede that some scope

Behaviour, meanwhile, of VST and H working has been measured by number of homeworked days in a defined 5-day reference week.

Organisational factors associated with teleworking

Organisational factors are frequently cited as facilitators, inhibitors and consequences of teleworking. Regardless of many potential organisational benefits – such as higher organisation commitment (Olson, 1987) and increased job satisfaction (Bailyn, 1988) - employees themselves may consider their employment role unsuitable for teleworking (Mokhtarian, 1998; Mokhtarian and Salomon, 1996a). Mokhtarian and colleagues (Mannering and Mokhtarian, 1995; Mokhtarian and Salomon, 1997; Stanek and Mokhtarian, 1998; Bagley and Mokhtarian, 1997) suggest that work-related factors are most predictive of an individual's choice to work remotely. For instance, job suitability affects the *desire* to telecommute as well as the person's *ability* to choose to telework (Mokhtarian and Salomon, 1997). Further, an employer's (lack of) support has repeatedly emerged as an important factor (Mokhtarian and Salomon, 1994, 1995, 1996; Huws et al 1990; Mokhtarian et al 1998). It has long been argued that this is the principal barrier to the growth of teleworking (Olson, 1988).

Two belief statements in the survey were concerned with workplace issues and homeworking: “*My employer is/would be supportive of me working at home*”; and “*Avoiding interruptions from other people at work is a motivation for me to work at home*”. ‘Interruptions’ at work it seems can be both a motivator and constraint to work at home, as the following two focus group quotes illustrate:

remains for the statement to have been ambiguously interpreted by some respondents – for instance in taking the statement to encompass both whole and part-day homeworking.

“You get more done (at home) than you would at work, you’re not physically working (at work) because people are chatting to you”

“It is nice to go into work to speak to other people and communicate, and get the office gossip and interact with everybody else”

Travel factors associated with teleworking

It has been suggested that the daily (car) commute is often perceived to be a ‘struggle’ (e.g. Novaco, 1989; Gatersleben and Uzzell, 2007). With the prospect of teleworking this can be avoided (Mokhtarian and Salomon, 1997). This was something recognised in the focus groups:

“I prefer to work just at home. Drives me mad the traffic”

Conversely it has been suggested that commute removal may actually increase stress for a teleworker as ‘private’ time associated with commuting is lost (Richter, 1990). The commute between home and work has traditionally enabled the transition between roles to occur (Ellison, 1999; Lyons and Chatterjee, 2008; Jain and Lyons, 2008) and thus can be seen to represent positive utility in itself (Redmond and Mokhtarian, 2001). A potential consequence of teleworking and thus arguably a motivating factor is that of residential relocation – notably locating further from the workplace, ‘compensated’ for by the individual undertaking fewer commute trips (Lund and Mokhtarian, 1994; Nilles, 1991).

Seven of our 16 belief statements related to *travel* aspects or impacts of teleworking. Two belief statements have been included to investigate whether the

commute ‘struggle’ is an influence for working at home. These are: “*I find travelling to work a struggle*” and “*I find travelling home from my workplace a struggle*”.

The notion of unnecessary loss of time in traffic is addressed by the statement “*Avoiding the 'wasted' time in traffic is a motivation for me to work at home*”.

Meanwhile two belief statements (“*I appreciate the time I have to myself on my way to work*” and “*I appreciate the time I have to myself on my way home from work*”) allow investigation of a positive perception of commuting². Following the focus group research, it was suggested that some individuals may choose not to work at home for more days per week than they currently do because they welcome their commuting time (Jones and Lyons, 2005):

“I do like going to the studio and having 20-30 minutes travel”

One statement, “*If I (could) work at home others in my home (would) find it helpful to have my car on those days*”, aimed to probe the significance (or not) of car availability and use in the household. A final travel-related statement considers residential relocation influence: “*Homeworking has/would influence(d) how far I live from my workplace*”.

Household related factors associated with teleworking

Homeworking has been found to increase home-work conflict (Baruch and Nicholson, 1997; Standen et al 1999; Golden et al, 2006). Although many teleworkers attempt to develop spatial boundaries between work and home life - such as assigning a

² Distinctions were made in the survey between the commute to and the commute from the workplace to allow examination of possible differential considerations of these in the context of varied spatio-temporal working – though as will later be seen, a significantly different influence of these has not been identified.

dedicated room at home for working - working at home can still blur the boundaries not only for the teleworker but for the family too (Ellison, 1999). Another source of family-related stress is where work time spills over into family time representing difficulties in defining the temporal boundaries within the home (Standen, 2000; Steward, 2000). Meanwhile, teleworking can have the stress-reducing benefits of providing a better working environment than that of the conventional workplace (Baruch and Nicholson, 1997; Mann et al, 2000).

Five of our 16 belief statements related to *household* aspects or impacts of teleworking. Three statements look at household related issues. Two statements “*Working at home can/could conflict with my personal life*” and “*I (would) work longer hours by working at home*” - concern (perceived) potential work-life balance issues. As one of the focus groups participants remarked:

“If there’s nothing else to do I work. I work longer hours than I ever worked before”

The statement “*Other members of my household (would) appreciate me working at home*” aims to further probe the significance of positive or negative interaction between home and work life. Such interaction was an issue highlighted in the focus groups:

“I think that again there is a new generation of working mums with young children coming through that need that flexibility to fit in their day”

“If she’s off school you know the amount of homework that she gets,

and if I happen to be working at home the same day she's expecting to do something on the computer – clash”

Two further beliefs relating to the household are included: *“The cost of travel to/from work is a burden on my household”* and *“Our household has a suitable room to allow me to work at home”*.

Socio-demographic factors

In past research on teleworking it has been found that socio-demographic characteristics are important determinants of preference to telework and teleworking behaviour. Socio-demographic variables that have been found to affect attitudes towards homeworking include the presence of small children, the number of people in the household (Mannering and Mokhtarian, 1995; Mokhtarian and Salmon, 1996b; Iscan and Naktiyok, 2005); education and age (Bagley and Mokhtarian, 1997; Popuri and Bhat, 2003); and income (Popuri and Bhat, 2003; Handy and Mokhtarian, 1996). It has also been suggested that the likelihood of teleworking increases with commute distance (Iscan and Naktiyok, 2005; Helminen and Ristimäki, 2007). Gender has been found to influence the desire to homework and to actually homework (Mokhtarian and Salmon, 1996b, Iscan and Naktiyok, 2005, Walls et al, 2006) – with teleworking generally being more attractive to females (though evidence is mixed concerning the role of gender in actual homeworking adoption). Teleworking provides work flexibility and this is seen to be particularly attractive to females (e.g. Mokhtarian, Bagley and Salomon, 1998; Mokhtarian and Salomon, 1996; Handy and Mokhtarian 1996; Beasley et al 2001; Iscan and Naktiyok, 2005). Schwartz and Scott

(2000) suggest that the opportunity that teleworking presents to spend more time with one's children has a greater importance for women than men (Beasley et al 2001).

3. Data description

3.1 Survey sample

The overall aim of the research study upon which this paper draws is to examine the prevalence and potential for VST working and its effects on the daily commute. The population of interest is adults (aged 18-64) in full-time paid employment. A response sample of c1000 individuals has been secured in each 12-monthly survey wave (four waves in total). Sample quotas are set relating to gender, age, occupation (blue/white collar workers³) and UK region. The sample selection aimed to include a specific number of participants with given socio-economic characteristics in order that the relevance of these characteristics could be explored in analysis (as distinct from directly pursuing a random sample of the UK labour force). The Internet-based survey was administered by GfK NOP⁴ and drew upon their panel of 120,000 weekly Internet users. The intention over time has been to gather panel data. Accordingly, respondents to previous survey waves were targeted in each new wave and then, due to attrition, the sample has, in waves 2 to 4 been refreshed with new respondents.

This paper analyses data from the third wave of the survey carried out in March 2007. The wave three sample size is 1015, of which 43.5 per cent of respondents are female. The mean age is 42 (age range 18 to 64, SD = 12.7 years). The modal annual household income is in the band £28,001 - 34,000. Twenty-one per

³ 'Blue collar' is categorised as: skill trades occupations, personal service occupations, process, plant and machine operatives, and semi-skilled occupations. 'White collar' is categorised as: managers and senior officials, professional occupations, associate professional and technical occupations, administrative and secretarial occupations, and sales and customer service occupations.

⁴ GfK NOP (formally NOP World) is an international market research company. More information can be found at <http://www.gfknop.co.uk/>

cent of respondents indicated having a university degree or equivalent with 10 per cent having a postgraduate qualification. The average commute distance band is 5 to 10 miles. 22.5 per cent of respondents have dependent children. 45.5 per cent of respondents had also participated in one or both previous waves of the survey.

3.2 Questionnaire

The questionnaire was designed with the primary purpose of recording respondents' work and commute patterns during the preceding 5-day (Monday to Friday) reference week (for wave three this was the period 19-23 March 2007). For each reference weekday a set of questions were asked to enable classification of working day and to capture commute-related details. For classification of working day, respondents were able to choose from the following seven options: worked at my workplace only (W); worked at home only (H); worked at home and then at my workplace (H-W); worked at my workplace and then at home (W-H); worked at home then my workplace then at home (H-W-H); did not work today; and other working pattern (O). The patterns H-W, W-H and H-W-H are taken together to represent VST working in the reference week. For this paper, classification of individuals as VST workers and/or H workers has been based on their recorded reference week work pattern.

A subsequent section of the questionnaire contained the 16 belief statements previously introduced (more statements were not possible given survey length constraints). 'Not applicable' responses have been treated as missing in terms of the following analysis. Belief statements were presented in a randomised order to each respondent. The final part of the online survey collected further details concerning respondent characteristics – including age, gender, occupation, level of education, parental status and commute distance.

3.3 Analysis sample

The survey incurred a large amount of missing response data for the belief statements (due in part to the inclusion of a 'not applicable' response option). The regression analyses presented later in the paper were undertaken based only on respondents who had provided valid answers to the belief statements that were shortlisted as independent variables for analysis after consideration of bivariate correlations (see section 4.2). Thus the sample size for analysis was 570. The composition of this sample with respect to the socio-demographic variables was examined and found to be similar to that for the full sample. Regression analysis was also undertaken for VST and H frequency for both samples based only upon socio-demographic data (which had been secured for all 1015 respondents). The results were found to be very similar. This provides confidence that systematic bias introduced by reducing the sample size is limited.

4. Analysis and results

4.1 Summary of behaviour recorded in survey

98 of the 570 respondents had practiced one or more days of VST working in the reference week (17.2 per cent); the corresponding figure for H working is 56 (9.8 per cent). 31 (5.4%) of these individuals had undertaken both VST and H working during the reference week. Table 1 shows the number of days on which individuals were practicing each form of homeworking during the reference week for both the full survey sample and the smaller analysis sample. This shows slightly higher levels of both forms of homeworking for the analysis sample.

INSERT TABLE 1 ABOUT HERE

INSERT FIGURE 1 ABOUT HERE

Recollecting that it is of particular interest to this research to consider the impact (or potential for impact) of VST working on peak period congestion, an examination can be made of the timing of return commuting trips reported in the survey for VST days. If employees who VST work travel home at the same time of day as days when they do not homework then the question would arise as to whether part-day homeworking merits any further attention from a transport perspective. In order to offer some reassurance that VST is not (always) reflective of overworking or at least of no impact on commute timing, Figure 1 has been prepared. Evening commute departures from work to home in the reference week for each individual (drawing from the full sample – n=1015) have been averaged for any VST working day(s) and W working day(s) - with the results plotted. This approximation must be caveated with a recognition that day to day variation in workday duration and departure times may also be occurring – the inevitable difficulty of determining what is meant by ‘normal’ or typical for many people’s working practices on a day to day basis. The results in Figure 1 suggest that for a substantial proportion of individuals VST is indeed resulting in earlier evening commutes with a notable incidence of seemingly ‘early’ departures. Nevertheless, around one third of respondents for the

full and analysis samples agreed that “they (would) work longer hours by working at home”.

4.2 Preliminary analysis and data reduction

Further to a familiarisation with the working behaviours captured by the survey, the paper now moves to look at the bivariate correlations concerning the set of belief statements outlined in section 3. The means, correlations and standard deviations resulting from the bivariate analysis are set out in Table 2.

The desire to VST work (more) has a strong correlation of 0.63 with wanting to H work (more). This suggests a wish to homework or not homework, *regardless of the form that it takes*. It could be a signal of the earlier issue concerning statement wording regarding ‘working at home’.

INSERT TABLE 2 ABOUT HERE – LANDSCAPE

There are large correlations between many of the belief statements and the desire to H and VST work (more). This includes organisational, travel and household belief statements. The correlations have the expected signs. The correlations between belief statements and desire to H and VST work are similar but are consistently somewhat higher in magnitude for H work. Belief statements that have the highest correlation are: other members of household appreciating me working at home; avoiding interruptions from other people at work; our household has a suitable room;

avoiding 'wasted' time in traffic; working longer hours by working at home; and homeworking influencing how far I live from workplace.

There is a weak negative correlation between appreciating time to oneself travelling to/from work and desire to H work (more). Correlation between employer support for working at home and desire to H and VST work (more) is weak and positive. This does not imply that there is no link between employer support and being *able* to work at home.

As Table 2 shows, some belief statements are highly correlated with each other – especially the two concerning commute struggle (“*I find travelling to work a struggle*” and “*I find travelling home from my workplace a struggle*”) and the two concerning commute appreciation (“*I appreciate the time I have to myself on my way to work*” and “*I appreciate the time I have to myself on my way home from work*”). To avoid issues of multicollinearity these four variables have been reduced (by taking the mean score) to create one variable measuring the ‘commute struggle’ (Cronbach’s $\alpha = .87$) and one measuring appreciation of the commute (Cronbach’s $\alpha = .86$).

The process of data reduction involved the removal of three belief statements. Firstly, the statement “*If I (could) work at home others in my home (would) find it helpful to have my car on those days*” had a particularly high number of missing responses (missing $n = 397$) and deletion of this increased the sample size substantially. Further, the two statements “*Homeworking has/would influence(d) how far I live from my workplace*” and “*Our household has a suitable room to allow me to work at home*” were removed because of concerns that (due to the phrasing used) in relation to the dependent variables being considered (desire to VST and H work and VST and H frequency) the statements reflect *consequences* rather than causal factors.

4.3 VST and H desire

To explore further the factors related to desire to H and VST work, regression modelling was undertaken (using Limdep) in which desire to VST work (more) and desire to H work (more) are treated as the dependent variables. Given that the dependent variable is ordinal in each case, Ordered Probit regression models were estimated. A two-step procedure was adopted. After careful inspection of the socio-demographic independent variables (including checking that they were not strongly correlated) five of these were included in a socio-demographic model for VST and for H (step 1). Then, models were developed also including belief statements (step 2). These were selectively added to the previous models depending on whether they were statistically significant and increased the performance of the overall models. This approach sought to identify whether socio-demographic variables continue to provide any or as much explanation once the belief statements are added and to assess the explanation of belief statements when combined with other relevant variables. Table 3 presents coefficient values with p-values and model goodness of fit statistics for desire to VST and desire to H work (more). Only belief statements that were statistically significant in one or both of the pair of models are included in the tables.

Desire to VST work (more)

The results of the regression analysis for step one indicate that demographic factors alone do not strongly explain desire to VST work ($\chi^2(5, 565) = 18.30, p = .26$). In the first step, occupation ($\beta = .36, p < .01$) is the only significant variable with its positive coefficient indicating that white collar workers want to VST work more than blue collar workers.

As shown in Table 3, the addition of belief statements adds substantially to the model ($\chi^2 (9, 561) = 256.80, p < .001$). Avoiding interruptions at work ($\beta = .34, p < .01$) and other household members appreciating the employee homeworking ($\beta = .33, p < .001$) have the largest beta values for VST desire, followed by avoiding wasted time in traffic being a motivation for homeworking ($\beta = .19, p < .01$). Working longer hours is also marginally statistically significant ($\beta = .09, p = .05$).

 INSERT TABLE 3 ABOUT HERE

Desire to H work (more)

Regression analysis for step one indicates again that demographic factors alone do not strongly explain desire to H work ($\chi^2 (5, 565) = 23.29, p = .66$). Occupation is the only statistically significant variable at the 95% confidence level with white collar workers being more attracted to H working than blue collar workers. Parents of children are more likely to desire to H work, but this is not statistically significant at 95% level ($p=0.07$).

As shown in Table 3, the addition of the belief statements adds substantially to the explanatory power of the model ($\chi^2 (12, 558) = 396.19, p < .001$), with a larger number of beliefs being indicated by the model to have an influence on desire to H work. As with VST desire, avoiding interruptions at work ($\beta = .39, p < .001$) and other household members appreciating the employee homeworking ($\beta = .36, p < .001$) have the largest beta values, followed by avoiding wasted time in traffic ($\beta = .24, p < .01$) and working at home can conflict with one's personal life ($\beta = -.24, p < .01$).

Working longer hours ($\beta = 16, p < .01$), cost of the commute as a burden ($\beta = .13, p < .05$) and perceived employer support ($\beta = -.08, p < .05$) are also statistically significant. Employer support is associated with a lower desire to H work and is a counterintuitive result. It is of marginal statistical significance and may reflect that the variable is correlated to other unobserved factors. It could also imply some resistance from employees to being asked to work from home. Of the demographic variables, occupation remains significant ($\beta = .32, p < .01$). Commute distance becomes marginally significant with a counterintuitive relationship where a longer commute distance is associated with a lower desire to H work.

Discussion

Four belief statements are found to be associated with both desire to VST and to H work (more): avoiding interruptions at work; other household members appreciating the employee homeworking; avoiding wasted time in traffic and (to a lesser extent) working longer hours. There are, however, three belief statements that are associated with desire to H work but not VST work.

For both VST and H working, socio-demographics seem to provide little explanatory power regarding desire to VST or to H work (more), regardless of whether the belief statements are also considered. Gender is not found to be statistically significant. White collar workers are more attracted to H working than blue collar workers, and this also applies to VST working (but this is not statistically significant when belief statements are included). It is surprising and counter to previous research that a longer commute is associated with less desire to homework. The limited explanatory power of the socio-demographic variables should not mean

that their relevance is completely dismissed. The belief statements themselves may be partly influenced by socio-demographic characteristics.

Considering the step two regression analysis results overall it is notable that more of the belief statements used in the survey are significant in relation to desire to H work (more) than is the case for desire to VST work (more). More explanatory power is also evident as a result in the former model. This may suggest at least two important points. Firstly, that while there is common ground between these two forms of homeworking in terms of factors determining desire there appear to be other factors, as yet to be identified, which may contribute to people's appreciation of the role of VST working. Secondly (or as an alternative explanation), many people may, as yet, have less well-formed perceptions and attitudes towards the concept of VST working as opposed to H working which has, accordingly, affected, in ways undetected, their indication of desire to VST work.

Furthermore, as suggested in previous work (Lyons and Haddad, 2008), VST working is often practiced on an ad hoc basis (as opposed to the more planned approach for H working); therefore a lower explanatory power may be expected.

4.4 VST and H frequency prediction - regression results

Given the availability of the diary data on home working practiced during the reference week further regression analyses were carried out (see Table 4) to help gain a better understanding of what personal characteristics and beliefs are important in VST and H behaviour.

VST frequency

Step one indicates that socio-demographic factors alone explain a relatively small proportion of the variance of VST frequency ($\chi^2 (5, 565) = 26.26, p = .79$). In the first step occupation ($\beta = .46, p < .01$) and commute distance ($\beta = .11, p < .01$) are significant socio-demographic determinants. The addition of the set of beliefs in step two of the regression analysis ($\chi^2 (7, 563) = 53.73, p < .001$), sees commute distance ($\beta = .08, p < .05$) remaining significant. The two significant belief statements included in the model are employer support ($\beta = .23, p < .001$) and avoiding interruptions at work ($\beta = .15, p < .05$).

 INSERT TABLE 4 HERE

H frequency

Step one indicates that socio-demographic factors alone have little explanatory power for H frequency ($\chi^2 (5, 565) = 16.07, p = .66$). In the first step, only occupation ($\beta = .44, p < .05$) and age ($\beta = .13, p < .05$) are significant. The addition of the set of beliefs in step two adds substantially to the explanatory power of the model ($\chi^2 (7, 563) = 92.45, p < .001$). Age remains significant when the set of beliefs are added ($\beta = .19, p < .01$). The two significant belief statements included in the model are (as for the VST frequency model) employer support ($\beta = .49, p < .001$) and finding the commute a struggle ($\beta = .38, p < .001$).

Discussion

For both VST and H working, the regression models of desire have performed better than those of behaviour. A higher relative increase in log-likelihood for H working

frequency is achieved than is the case for VST working frequency. It should be noted that survey respondents are full-time paid employees who have a conventional workplace. Thus in nearly all cases homeworking is an occasional practice for the individuals. It can be suggested that as such, behaviour in terms of homeworking may not follow a regular and repeatable pattern week-by-week or even month by month. The pattern of homeworking may fluctuate throughout the year according to home and work spatio-temporal constraints as well as fluctuations in the specific set of work tasks. Therefore it may be inherently easier to predict behavioural desire than to predict behaviour itself (with the latter based only on one reference week of data).

Employer support is significant to both VST and H frequency. Unlike the case with desire, employer support has a positive effect on actual behaviour – whereas it appears to have a negative effect on desire. For VST frequency, the only other significant belief statement is avoiding interruptions – yet this belief statement is not retained in the H frequency model. It could perhaps be that specific concerns over interruptions (in the reference week) motivate a change in work environment which is immediately acted upon (note the earlier reference to the ad-hoc or ‘reactive’ nature of VST working). Whereas when concerning H working, though the avoidance of interruptions is something which is seen as important when one *desires* to H work, in practice its importance is not such a direct motivator to behaviour.

5. Concluding remarks

This paper has revisited past literature on factors associated with people’s desire for and practice of homeworking. Having re-introduced the concept of part-day (VST) homeworking, the paper has then proceeded to examine how part-day and full-day (H) homeworking compare for a sample of full-time paid employees. A

number of caveats and considerations associated with the data and analyses have been highlighted.

The paper has compared response data relating to VST and H working. For both forms of working practice, the belief statements are better able to explain desire to homework (more) than to explain frequency of homeworking. This is perhaps not surprising given the variability of work patterns at the level of the individual that can occur from week-to-week (or even from month-to-month). Meanwhile desire can be considered more 'stable' and thus more able to be explained by attitude data.

The belief statements considered were able to achieve a higher relative increase in log-likelihood for desire to H work (more) than in the desire to VST work (more) and more of the beliefs were included and significant for the former. Recent qualitative research by the authors has found that VST working can be more impulsive or ad-hoc in nature compared to H working. Overall, we can conclude that while there are common features of appeal and limitation to different forms of homeworking practice it must nevertheless be recognised that the heterogeneity of working practices under the umbrella term 'homeworking' is underlined. It is important for further consideration to be given to other factors that may prove more significant to explaining VST working desire. It is acknowledged that previous studies (often implicitly of H working only) are based on a larger set of variables/statements. Any future research into VST working should set out to involve a larger set of factors than was possible in this current study.

Underlining the pertinence of heterogeneity of homeworking practice, a further important caveat is introduced to the interpretation of the findings in this paper – overworking is likely to occur to some degree alongside or be combined with flexible working.

To conclude we reiterate a point made at the outset of the paper – working practices continue to evolve even within the umbrella terms ‘teleworking’ or ‘homeworking’. If, increasingly, people have and exercise greater spatio-temporal flexibility in their working patterns then this introduces potentially important consequences for patterns as well as levels of travel for transport planners to address and poses new challenges for research to address.

Acknowledgements

The research reported in this paper is part of a study funded by the UK’s Engineering and Physical Sciences Research Council (EPSRC) FUTURES initiative. Tim Jones contributed heavily in the early stages of the research, namely designing the questionnaire. Yusak Susilo is gratefully acknowledged for his analytical advice and support. Many thanks also to the reviewer who gave thorough and invaluable feedback.

This paper was first presented at the third international specialists meeting ‘ICTs, everyday life and urban change’ which was hosted by the University of the West of England, Bristol, UK. Further details about this network of international specialists can be found online at <http://www.geo.uu.nl/mobilizingICT>

References

Bagley, M. N, and Mokhtarian, P. L. (Analyzing the Preference for non-exclusive forms of telecommuting: Modeling and Policy Implications. *Transportation*, Vol. 24, 203-226, 1997.

- Bailyn, L. (1988). Freeing work from the constraints of location and time. *New Technology and Employment*, 3, 143-152.
- Baruch, Y., and Nicholson, N. (1997). Home sweet work: requirements for effective home working. *Journal of General Management*, 23, 15-30.
- Beasley, D.E., Lomo-David, E., and Seubert, V.R. (2001). Telework and gender: implications for the management of information technology professionals. *Industrial Management and Data Systems*, 101(9), 477-482.
- Cairns, S., Sloman, L., Newson, C., Anable, J., Kirkbride, A., and Goodwin, P. (2004). Smarter choices – changing the way we travel. Final report to the Department of Transport, London: UK.
- DfT (2005). Focus on Personal Travel 2005 Edition.
- Ellison, N.B. (1999). Social Impacts: New perspectives on tele-work. *Social Science Computer Review*, 17(3), 338-356.
- Gatersleben, B. and Uzzell, D. (2007). Affective Appraisals of the Daily Commute: Comparing Perceptions of Drivers, Cyclists, Walkers and Users of Public Transport. *Environment and Behavior*, 39, 416.
- Golden, T. D., Veiga, J. F., Zeki Simsek, Z. (2006). Telecommuting's Differential Impact on Work-Family Conflict: Is There No Place Like Home? *Journal of Applied Psychology*, Volume 91, Issue 6, November 2006, Pages 1340-1350.
- Haddad, H., and Lyons, G. (2008). An exploration of demographic, work, home and commute aspects of part-day and whole-day homeworking. Invited paper prepared for *Third International Specialist Meeting on ICT, Everyday Life and Urban Change*, March 2008, Bristol, UK.
- Handy, S.L., and Mokhtarian, P.L. (1996). The future of telecommuting. *Futures*, 28, 227-240.

- Helminen, V., and Ristimäki., M. (2007). Relationships between commuting distance, frequency and telework in Finland. *Journal of Transport Geography*, 15, 331–342
- Huws, U., Korte, W.B., and Robinson, S. (1990). *Telework: Towards the elusive office*. Chicester: Wiley.
- Iscan, O. F., and Naktiyok, A (2005). Attitudes towards telecommuting: the Turkish case. *Journal of Information Technology*, 20, 52–63
- Jain, J. and Lyons, G. (2008). The gift of travel time. *Journal of Transport Geography*. 16, 81-89.
- Jones, T. and Lyons, G. (2005). Rationale for the Design and Implementation of a National Longitudinal Survey, Working Paper. Centre for Transport & Society, University of the West of England, Bristol, February.
- Kaplan, R. and Kaplan, S. (1989). *The experience of nature: A psychological perspective*, Cambridge University Press, Cambridge.
- Kaplan, S. (2001). Meditation, restoration, and the management of mental fatigue. *Environment & Behavior*, 33, 480-506.
- Kugelmass, J. (1995). *Telecommuting: A manager's guide to flexible work arrangements*. Lexington Books: New York.
- Lund, J., and Mokhtarian, P.L. (1994). Telecommuting and residential location: Theory and implications for commute travel in the monocentric metropolis. *Transportation Research Record*, 1463, 10-14.
- Lyons, G. and Chatterjee, K. (2008). A human perspective on the daily commute: costs, benefits and trade-offs. *Transport Reviews*, 28(2), 181-198.

- Lyons, G. and Haddad, H. (2008). Commute displacement or commute replacement: the rise of part-day homeworking. Forthcoming in *Transportation Research Record*.
- Lyons, G., Haddad, H. and Jones, T. (2006), Introducing Consideration of Varied-Spatiotemporal Workers to the Study of Teleworking, Paper presented at the 11th International Conference on Travel Behaviour Research, Kyoto, August.
- Mann, S., Varey, R. and Button, W. (2000). An exploration of the emotional impact of teleworking via computer-mediated communication. *Journal of managerial Psychology*, 15(7), 668-690.
- Mannering, J.S., and Mokhtarian, P.L. (1995). Modelling the choice of telecommuting frequency in California: an exploratory analysis. *Technological Forecasting and Social Change*, 49, 49-73.
- Mokhtarian P. and Salomon I. (1994) Modeling the choice of telecommuting: setting the context. *Environment and Planning A* 26, 749-766.
- Mokhtarian, P.L. (1998). A synthetic approach to estimating the impacts of telecommuting on travel. *Urban Studies*, 35(2), 215-241.
- Mokhtarian, P.L., & Bagley, M.N. (2000). Modelling employees' perception and proportional preferences of work locations: the regular workplace and telecommuting alternatives. *Transportation Research A*, 34, 223-242.
- Mokhtarian, P.L., and Salomon, I. (1996a). Modelling the choice of telecommuting: 2. A case of the preferred impossible alternative. *Environment and Planning A*, 28, 1859-1876.
- Mokhtarian, P.L., and Salomon, I. (1996b). Modelling the choice of telecommuting: 3. Identifying the choice set and estimating binary choice models for technology-based alternatives. *Environment and Planning A*, 28, 1877-1894.

- Mokhtarian, P.L., and Salomon, I. (1997). Modelling the desire to telecommute: the importance of attitudinal factors in behaviour models. *Transportation Research A*, 31(1), 35-50.
- Mokhtarian, P.L., Bagley, M.N., and Salomon, I. (1998). The impact of gender, occupation and presence of children on telecommuting motivations and constraints. *Journal of the American Society for Information Science*, 49, 1115-1134.
- Nilles, J. M. (1994). *Making Telecommuting Happen*. Van Nostrand Reinhold, New York: NY.
- Novaco, R.W., Stokols, D., and Milanese, L. (1990). Objective and subjective dimensions of travel impedance as determinants of commuting stress. *American Journal of Commuter Psychology*. 18, 231-257.
- Olson MH, (1988), Organisational Barriers to Telework. In W.B. Korte, S. Robinson, and W.L. Steinle (Eds.), *Telework: Present situation and further development of a new form of work organisation*. (pp.77-100). Bonn, Germany: Empirica.
- Olson, M.H. (1987). Telework: Practical experience and future prospects. In R.E. Kraut (Ed.), *Technology and the transformation of white collar work*. (pp. 136-152). Hillsdale, NJ: Erlbaum.
- Popuri, Y. D. and Bhat, C. R (2003). On Modeling the Choice and Frequency of Home-Based Telecommuting. Paper presented at the Annual Meeting of the Transportation Research Board, Washington D.C, January.
- Redmond, L.S. and Mokhtarian, P.L. (2001). The positive utility of the commute: modeling ideal commute time and relative desired commute amount. *Transportation*, 28, 179-206.

- Richter, J. (1990). Crossing boundaries between professional and private life. In the *Experience and meaning of work in women's lives*, H. Grossman and C. Lane (eds) (143-163). Lawrence Erlbaum, Hillsdale, NJ.
- Schwartz, M.A. and Scott, B.M. (2000). *Marriages and Families: Diversity and Change*. Prentice-Hall, Upper Saddle River, NJ.
- Standen, P. (2000). The home/work interface. In Daniels K, Lamond, D.A. and Standen, P (eds) (83-92). *Managing Telework*. London: Business Press
- Standen, P., Daniels, K. and Lamond, D. (1999). The home as a workplace: work-family interaction and psychological well-being in telework. *Journal of Occupational Health Psychology*, 4(4) 368-381.
- Stanek, D.M., Mokhtarian, P.L. (1998). Developing models of preference for home-based and center-based telecommuting: findings and forecasts. *Technological Forecasting and Social Change*, 57, 53-74.
- Steward, B. (2000). Changing times – the meaning, measurement and use of time in teleworking. *Time & Society*, 9 (1), 57-74.

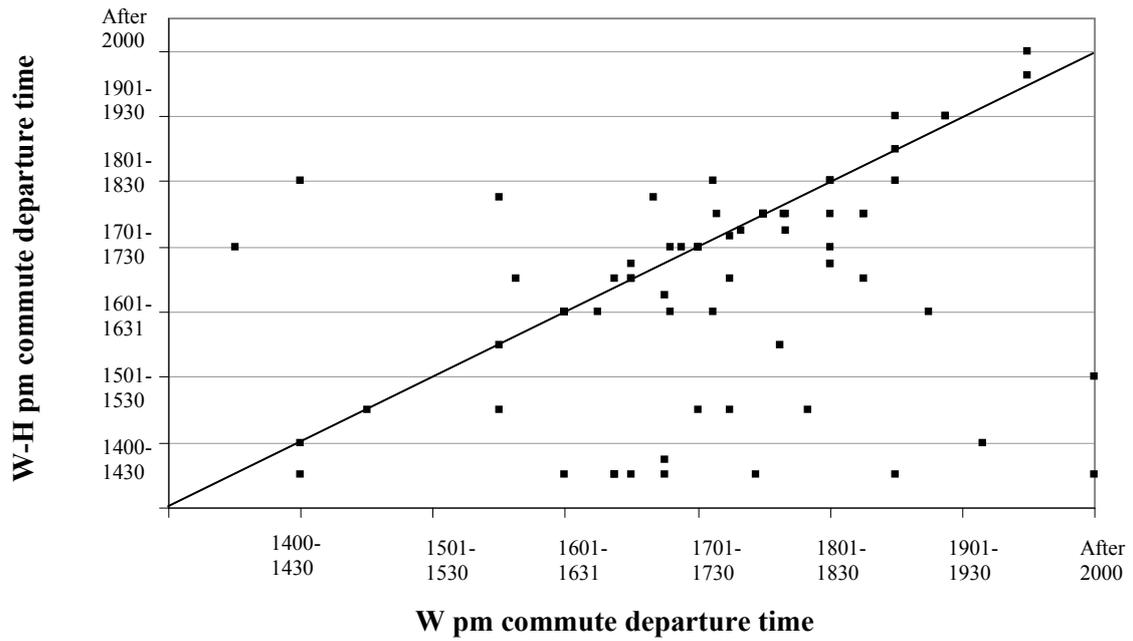


Figure 1. Comparisons, for individuals who have worked one or more VST days in the reference week, of PM commute departure times on W days and W-H days

Table 1. Days per week homeworked per individual

Number of days	Full survey sample				Analysis sample			
	VST		H		VST		H	
	n	%	n	%	n	%	n	%
0	880	86.7	942	92.8	472	82.8	514	90.2
1	58	5.7	37	3.6	42	7.4	27	4.7
2	40	3.9	12	1.2	31	5.4	11	1.9
3	16	1.6	17	1.7	11	1.9	13	2.3
4	13	1.3	4	.4	10	1.8	3	.5
5	8	.8	3	.3	4	.7	2	.4
Total	1015	100	1015	100	570	100	570	100

Table 2. Summary results of bivariate analysis (focused upon the 16 belief statements but with the inclusion also of one-way commute distance)

Statement	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Distance of one-way commute from home to workplace	3.85	1.54																	
<i>Desire</i>																			
2 I would like to have (more) days where I do some work at the workplace and some work at home	2.41	1.08	0.56																
3 I would like to work at home (more)	2.52	1.15	0.04	.63**															
<i>Organisational</i>																			
4 My employer is/would be supportive of me working at home	1.40	1.17	.17**	.10*	.12**														
5 Avoiding interruptions from other people at work is a motivation for me to work at home	2.29	1.07	-0.01	.48**	.54**	.13**													
<i>Travel</i>																			
6 I find travelling to work a 'struggle'	1.60	1.18	.34**	.22**	.29**	.18**	.28**												
7 I find travelling home from my workplace a 'struggle'	1.65	1.15	.31**	.20**	.26**	.18**	.23**	.74**											
8 Avoiding the 'wasted' time in traffic is a motivation for me to work at home	2.47	1.12	.19**	.41**	.48**	.21**	.40**	.43**	.47**										
9 I appreciate the time I have to myself on my way TO WORK	2.24	0.98	.09*	0.00	-0.06	.11**	-0.05	-0.07	-0.03	-0.03									
10 I appreciate the time that I have to myself on my way HOME FROM WORK	2.32	0.96	.09*	0.03	-0.08	0.08	-.09*	-.09*	-0.06	-0.05	.76**								
11 If I (could) work at home others in my home (would) find it helpful to have my car on those days"	1.51	1.15	0.06	.20**	.22**	.11*	.27**	.31**	.28**	.33**	-0.05	-0.02							
12 Homeworking has/would influence(d) how far I live from my workplace"	2.18	1.05	0.05	.33**	.41**	.12**	.37**	.27**	.21**	.48**	0.02	0.02	.32**						
<i>Household</i>																			
13 Working at home can/could conflict with my personal life	1.84	1.11	-0.06	-.19**	-.33**	-0.03	-.24**	-.08*	-0.05	-.14**	0.04	.08*	-0.02	-0.05					
14 I (would) work longer hours by working at home	1.97	1.14	.10*	.37**	.43**	.24**	.37**	.31**	.30**	.43**	.08*	0.08	.26**	.32**	-.14**				
15 Other members of my household (would) appreciate me working at home	2.23	1.08	.08*	.48**	.55**	.18**	.43**	.30**	.27**	.44**	-0.02	0.00	.34**	.40**	-.26**	.43**			
16 The cost of travel to/from work is a burden on my household	1.84	1.18	.39**	.19**	.29**	.12**	.17**	.54**	.52**	.44**	0.00	0.00	.22**	.26**	-0.06	.25**	.28**		
17 Our household has a suitable room to allow me to work at home"	2.51	1.26	.13**	.38**	.51**	.23**	.42**	.22**	.20**	.39**	-0.04	-0.04	.14**	.29**	-.26**	.35**	.45**	.22**	

** Correlation is significant at the .01 level; * Correlation is significant at the .05 level, n = 570

Note: mean values in the table are based on responses having been recoded from 1-5 to 0-4 because of requirements of the analysis software use



University of the
West of England

This is a pre-publication version of the following article:

Haddad, H., Lyons, G. and Chatterjee, K. (2009). An examination of determinants influencing the desire for and frequency of part-day and whole-day homeworking. *Journal of Transport Geography*, 17, 124-133.



Centre for
Transport &
Society

Table 3. Results of Ordered Probit regression analyses concerning desire to VST and to H work (more)

Variable	VST		H	
	Coef. β	<i>p</i> -value	Coef. β	<i>p</i> -value
Step 1				
Constant	1.39	.00	1.18	.00
Age	-.048	.17	.00	.97
Gender (male)	-.13	.16	-.09	.34
Parent of dependent children	.06	.56	.18	.07
Occupation (white collar)	.36	.00	.46	.00
One-way commute distance	.01	.72	.01	.66
Threshold 1	.67	.00	.75	.00
Threshold 2	1.48	.00	1.39	.00
Threshold 3	2.68	.00	2.42	.00
Log likelihood function	-809.11		-829.42	
Restricted log likelihood	-818.26		-841.06	
Chi sq	18.30		23.29	
df	5		5	
n	570		570	
Step 2				
Constant	.02	.93	.11	.65
Age	-.06	.10	-.01	.88
Gender (male)	-.14	.16	-.08	.43
Parent of dependent children	-.14	.18	.025	.83
Occupation (white collar)	.15	.20	.32	.01
One-way commute distance	-.02	.44	-.07	.05
Avoiding interruptions from other people at work is a motivation for me to work at home	.34	.00	.39	.00
Other members of my household (would) appreciate me working at home	.33	.00	.36	.00
Avoiding the 'wasted' time in traffic is a motivation for me to work at home	.19	.00	.24	.00
I (would) work longer hours by working at home	.09	.05	.16	.00
Working at home can/could conflict with my personal life	-	-	-.24	.00
The cost of travel to/from work is a burden on my household	-	-	.13	.01
My employer is/would be supportive of me working at home	-	-	-.08	.05
Threshold 1	.88	.00	1.12	.00
Threshold 2	1.91	.00	2.05	.00
Threshold 3	3.38	.00	3.53	.00
Log likelihood function (LL at convergence)	-689.86		-642.97	
Restricted log likelihood (LL at 0)	-818.26		-841.0	
Chi sq	256.80		396.19	
df	9		12	
n	570		570	

Table 4
Results of Ordered Probit regression analyses concerning frequency of VST and H working

Variable	VST		H	
	Coef. β	<i>p</i> -value	Coef. β	<i>p</i> -value
Step 1				
Constant	-2.12	.00	-2.35	.00
Age	.07	.14	.13	.03
Gender (male)	.19	.14	.25	.10
Parent of dependent children	.23	.08	.20	.19
Occupation (white collar)	.46	.01	.44	.04
One-way commute distance	.11	.01	.04	.35
Threshold 1	.36	.00	.36	.00
Threshold 2	.79	.00	.59	.00
Threshold 3	1.05	.00	1.12	.00
Threshold 4	1.56	.00	1.46	.00
Log likelihood function	-379.40		-247.08	
Restricted log likelihood	-392.54		-255.12	
Chi sq	26.26		16.07	
df	5		5	
n	570		570	
Step 2				
Constant	-2.54	.00	-3.36	.00
Age	.07	.15	.19	.01
Gender (male)	.154	.25	.129	.45
Parent of dependent children	.19	.15	.21	.21
Occupation (white collar)	.25	.17	.10	.66
One-way commute distance	.08	.04	-.06	.23
Avoiding interruptions from other people at work is a motivation for me to work at home	.15	.02	-	-
Commute struggle	-	-	.38	.00
My employer is/would be supportive of me working at home	.23	.00	.49	.00
Threshold 1	.38	.00	.45	.00
Threshold 2	.82	.00	.75	.00
Threshold 3	1.09	.00	1.46	.00
Threshold 4	1.60	.00	1.87	.00
Log likelihood function (LL at convergence)	-365.67		-208.89	
Restricted log likelihood (LL at 0)	-392.54		-255.12	
Chi sq	53.73		92.45	
df	7		7	
n	570		570	