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The impact of incentives and interview methods on response quantity and quality in diary- and booklet-based surveys

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This paper investigates the impact on response quantity and quality of a diary- and booklet-based survey of using different interview methods and lottery prizes. In addition to a conventional questionnaire the survey included time-diaries for household members and a expenditure booklet for recording the previous month's spending by the household. The respondents could choose to use either CATI (Computer-Assisted Telephone Interviewing) or web-based CAPI (Computer-Assisted Personal Interviewing) for the different parts of the survey. Lottery prizes varied during the survey period, and the prizes were doubled if they had used only the CAPI method. The response rate was significantly affected by the size of the lottery prizes, and the doubling of these prizes for using the web had a high impact on the number of respondents choosing this method. The implication was that also the response quality increased as a result of the impact on the number of web interviews, because this method was found to yield a significantly higher quality for the diary, booklet and questionnaire information.
Keywords: Response quantity, response quality, survey methods, economic incentives

Introduction

In parallel with the recent trend towards conducting ever more surveys, there has also been a decline in the response rates, making it harder to obtain the desired number of completed interviews for these surveys (Hansen, 2006; Curtin et al., 2005; de Leeuw and de Heer, 2002). At the same time, the world wide web has become more frequently used for survey data collection, because most people in developed countries now have access to the internet and the use of the web is less costly than surveying by ordinary mail or telephone. The drawback of web surveying, however, is that the response rates are usually even lower than those obtained by the conventional data collection methods (Couper, 2000; Dillman and Bowker, 2001), though some findings do indicate the opposite in certain studies (Schneider et al., 2002; Crawford et al. 2002). As the quality of survey estimates is contingent on a high response rate, this problem has prompted the introduction of various incentives aimed at obtaining a greater number of completed interviews.

Moreover, evaluations of the impact of the incentives used in surveys and of the impact of applying different survey methods – mail, telephone, web – usually focus on response rates – the quantitative outcomes – leaving undetermined the effect on the quality of the replies to the questions in the surveys – the qualitative outcomes.

On the basis of a large-scale Danish time-use and consumption survey (2008/09), which included a questionnaire, diaries and an expenditure booklet, we have tested the impact of different financial incentives and interview methods on the quantity (response rates) and quality (accuracy) of the results achieved. Lottery prizes were increased considerably during the final six months in order to encourage people to participate. To measure the impact of lottery prizes as an incentive for participants to switch from telephone interviews to the web, the prizes were doubled for participants who used the latter method instead of the former for all the instruments of the survey, i.e. the questionnaire, the diaries and the expenditure booklet.

In the next section, the background for this paper is further discussed with references to other evaluations. Then follow a section about data and the methods used in this evaluation. The results section includes descriptive statistics about response rates for the different instruments used, as well as statistical analyses of the impact of the financial incentives on response quantity and quality. The final section offers some conclusions.

Background

The general decline in household survey response rates in recent decades, see for example Curtin et al. (2005) and de Leeuw and de Heer (2002), has led to growing concern about the ability of household survey data to represent the behaviour of the population, due to possible selection biases. There are different reasons for the increasing non-response rates. In part they are due to the increasing number of private and public surveys demanding more of people's time, and thus overburdening it; and in part they are due to an increase in working hours among employed people, making them more time-constrained. Both factors result in people becoming more selective in what they want to participate in, with the result that for some surveys they end up as refusals or non-contact persons (Groves and Couper, 1998). For sur-

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veys including time-use information, as in this case, this lack of available time might be a major problem simply because busy people would be less frequently at home, thus decreasing the contact rates – and, at the same time, these busy people may be less willing to take the time to participate in a survey, thus increasing the refusal rate. Partly contrary to such expectations, while busy people may be harder to contact initially, but if persuaded to participate, Robinson (1999) and Kalfs and Saris (1998) find that this gives a higher quality of responses, a finding we replicate here, see below.

In addition, people with weak community ties may also respond less often than other people to surveys (Robinson and Godbey, 1997; Abraham et al., 2006) not to mention people who do not have the inclination to fill out surveys for ideological or other reasons. In the first case, the lack of participation by busy people, the bias may lead to an underestimation of hours worked in the population, and in the latter cases, the lack of participation by people with weak community ties[1] and/or negative attitudes towards survey-participation, the result might be an overestimation of hours spent on volunteer work (Abraham et al., 2006).

Although the busy people hypothesis has been rejected by Pääkkönen (1999) and actually reversed by Robinson (1999), who found that busy people are more likely to participate than less busy people in time-use surveys – we have the same finding; people working 37 hours a week or more were participating to a higher extend than people working less than 37 hours in the background interview and in filling out diaries and the expenditure booklet – and thus that non-response is therefore not necessarily a source of bias in survey estimates (Groves, 2006). For that reason different strategies have been introduced to increase participation rates, including the introduction of both financial and non-financial incentives and the use of more efficient interview instruments such as the world wide web.

Various incentives that refine the data collection tools have been introduced to counter the problem of falling response rates in surveys. Advance letters explaining the importance for society of doing research on a specified topic, with the research being made possible though survey information, is one method used to convince people to participate, together with information about how much (or little) time the survey is likely to take. In addition, increasing the number of follow-up calls is used as a method of increasing response rates in surveys. The impact of advance letters on response rates, however, is mixed, with Hembroff et al. (2005) finding a positive and significant impact but Singer et al. (2000) coming up with no significant impact.

Among prepaid rewards for participating in surveys, scratch cards are one of the most popular, because the recipient cannot resist scratching the card and thereafter feels obligated to participate in the survey irrespective of whether or not he/she has won a prize. Personal in-kind gifts are also used as prepaid rewards, particularly in commercial surveys. Rewards given after participation include cash paid directly to the respondent and charitable donations made on behalf of the respondent to, for example, the Red Cross or Médecins sans Frontières if the questionnaire is submitted. Warriner et al. (1996) and Armstrong (1975) showed that only prepaid cash incentives have a positive impact on response rates, while neither gifts to charities nor the chance of winning lottery prizes have any impact on the response rates of mail surveys. In contrast, Fahimi et al. (2006) found that post-interview cash incentives have a positive impact on the response rate if they are of appropriate amounts, while Porter and Whitcomb (2003) confirmed that offering a prize – regardless of the size – to survey recipients for responding to the survey, with every recipient who responds being entered in a draw for one or more prizes, has no significant impact on the response rate of the survey. Hence, although lottery incentives in particular appear to be a popular and growing method for increasing response rates, the extensive survey research literature on post-paid and lottery incentives indicate that they have little or no impact on survey response rates, or that if they have an effect this is found to diminish as the size of the prize is increased (Warriner et al., 1996; Singer et al., 2000; Ryu et al., 2006.

Because the majority of households in developed countries – 86 percent in Denmark – have an internet connection, which they know how to use in an efficient way, world-wide-web surveys have become more commonly used as a data collection instrument (Statistics Denmark 2009). In Denmark the remaining 14 percent without internet connection consists mostly of the elderly, the unemployed, and people with low education, though the percent without internet connection never rises above 30 percent for any of the lowest represented groups. However, it might still be that some people are more familiar with the use of the internet mode than other people, which is not possible to correct for, unfortunately.

Although web surveys offer the respondent the opportunity to participate at a time of the day most appropriate for her/him, avoiding problems such as being called for a telephone interview while eating a meal or watching a favourite TV programme, the drawback of web interviews is the relatively small response rate compared to other data collection modes (Couper, 2000). This has made the importance of incentives to encourage participation in web surveys even greater, and a large number of experiments have been performed to investigate whether they work. In a meta-analysis Göritz (2006) found that material incentives promote responses and participant retention in web surveys, and that the retention rate, i.e. the share of the sample contacted who continue participating until the end of a survey, is higher when incentives are employed.

It is believed that both the mode of interview used and the incentives used to improve response rates, i.e. response quantity, have an impact on the response quality. With incentives paid post-interview it is possible to make receipt of the incentive contingent on the completeness of the questionnaire submitted. Göritz (2005) carried out an experiment in

[1] The participation rate of people living in rented properties is found smaller than that of house owners, which could be explained by looser community ties due to a higher residential turnover in non-owner housing areas.

which some people were invited to participate in a survey where all participants were eligible for the incentive – an unconditional incentive – and some other people were invited to participate in a survey where only those who answered every question asked received the incentive – a contingent incentive. The result was that contingent incentives decreased responses to the study compared to unconditional incentives, and that the quality and retention were no different in either case.

Another study by Göritz (2004) on the impact of incentives for online access panels showed that redeemable bonus points, money lotteries or gift lotteries had an impact on response quality and survey outcome, although the attrition rate was lower when bonus points were offered in comparison with the lottery incentives. Moreover, whether the prize in a cash lottery is given as a single payout or split up into several prizes has been found to have no impact on response and retention rates in online panels, nor does the amount of the prizes affect these rates (Göritz, 2006).

It might also be that web survey respondents are more likely to enter answers without giving them much thought partly because of not being advised by an interviewer (Kalfs and Saris, 1998), thereby producing data of lower quality. Heerwegh and Loosveldt (2008) show that compared to face-to-face interviewees, web survey respondents produce a higher "don't know" response rate, differentiate less on rating scales, and produce more item non-responses. Whether this also holds if the web is compared with telephone interviews is an open question, however.

Finally, the discussion of the impact of incentives and mode of data collection is only important if the non-response biases in estimates are directly related to non-response rates, and/or one mode of data collection is more cost-effective than the other. To be more precise, there is only a problem if the survey variable under consideration is correlated with the propensity to respond. Groves (2006) argues that this is not necessarily the case, although one always has to be aware of the problem within probability sample surveys. For the survey discussed in this paper, we were able to correct for these biases through a weighting procedure developed by Statistics Denmark and based on information from administrative registers. However, this does not completely remove sampling biases within the Danish Time Use and Consumption Survey, for which reason efforts were made to improve the quality of this survey, including the use of financial incentives and different modes of data collection.

Data and method

Data

In order to carry out the study of daily time use and consumption in Danish families, a sample of 6,000 adults (ages 18-74) was drawn randomly from administrative registers held at Statistics Denmark.

The respondents received a letter offering them the choice of a telephone interview lasting 10-15 minutes or completion of a questionnaire on the web (an access code was provided for this).[2] The questionnaire included around 50 questions about family background, educational level, labour market attachment, etc. Respondents were also asked to complete two forms for daily time use – one for a weekday and one for a weekend day – together with an expenditure booklet. If respondents in the 18-74 age group had a spouse or cohabiting partner and/or children aged 12-17, these people were also asked to complete the forms for time use. Finally, a booklet for information about the previous month's spending on goods and services and about regular costs and durable goods bought within the previous year was to be filled out for all household members.

Thus, the survey included three different instruments: Q_{hm}; D_{hijm}; E_{hm}, where Q is the questionnaire, D the diary[3], E the Booklet[4] – expenditures for the household – and h represents the household, i the individuals/household members, j the diary day – weekday or weekend day – and m the method used – telephone or web.

A pre-coding system was used for both time use (the day was divided into 10-minute intervals) and types of consumption, and this enabled the respondents and/or the interviewer to make electronic searches on key words, etc. This was intended to ensure more consistent processing of the responses, while also greatly reducing the subsequent work of coding in comparison with previous surveys.

The interviews were conducted at regular intervals over twelve months, covering the period March 2008 to March 2009. By linking the information obtained with register information from Statistics Denmark, it will be possible to study time use, consumption, income, family situation, attachment to the labour market, use of primary and secondary health system, etc. for around 10,000 people living in Denmark (inclusive of immigrants living in Denmark for more than seven years or with Danish citizenship).

Method

As the interview included different phases with different instruments for different family members, strenuous efforts were made to achieve the greatest possible number of completed interviews (i.e. the highest possible response rate[5]) by

[2] If Statistics Denmark had not received the web interview after a week, the respondent was called and asked to complete the form. Respondents were also offered the option of an immediate telephone interview.

[3] Information on primary activities the respondent was engaged in for every 10-minute period during a designated weekday and weekend day (2*144) together with information on who the respondent was together with, if anyone, during these periods (2*144).

[4] Accounts for all expenditures on everyday goods bought by the household members within the previous month, as well as for expenditures on regular spending and durable goods bought within the previous year. Goods and services bought for the IP, spouse, children or people outside the household were assigned to the relevant person.

[5] Response rate = completed interviews / (completed interviews + respondent refusals + non-interviews (phone never answered, language barriers, incomplete interview, permanent health problems, etc.)).

Table 1: Changes to incentive-structure within DTUC across time

Week number/Month and year	Letter	Incentives
Weeks 16-39 April to September 2008	Announcement of incentives in the final letter only	Monthly prizes: 1 DKK 5,000, 2 DKK 1,000 Expected average payout per person: DKK 17.5
Weeks 40-15 October 2008 to March 2009	Announcement of incentives in all three letters	Monthly prizes: 1 DKK 10,000, 1 DKK 5,000, 1 DKK 2,000 Double amounts for web use Expected average payout per person: DKK 42.5; web use DKK 85.0 Follow-up: cinema tickets for all participants in the family

introducing refusal conversion incentives, see Table 1.

In the first six month of the survey (April 2008 to September 2008), the respondents interviewed participated in a lottery with three prizes, one of DKK 5,000 and two of DKK 1,000 net of tax (1,000 DKK ≈ 133 EURO), provided they filled out all the instruments – questionnaire, diaries and booklet – either via the web or by participating in telephone interviews, with different combinations of response methods allowed. Notice of the lottery prizes was first given in the announcement letter for the expenditure booklet, the sending out of which was dependent on earlier participation in both questionnaire and diary. To further increase the response rate, the lottery prizes were increased from October 2008 so that participants could now win DKK 10,000, 5,000 or 2,000 for the completion of all the instruments, and if they used the web throughout the prizes were doubled to DKK 20,000, 10,000, or 4,000 net of tax. This is a sizeable amount of money, as the average monthly disposable income for a family in Denmark was DKK 15,400 in 2007 implying that the "average" household could win up to 130% of their monthly income net of taxes.[6] At the same time, notice of the lottery was given in all three announcement letters.

Finally, the ordinary follow-up call procedure, with up to nine reminder calls per instrument per participant, was supplemented from week 40 in 2008 with the offer of cinema-tickets to all the survey participants in the family if they filled out the remaining non-completed instruments, i.e. diaries and/or the expenditure booklet.

Results

Descriptive statistics

Table 2 shows the overall response and cooperation rates for the different instruments used in the DTUC survey. We see that the response rate was fairly high compared to other questionnaire-based surveys, with 77% of the respondents completing the questionnaire either on the telephone or via the web, and 80% of the respondents contacted actually co-operating/participating in the survey. The corresponding response rate for the questionnaire in the Danish Time Use Survey 2001 (Bonke, 2002), where there were no economic incentives to participate, was 65-67%.

The response rate for diaries filled out by the interview person (IP) him/herself is more modest, namely 48, which is close to that obtained in the DTUS-2001 (.49). For the expenditure booklet the response rate was 45, which is similar to that of the ordinary Danish Household Expenditure Survey. This gives response rates conditional on having filled out the questionnaire of 59 for the booklet and 62 for the IP's diaries. There was a good level of retention; 84 of the IP diary respondents or their spouses also filled out the expenditure booklet.

The number of respondents using the web was considerably higher for the questionnaire than for the diaries and the expenditure booklet, which is surprising because the two last instruments are more time-consuming and thus more appropriate to be filled out at a time of the day most convenient to the respondent, i.e. with the lowest opportunity cost in terms of time. Nonetheless, the proportion of web completions was more than 50 percent higher for the questionnaire, with one third of participants using the web (.33) compared to only around one fifth (.20 and .23) for the diaries and the expenditure booklet (Table 3).

The respondents were given the opportunity to choose the methods most convenient for them to use for the different instruments; 33% used a combination of methods with half of them going from a telephone interview to an internet based interview.[7] The majority of respondents, however, kept to the same mode throughout the survey; however, there were five times as many instances of respondents doing all the interviews by telephone than respondents doing all the interviews via the web (51.7% vs. 10.0%).

The proportion of Danish households with access to the Internet from home in 2009 is 93%, and for the 7% of the population without this access workplace computers and computers at libraries were in some cases available for the replying to the survey.

Response quantity – incentives and methods

The response rates over the survey period are shown in Figure 1. We see that there was some seasonal variation, with a lower response rate during the summer period and a higher response rate over the rest of the year. Moreover, a steep increase was seen at the beginning of the survey period, probably due to the fact that the interviewers became more familiar with the questions after a short time. Another

[6] Own calculations based on data from Statistics Denmark.

[7] The interviewers were encouraging people to use the internet mode when making follow-up calls, which might explain some of the shifts from telephone to internet based interviews.

Table 2: Unconditional and conditional response rates

	Questionnaire	Diary (IP)	Booklet
Response rates[1] (cooperation rates[2])			
- unconditional	77 (80)	48 (51)	45 (47)
- conditional on Questionnaire		62	59
- conditional on Diary			84
Number of interviews (completed)	6,091	3,755	3,575

[1] Includes non-contacts in the denominator

[2] Excludes non-contacts in the denominator

Table 3: Interview methods for questionnaire, diary, and expenditure booklet

	Questionnaire		Diary				Booklet	
	# interviews IP	%	# interviews IP	# interviews All resp.	% IP	% All resp.	# interviews IP	%
Telephone (m=1)	4,059	67	3,005	5,776	80	79	2,757	77
Web (m=2)	2,032	33	750	1,570	20	21	818	23
	6,091	100	3,755	7,346	100	100	3,575	100

interesting finding is that at the time of the changes in incentives, i.e. week number 40, the response rates went up for all the three instruments used in the survey, which is what we expected to be the outcome of introducing these incentives.

To investigate the impact of the introduction of incentives in the survey in more detail, we apply a regression discontinuity (RD) design, as used in the programme evaluation literature (e.g. Heckman et al. (1999) and Lee and Card (2006)). The basic idea behind the RD design is the notion of the appearance of a threshold on a continuous scale – in our study, this scale is the week numbers in which the participants received the invitation to participate in the study, and the threshold occurred at week 40, when the incentive was introduced. We argue that since respondents on either side of the threshold (weeks 39 and 40) can be assumed to be almost identical in general characteristics – they are chosen randomly from Danish central population registers – the effect of the incentives can be estimated by estimating the difference in the response rates for the periods on either side of the threshold.

Using the notation from Heckman et al. (1999), we let Y_1 represent the response rate for individuals who have received the offer of the incentive ($t \geq 0$), and Y_0 the outcome if incentives have not been offered ($t < 0$). Since Y_1 and Y_0 cannot be simultaneously observed at any t, we instead observe $Y = D_t Y_1 + (1 - D_t)Y_0$. We wish to estimate an effect of the incentive, $E[Y_1|D_t = 1] - E[Y_0|D_t = 1]$, by estimating both the effect on an individual who received the incentive, $E[Y_1|D_t = 1]$, and the counterfactual observation for an individual who participated while the incentive was offered, but did not receive the incentive, $E[Y_0|D_t = 1]$. Since the counterfactual cannot be observed, we instead use $E[Y_0|D_t = 0]$ and extrapolate by assuming that the trend for the pre-incentive subsample would have continued into period $t = 0$ if the incentive had never been offered.

Because it is not possible to completely correct for seasonal variations in the behaviour of the respondents, we only look at data collected from 10 weeks before to ten weeks after the introduction of the incentive, i.e. from week 30 to week 49. Because some of the respondents contacted in weeks 44-47 were repeaters from a time use survey in 2001, we included a dummy to account for the non-random sampling of this group. A number of covariates to describe gender, ethnicity, family composition, etc. were also used as controls. Since we assume that the time trend does not change with the introduction of the incentive, we have the following model:

$$Y_{ij} = \beta_0 + D_t + \beta_1 t + D_{44-47} + \beta X_i + e_i \quad (1)$$

where Y_{ij} is the response rate for individual i in the month j, β_0 is the general intercept, D_t is a dummy for the incentive, β_{1t} is the time trend for t, D_{44-47} is the dummy for repeaters in week 44-47, β_{Xi} is a group of covariates, and e_i is the individual error term.

Since the characteristics of the respondents who choose to participate in the questionnaire may vary according to whether they have been offered the incentive or not we cannot simply evaluate the effect of the incentives based on the parameter estimate of D_t. Instead, as mentioned earlier, we estimate the difference in average response rates between individuals who received the incentive and the counterfactual observation, thereby taking the possible change in respondents' make-up into account. Hence, what we term the *average treatment effect of the treated* (ATE) is calculated as follows for the effect of the incentive in the period $t = 0$:

$$ATE = E[Y_1|D_t = 1] - E[Y_0|D_t = 1] \quad (2)$$

In Table 4 we use a Probit model to estimate the impact of the incentive and the treatment effect. The ATE is calculated by first extrapolating the predicted response rates for the pre-treatment period into the first week of the treatment

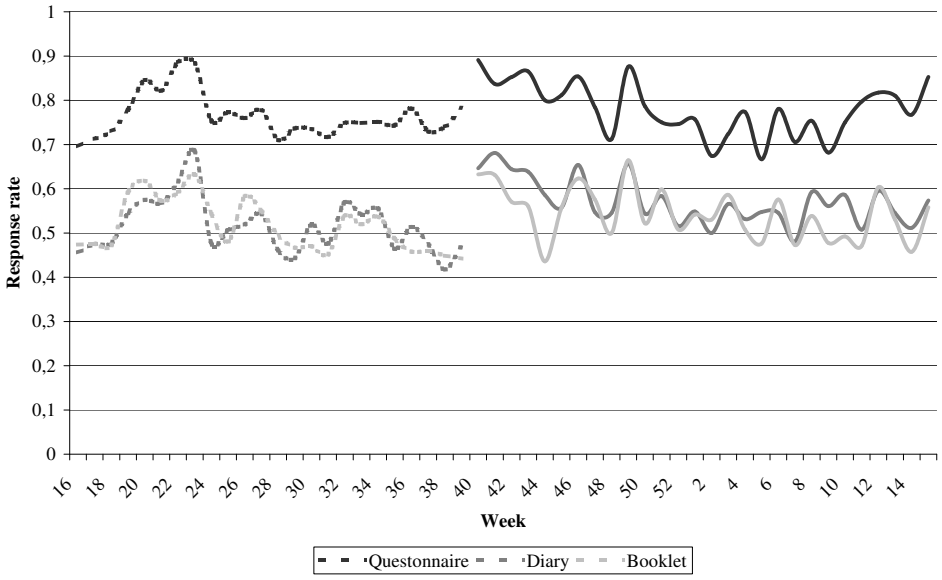

Figure 1. Response rates for the different instruments used in the survey during the period 1 April 2008 – 31 March 2009

Table 4: RD estimation for ATE on incentives (probit model)

	coeff.	SE
Incentive	.329**	.107
Migrant	-.506***	.108
Female	.121*	.052
Has children	-.011	.068
Couple	.275***	.061
Age (<25 years old)		
25-44 years old	.031	.104
45-59 years old	-.019	.101
≥60 years old	.001	.106
Weeks 44-47	-.098	.084
Time	-.002	.009
Constant	.437	
n	3,003	
R^2	.028	
ATE	.103	

* $p < .05$; ** $p < .01$; *** $p < .001$

period, and then subtracting this value from the predicted response rate for the first treatment period. We find the effect to be just over 10 per cent. We have also made the estimations using data from the entire period of the survey,[8] as well as for the same period but not including the dummy for the respondents who also participated in 2001. Both estimations produced similar results. The results were also reproduced using an OLS estimator, which gave the same effects.

We have also calculated the ratios of questionnaires completed via the web relative to those completed by telephone throughout the period of the survey, as shown in Figure 2. Although the proportion of web-completed questionnaires was considerably higher after the doubling of the lottery prizes for respondents who completed all the instruments via the web – i.e. after week 39 – we cannot separate the direct impact of this incentive from the indirect effect of the higher response rate for the whole survey.

Response quality – incentives and methods

The number of non-response items is often used to measure response quality of a questionnaire, working on the assumption that the more questions there are with no responses the lower is the quality of the survey (see for example Singer et al., 2000). We do the same here by looking specifically

[8] Here we also controlled for respondents interviewed in weeks 20-23 who were also participants in the 2001 survey. We also controlled for the Christmas period, where both interviewers and respondents were assumed to be less active.

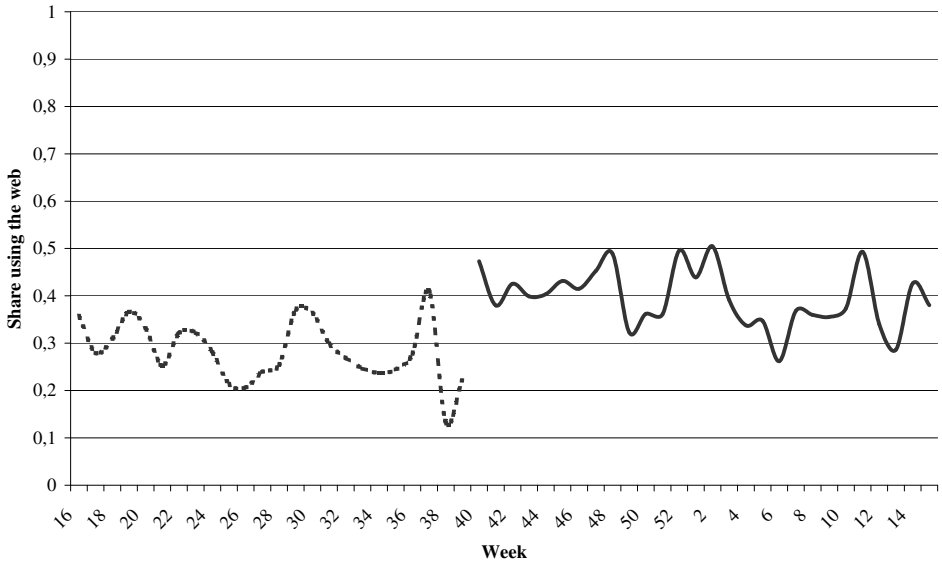

Figure 2. Ratio of instruments completed via the web relative to those completed by telephone during the survey period 1 April 2008 – 31 March 2009

at three questions that we believe might have been problematic, either because it is difficult to recall the information required or because they demand sensitive information. These questions concern 1) the number of holiday weeks taken the previous year, 2) expenditures on personal consumption in the previous year, and 3) personal income net of tax in the previous year.

The results are shown in Table 5 and 6, where we see that the great majority of respondents gave answers to all three questions, and that the mean number of positive replies was significantly higher among web users than among respondents interviewed by telephone. This result remains significant when we control for socio-economic characteristics such as sex, marital status, age, education and labour market attachment (Table 9). We therefore conclude that the use of the web yields a higher response quality than telephone interviews. At the same time we find that for the questionnaire, the introduction of incentives actually decreases quality for the respondents using telephone interviews – but because of the inherent selection problem introduced with the incentives, we cannot imply a causal relationship between the incentive and the quality of the telephone-based responses.

However, it should be noted that the rise in numbers of responses on the web was greater than the rise in the response rate, which implies that either the respondents who yielded a high quality in their responses were more prone to use the web – thereby creating a selection effect – or that the respondents who would not have participated had the incentives not been offered generally gave a poorer quality of answers to difficult or sensitive questions. If the one or the other explanation holds is indeed interesting, but not investigated here.

The response quality of the diaries is measured as the number of different activities recorded during the day and the number of activity sequences performed (the same activity may be performed several times a day), assuming that these numbers are, among other things, a function of the respondent's accuracy in filling out the diary. Hence, it is assumed that the more the respondent is able to choose the time of the day for making the response, the more accurate he or she will be, investing more effort in recalling what happened during the day(s) concerned. On the other hand not being able to get help from an interviewer may imply less accurate and fewer activities reported. Finally, we look at the ratio between different activities and sequences, to remove the possibility of autocorrelation between the two measures – i.e. the more sequences reported, the more different events are also reported. It has to be mentioned that counting the number of activities and sequences does not take into consideration that the accuracy of the time spent on different tasks may depend on the interview mode. For example found Hence, Kalfs and Saris (1998) that travel information obtained through telephone interviews was more reliable than by using the internet mode, while the opposite happened to watching TV information properly because of a tendency towards giving more social desirable answers to interviewers.

As we found for the questionnaire, the response quality was higher when respondents used the web relative to participating in a telephone interview. This is shown by Table 7 where the number of activities as well as the number of sequences is seen to be significantly higher when using the web mode than when using the telephone mode, which might confirm our expectations of greater accuracy when there is more time for making the response. When socio-economic characteristics are controlled for, we still find that the web mode is superior to the telephone mode, which also holds true for the ratio between the number of sequences and the number of different activities (Table 10).[9] We also find indi-

[9] From Table 10 we see that women are better at filling out di-

Table 5: Number of completed sensitive questions (1-3)

Distribution of variable	Answered 0	Answered 1	Answered 2	Answered 3	Total
Number of respondents	3	64	743	5,281	6,091

Table 6: Completed sensitive questions in questionnaire by method

	Mean number of questions answered
Telephone	2.79
Web	2.96
Ho: Diff = 0	t-value: 16.30, p < 0.001, df: 6,098

Table 7: Number of activities and sequences in diary by method

	Sequences (1-144)	Activities (1-37)
Telephone	14.97	9.10
Web	16.09	10.95
Ho: Diff = 0	t-value: -11.18 p <.0001 df: 12,336	t-value: -33.44 p <.0001 df: 12,336

Table 8: Number of goods and assigned goods in expenditure booklet by method

	Goods	Assigned goods
Telephone	14.89	13.77
Web	17.28	16.48
Ho: Diff = 0	t-value: -111.92 p < 0.001 df: 3573	t-value: -13.93 p < 0.001 df: 3573

Table 9: Number of completed sensitive questions in questionnaire, probit regression, 3 or <3 questions completed

	coeff.	robust SE
Method (web=1)	-.622***	.083
Incentive	-.334***	.047
Method*Incentive	-.597***	.120
Female	-.241***	.045
Couple	-.054	.053
Children	.045	.059
Age (<25 years old)		
25-44 years old	.722***	.103
45-59 years old	.579***	.100
≥60 years old	.427***	.114
Education (no education)		
skilled	.106	.058
short further	.217**	.066
long further	.102	.085
Labour market status (OLF)		
Student	.082	.124
Working	.066	.076
Unemployed	.008	.129
Constant	-.561	
Log Likelihood	-2109.92	
n	6091	
Pseudo R^2	0.116	

* p < .05; ** p < .01; *** p < .001

Table 10: Number of sequences and activities in diary. OLS regression models with robust SE

	# sequences (1-144)		# activities (1-37)		Ratio[1]	
	coeff.	robust SE	coeff.	robust SE	coeff.	robust SE
Method (web=1)	1.282***	.262	1.920***	.145	.077***	.006
Incentive	.573***	.131	.315***	.070	-.001	.003
Method*Incentive	-.598	.340	-.334*	.185	.002	.008
Female	1.311***	.100	.892***	.056	.003	.002
Couple	.260	.168	.033	.089	-.013**	.004
Children	.840***	.149	.586***	.081	.006	.006
Age (<25 years old)						
25-44 years old	2.220***	.322	1.287***	.171	-.009	.009
45-59 years old	2.064***	.324	1.206***	.172	-.010	.010
≥60 years old	2.579***	.349	1.444***	.186	-.018	.010
Education (no education)						
skilled	-.042	.158	.061	.085	.004	.004
short further	.443*	.179	.436***	.095	.009*	.004
long further	.648**	.220	.448***	.115	.005	.005
Labour market status (OLF)						
Working	-.645**	.194	-.126	.100	.016	.001
Student	-.537	.379	-.051	.203	.013**	.005
Unemployed	-.510	.497	-.352	.266	.001	.010
Day (weekend = 1)	-.012	.009	-.004	.005	.000	.000
IP reported two days	.459	.491	.076	.265	-.023*	.010
Movie tickets	.115	.441	.022	.245	-.005	.012
Constant	11.186		6.390		.651	
n	12,940		12,940		12,940	
R^2	.068		.155		.094	

[1]Number of activities divided by number of sequences
* p < .05; ** p < .01; *** p < .001

cations that the incentive actually yields a larger number of sequences performed as well as a larger number of different activities – though the parameter estimates for the interaction between the incentive and reporting online indicate that this is only found among respondents interviewed by telephone. However, no similar result is found for the ratio between sequences and unique activities.

Finally, the response quality of the expenditure booklet was higher when the web was used relative to the quality when the telephone was used, in the sense that more goods and services were reported using the former than the latter mode (Table 8). We looked at both reported goods in general and reported assigned goods (where the respondents indicated for whom the item was bought), and also the ratio between the two. Again, the quality differential remains significant when we control for socio-economic characteristics (Table 11). We only find an effect for the incentive when we look at the ratio, and here we find that the incentive lowers the reported 'assigned goods to all goods' ratio, but only for telephone respondents.

Conclusion

In this paper we have investigated the impact of incentives and the use of web-based CAPI on the response quantity and quality in a large scale Danish survey on time-use and consumption behaviour 2008/09. The point of departure was that most surveys nowadays suffer from ever lower response rates and that the growing use of web-based interviews seems to intensify this problem. However, web-based surveys have several advantages over telephone and face-to-face interviews, not least in terms of cost. We therefore introduced different monetary incentives dedicated to combating this problem.

The idea was to change the magnitude and structure of the monetary incentives after the survey had been in progress for some months, offering the new respondents larger lottery prizes than those participating in the first months of the survey. The survey was carried out over a period of one year, with around 6,000 completed interviews. Moreover, in the latter part of the survey the lottery prizes were doubled for respondents who filled out all the different parts of the survey – questionnaire, diary, expenditure booklet – using the web rather than being interviewed by telephone.

We found that large monetary incentives can have a significant effect on the general response rates in CATI and web-based CAPI surveys. We have also argued that not only can higher response rates be obtained through the use of incen-

aries than are men, however if we interact gender with the use of the internet mode (not shown) a higher quality – more activities and sequences – appears for men than for women using the internet.

Table 11: Number of goods and assigned goods in expenditure booklet. OLS regression models

	Number of goods		Number of assigned goods		Ratio	
	coeff.	robust SE	coeff.	robust SE	coeff.	robust SE
Method (web=1)	1.284***	.259	1.616***	.256	.026***	.003
Incentive	.080	.155	.072	.156	-.011*	.004
Method*Incentive	.363	.353	.505	.347	.012*	.004
Female	-.044	.143	-.178	.143	-.009*	.003
Couple	3.521***	.169	3.041***	.168	-.018***	.004
Children	.520**	.183	.325	.183	-.012***	.003
Age (<25 years old)						
25-44 years old	2.167***	.435	2.068***	.496	-.014	.008
45-59 years old	2.694***	.440	2.453***	.420	-.023**	.008
≥60 years old	2.001***	.476	1.719***	.458	-.033**	.010
Education (no education)						
vocational	1.565***	.202	1.557***	.201	.007	.005
short further	2.840***	.220	2.915***	.221	.018***	.005
long further	3.347***	.296	3.429***	.268	.020***	.006
Labour market status (OLF)						
Student	.558	.483	.680	.467	.017	.009
Working	1.888***	.241	1.739***	.243	-.001	.005
Unemployed	.859	.520	.579	.523	-.011	.014
Cinema Tickets	.788	.503	.791	.520	.002	.010
Constant	7.034		6.712		.961	
n	3,579		3,579		3,579	
R^2	.355		.328		.064	

* p < .05; ** p < .01; *** p < .001

tives, but also that the choice of instruments – telephone or web – can be influenced when participants are offered differentiated incentives. This result is interesting, because empirical evidence shows that monetary incentives have only a limited impact on response rates, and to our knowledge no-one has previously investigated the effect of differentiating the monetary incentives with the aim of prioritizing one instrument – the web – over another instrument – the telephone.

Another interesting finding concerns the response quality from using different interview instruments in large surveys. We consistently found that respondents' use of web-based CAPI yielded a higher response quality than the use of a CATI instrument. This holds for the questionnaire, where more questions were answered using the former instrument relative to the latter, for the diary, with more registered activities and sequences, and for the expenditure booklet, with a larger number of goods and goods assigned to individuals in the household obtained when respondents used the CAPI instrument rather than the CATI instrument.

The conclusion to be drawn from this paper is therefore that not only can large monetary incentives increase the response rates in a survey, but also that the response quality may increase if one succeeds in getting more people to use the web instrument instead of being interviewed by telephone. Whether this would hold for other surveys is an open question; the survey used here was relatively complex, in that it included not only a questionnaire but also time-diaries and booklets with expenditure information. It could be, however, that the effect would be as great or greater in simpler surveys.

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