Does Dependent Interviewing Really Increase Efficiency and Reduce Respondent Burden?

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ABSTRACT

Dependent interviewing techniques, where substantive information from previous interviews is fed forward and used in the formulation of questions or to prompt post-response edit checks, are increasingly employed by panel surveys. While there is substantial evidence that dependent interviewing improves the quality of longitudinal data, claims of improved efficiency of data collection and reduced respondent burden are mostly anecdotal. This paper uses data from a large experiment to systematically compare the effects of different question designs on efficiency and burden. The comparison highlights the wide variety of design options for dependent interviewing questions and their corresponding effects. In the present setup, efficiency gains were mainly due to reductions in coding costs for occupation and industry questions. The paper concludes by identifying the conditions under which dependent interviewing offers the largest scope for efficiency gains and burden reduction.

1   Introduction

All panel surveys feed forward identifying information to enable tracing and selection of respondents, and may also use such information as a basis for routing through the questionnaire. Increasingly panel surveys also feed forward substantive information, for example answers from previous interviews about income sources or labour market activity. These are used to remind respondents of previous reports and to route around follow-up questions if no changes have occurred (proactive dependent interviewing) or to prompt post-response edit checks to verify changes (reactive dependent interviewing). The main argument for using dependent interviewing (DI) techniques is their potential for improving data quality by reducing false rates of change (see Hill 1994; Hoogendoorn 2004; Jäckle and Lynn 2004; Lynn et al. 2004a; 2004b; Murray et al. 1991; Sala and Lynn 2004) and item non-response (Bates and Okon 2003; Moore and Griffiths 2003). Proactive DI may in addition increase the efficiency of data collection and reduce respondent burden. The evidence of such benefits is, however, mostly anecdotal. The present paper evaluates the effects of DI on efficiency and burden using data from a large scale experiment, which compared proactive and reactive DI with independent interviewing for a range of survey items.

The general conception is that "[d]ependent interviewing can bring very significant savings in both interview and coding time" (Lynn et al. 2004a, p.17). If no changes have occurred since the previous interview, the possibility of routing around follow-up questions reduces redundancy and leads to shorter interview durations. Similarly, the possibility of feeding forward coded answers to open-ended questions reduces coding costs. In this spirit Weinberg (2002) claimed that the interview length for the SIPP was reduced with the introduction of dependent interviewing. On the other hand, Mathiowetz and McGonagle (2000, p.411) noted that "the effect of dependent interviewing on administration time [is not clear]; the interviewers for several studies have indicated that the use of rosters resulted in more efficient interviewing (no quantitative data available), but the need to resolve conflicting pieces of information may lead to increases in administration time".

Fewer redundant (and therefore potentially irritating) questions and shorter interview durations obviously reduce respondent burden. In addition, presenting previous answers to respondents can make questions less tedious and demanding: the cognitive task of remembering becomes a task of recognising (Hoogendoorn 2004). Finally, the required answers may be shorter and easier. For example a question about current occupation can be

phrased as a yes/no question ('Last time you said your occupation was <OCCUP>. Are you still in that occupation?') instead of an open-ended question.

The effects of DI on efficiency and burden are not easily unravelled. Hoogendoorn (2004) described an application of proactive dependent interviewing (PDI) to questions on assets and liabilities and concluded that it did not lead to a substantial reduction in respondent burden in terms of interview duration. This conclusion is misleading, however. PDI can have confounding effects on sections where sets of questions are repeated an indefinite number of times. In Hoogendoorn's case respondents were first asked to report all assets and liabilities and then asked a set of follow-up questions about the characteristics of each item. If PDI reduced under-reporting in the first stage, it would have multiplied the number of times the follow-up questions were asked. So although PDI may lead to savings in questions and interview duration for a given number of items reported, overall these savings may be compensated by reductions in under-reporting.

This paper provides a systematic comparison of the effects of different DI designs on efficiency and burden for questions on current employment, earnings, school-based qualifications, income sources and job histories. The comparison highlights the variety of design options for DI questions and their corresponding effects. Focusing on PDI, different scenarios are distinguished according to the extent to which redundancies are eliminated or questions added and the extent to which net effects depend on the stability of characteristics or on the impact of DI on under-reporting. In the current study efficiency gains were mainly due to reductions in coding costs for industry and occupation questions by nearly three-quarters.

The experimental data and the design of the dependent interviewing questions are presented in Section 2, followed by a description of the expected effects of the PDI questions in Section 3. Section 4 examines the effect of PDI for each of the five experimental sections. Section 5 concludes by drawing out the conditions under which PDI offers the largest scope for improvements in terms of efficiency and burden.

2   Data and experimental DI questions

This paper uses data from an experiment carried out as part of a project on "Improving Survey Measurement of Income and Employment (ISMIE)" funded by the UK Economic and Social Research Council Research Methods Programme. The study followed up respondents from the UK low-income sub sample of the European Community Household Panel Survey,

for which funding expired in 2001. Respondents had been interviewed annually since 1994 and since 1997 jointly with the British Household Panel Survey (BHPS). The experimental study was based on the 2002 BHPS questionnaires, although some sections were shortened and others added for methodological purposes (for details see Jäckle et al. 2004). Computer assisted personal interviews (CAPI) were sought with all full respondents to the 2001 survey and achieved with 1,033 adults (89%). Fieldwork took place in spring 2003.

Three versions of questions were developed for the sections on current employment, earnings, job histories (covering the period since the previous interview), income sources and school-based qualifications: proactive dependent interviewing (PDI), reactive dependent interviewing (RDI) and independent interviewing (INDI). The INDI version used the standard BHPS questions. Respondents were randomly assigned to one of the three treatment groups. Table 1 summarises the design of the dependent interviewing questions. (The classification adopted in Table 1 was inspired by Pascale and Bates' (2004) classification of the different designs of dependent interviewing questions in the Survey of Income and Program Participation Methods Panel). The guiding objective was to improve data quality, although the PDI questions on current and retrospective occupation and industry were designed to also reduce redundancy of questions and coding.

With PDI respondents were always reminded of their answers in the previous interview. For current employment and earnings this information was used to ask about change in the form of 'Remind, Still?' questions. For example, "Last time we interviewed you, on <INTDATE>, our records show that your pay was <AMOUNT> per <PERIOD> <NET/GROSS>. Is that still the case now, or has your pay changed?" In the earnings section all respondents were then asked the original INDI question about their earnings. (The PDI question had been included to test whether DI would capture changes in earnings). In the current employment section additional routing was introduced depending on the answer to the 'Remind, Still' question. Respondents who said they were no longer in the same occupation were asked the open INDI question "What was your (main) job last week? Please tell me the exact job title and describe fully the sort of work you do." The answer was coded to the Standard Occupational Classification. Respondents who were still in the same occupation were routed around the open question and the occupation code from the previous wave was brought forward. Similarly, if respondents said they were no longer working for the same employer, they were asked two open INDI questions: "What does the firm/organisation you work for actually make or do?" and "What is the exact name of your employer or the trading name if one is used?" The answers to these questions were coded to the Standard Industrial

Classification. If the respondent was still working for the same employer, these two open-ended questions were skipped and the industry code from the previous interview was brought forward.

Table 1: Design of ISMIE dependent interviewing questions

Question	PDI		RDI
	Reminder	Routing	Corrective
Current employment			
Occupation	Still	Fewer open questions[1]	Always
Industry	Still	Fewer open questions[1]	Always
(Self-)Employed	Still	–	If inconsistent
Managerial duties	Still	–	If inconsistent
Sector	Still	–	If inconsistent
Size of workforce	Still	–	If inconsistent
Earnings from employment	Still	–	Selective
Income sources	Continue	–	If inconsistent
Job history	Confirm	Fewer open and closed questions[2]	If inconsistent
School-based qualifications	Confirm	–	If inconsistent

[1] If no change reported compared to previous interview. [2] For all respondents irrespective of change.

For income sources the reminder merely provided a boundary and memory support. In these 'Remind, Continue' type questions, the respondent was reminded of previous sources and asked whether he had continued to receive these: "According to our records, when we last interviewed you, on <INTDATE>, you were receiving <INC_x>, either yourself or jointly. For which months since <INTMON> have you received <INC_x>?" Respondents were then asked the INDI question in order to capture any additional sources. This involved showing the respondents four showcards, each containing a list of up to ten income sources.

For the job history and school-based qualifications, the respondent was asked to verify the information recorded in the previous interview. The 'Remind, Confirm' question in the job history section, for example, was "When we last interviewed you, on <INTDATE>, our records show that you were <ACTIVITY_TXT>. Is that correct?" Respondents were then asked adapted versions of the INDI questions covering schooling and economic activities since the previous interview. The job history questions were designed to reduce redundancy of questions for all respondents, by eliminating the overlap in activity reports across interviews. In the BHPS, respondents are asked to report details on their current activity at each interview. In the following year, they are asked about their activities since the start of fieldwork for the previous wave. Respondents therefore report on their wave t 'current activity' again in wave t+1: either in the form of the t+1 'current activity' if this has not changed, or in the retrospective histories if the activity has changed. The PDI design

eliminated the overlap in the job history questions by reminding respondents of their previous report of current activity and asking when this had ended. Not asking the whole battery of INDI questions meant that respondents who were not in employment at the time of the previous interview were asked three questions fewer, while respondents who had been in employment were asked 15 questions fewer, including two open-ended questions about occupation and industry.

The reactive treatment group were asked the independent questions plus corrective follow-up questions to verify apparent changes in reports. The objective was to ascertain that changes were not spurious, caused for example by different descriptions and subsequent coding of industry and occupation or by recall errors. In the case of current occupation and industry a follow-up question was always asked to verify whether the verbatim answer referred to the same occupation or industry as in the previous interview. For earnings a follow-up question was triggered if the report was 10% above or below the previous report. For all other sections, follow-up questions were asked whenever a report was inconsistent with the previous report. In all cases respondents were asked to correct and, except for current occupation, industry and income sources, to explain reasons for discrepancies. Since the only differences compared to INDI were the additional follow-up questions and requests for clarification, one would expect RDI to have adverse effects on efficiency and respondent burden.

3   Expected effects of PDI

The PDI questions can be grouped into four scenarios according to their expected effects on efficiency and burden. First, the design of the school-based qualification and earnings questions always implied additional questions. One would therefore not expect any gains in efficiency or reductions in respondent burden.

Second, for the current employment questions the net effect of PDI depended on the degree of stability experienced by respondents. If their situation had not changed since the previous interview, the INDI questions were replaced by easier (and potentially quicker) yes/no questions. In the case of occupation and industry there were also fewer open-ended questions. One would therefore expect the PDI question to reduce burden, interview duration and coding costs. If, however, the respondent had experienced a change, the original INDI question was asked in addition to the PDI question. The net effect of PDI therefore depends on the rates of change.

Third, in the job history questions redundancies in reporting the previous current economic activity were reduced for all respondents by eliminating overlapping reference periods. One would therefore always expect the PDI job history questions to be more efficient. Since INDI asked significantly more questions about employment spells than about non-employment spells, the gains are likely to be larger if the prevalent activity was employment. However, the following scenario also impacts on the job history questions.

Fourth, for the questions on job history spells and income sources the net effect of PDI depends on the effect on under-reporting. In these sections a predetermined number of questions were asked about each spell or source reported by the respondent. Depending on the number of spells or sources reported, the total number of questions therefore varied across respondents. (These sections can be thought of as 'indeterminate loops', where the size of the loop is known in advance, but it is not known how often the loop will be repeated.) For a given number of spells the reminder should simplify the recall and identification of income sources and activity spells, especially since both types of questions are burdensome, because they involve long lists or require retrospective recall. On the other hand, if the reminder reduces under-reporting of spells, PDI has a multiplicative effect on the number of questions respondents have to answer, since the loop is repeated once for each additional spell reported (this differs from the first two scenarios, where the PDI questions are merely additive). The net effect of PDI on the 'indeterminate loop' sections therefore depends on the effect of PDI on under-reporting.

Before examining the results, it is worth mentioning how the design of the DI questions in the ISMIE experiment compared to other surveys currently using DI techniques. The comparison is not straightforward, however, because different surveys use DI for different sets of questions and apply a variety of design features. In general the ISMIE PDI questions on occupation and industry were similar to those in the Current Population Survey (CPS), the Survey of Labour and Income Dynamics (SLID) and the Survey of Income and Program Participation (SIPP). The main difference is that these surveys make more use of routing around follow-up questions on employment characteristics. The PDI question on income sources was similar to the SIPP, as was the RDI question on earnings. Finally, the RDI question on income sources was similar to the SLID. (For information on DI in these surveys, see Hiltz and Cléroux 2004a; 2004b; Kostanich and Dippo 2002; Moore and Griffiths 2003). The comparison with PDI designs in other surveys suggests that there is scope for further efficiency gains compared to the ISMIE setup, if more extensive use is made of routing. In addition, the proportion of respondents who have not experienced

changes is likely to be larger in surveys with shorter periods between interviews, such as the CPS where interviews take place monthly.

4 Results: PDI *can* increase efficiency and reduce burden

As expected the effects of DI on efficiency and burden varied considerably across questions, depending on their nature and design. Each experimental section is therefore discussed separately, rather than drawing conclusions for the interview as a whole. As indicators of efficiency and burden, we used (1) the average number of answers provided by respondents, (2) the average number of open-ended answers which were subsequently coded and (3) the average administration time (Table 2). For each section the analysis is based on the sub sample of respondents who were asked the experimental questions: the qualification section includes all respondents; earnings are based on employees; current employment includes the employed and self-employed; income sources include only respondents who reported at least one source; the job history section includes only respondents whose current activity began after the start of fieldwork for the previous wave or after the date of the previous interview (PDI) and who therefore reported at least one retrospective activity spell.

Table 2: Mean number of (open-ended) answers and section timings

Section	Mean	INDI	PDI	RDI
School-Based Qualifications	Number of answers	0.7	1.4 ***	0.4
	Number of open-ended answers	-	-	[1]
	Length of section (mins)	3.3	3.7	2.9 *
	N	348	341	344
Earnings from employment	Number of answers	6.5	7.3 ***	6.7
	Number of open-ended answers	-	-	[1]
	N	149	149	137
Current Employment	Number of answers	5.6	6.6 ***	7.9 ***
	Number of open-ended answers	1.95	0.7 ***	2.03 **
	N	166	168	155
Income Sources	Number of answers	16.2	24.4 ***	17.4
	Number of open-ended answers	-	-	-
	Length of section (mins)	11.3	11.9	10.6
	N	244	252	274
Job History	Number of answers	14.8	6.6 ***	14.1
	Number of open-ended answers	2.1	0.4 ***	2.5
	N	75	99	82

Notes: Asterisks (*) indicate results from a test of difference of means compared with INDI. *** P<0.001, ** 0.001<P<0.01, * 0.01<P<0.05. 'Not answered' and 'refused' were coded as answers. Check questions were excluded, since they are automatic in CAPI.

Separate information on administration time was available for the demographic section of the survey, which included the qualification questions, and for the household finance section, which included the income source questions. The questions related to economic activity (current employment, earnings and job history) were timed as one survey section. Table 2 does therefore not include the average durations for these experimental sections. Instead, Table 3 presents the results of regressing the combined administration time on dummies for the experimental sections answered and interactions with the treatment groups expected to affect timing (treatment group alone was not a significant predictor.)

Table 3: Joint administration time for current employment, earnings and job history questions

	Coef.	(SE)	t	
Currently employed	9.370	0.887	10.57	***
Employed * PDI	-2.076	1.202	-1.73	+
Employed * RDI	-1.565	1.214	-1.29	
Currently earning	-0.962	0.918	-1.05	
Earning * PDI	1.803	1.273	1.42	
Earning * RDI	2.855	1.287	2.22	*
Number of employment spells in job history	2.932	0.283	10.37	***
Number of non-employment spells in job history	1.459	0.275	5.3	***
Employed at previous wave * Job history	2.287	0.517	4.42	***
Employed at previous wave * Job history * PDI	-2.027	0.704	-2.88	**
_cons	1.764	0.160	11.02	***
N	1030			
Adjusted R^2	0.696			

*** $P<0.001$, ** $0.001<P<0.01$, * $0.01<P<0.05$, + $P=0.08$.

4.1 School-based qualifications and earnings

In these sections the PDI design always implied additional questions. This is reflected in Table 2, PDI increased the average number of answers given by just under one in each section. The increase did, however, not impact on the administration times: reporting earnings with PDI did not increase the combined duration of the economic activity related questions (Table 3) and confirming previous reports of school-based qualifications did not increase the duration of the relevant section (Table 2).

For current earnings PDI respondents were reminded of their report in the previous interview and asked whether they still earned the same amount. They were then asked the INDI questions about their current earnings. Efficiency gains could have been achieved by skipping the follow-up question if no change in earnings was reported. In fact, the PDI question was added to test whether PDI would lead to under-reporting of change. At the

individual level the answers to the PDI 'Remind, Still' question were inconsistent with the independent reports of earnings in some cases: for 12% of respondents who claimed their earnings had not changed, the independent reports varied by more than +/-10%. We do not know, however, whether the PDI question led to false reports of stability, or whether the reported amounts contained errors inferring false rates of change. At the aggregate level PDI did not lead to different results. Substituting the previous wave information for respondents who reported that their earnings had not changed led to comparable mean earnings, mean changes in earnings and proportions of respondents who experienced a change by more than +/-10%. Ideally one would want to know how well PDI captures change after a number of successive interviews, since an initial amount of earnings may be fed forward several times, if the respondent repeatedly answers the 'Remind, Still' question saying he has not experienced any change.

The RDI earnings questions included a request for clarification if the reported earnings differed from the previous year's report by more than 10%. Table 3 shows that this increased the section timing by nearly 3 minutes compared to the INDI earnings questions.

4.2   Current employment

In this section the net effect of PDI depended on the degree of stability experienced by respondents: if no changes had occurred since the previous interview respondents were routed around follow-up questions, if changes had occurred respondents were asked additional questions. According to Table 2, PDI increased the mean number of answers by one. At the same time, the number of open-ended answers about occupation and industry was significantly reduced: from 2.0 with INDI to 0.7 with PDI (-65%). In the ISMIE survey, coding costs amounted to approximately 45 pence per code. (This estimate covers all coding done for the survey and is likely to be conservative to the extent that industry and occupation coding was more costly than the remainder coding activities). The average costs with INDI or RDI were therefore 90 pence per employed respondent compared to 31.5 pence with PDI, reducing coding costs by two-thirds. Although PDI increased the mean number of answers, the combined duration of the economic activity related questions was shortened by two minutes (Table 3). This suggests that the open-ended industry and occupation questions were replaced by more, but easier, questions.

Additional savings could be achieved by routing respondents who report working for the same employer and in the same occupation as in the previous year around subsequent

questions on the nature of their work, for example whether they were an employee or self-employed, whether they had managerial duties, the sector and size of the workforce.

4.3 Income sources

In the sections where questions were repeated as indeterminate loops, the net effect of PDI on burden depended on the effect on under-reporting. In the income sources section, PDI respondents provided on average 8 answers more than INDI respondents. This is however not because PDI added many questions per se (for each income source reported in the previous interview, one question was added). The initial interpretation was that this increase was due to a reduction of under-reporting of income sources, since for each source reported, five follow-up questions were asked. On inspection of the data, however, it became clear that the increase in the average number of answers was due to an apparent problem with the PDI income source questions. Nearly 50% of PDI respondents who answered this section reported at least one source twice, first when asked about a previous income source and then in the INDI follow-up question, when respondents were shown the showcards and asked whether they had received any other sources. (Duplicate reports were recorded by nearly all interviewers, but prevailed among respondents who reported three or more different income sources. This could perhaps be avoided by placing more emphasis on the need to exclude sources that have already been mentioned, both in the question wording and in the interviewer training.)

Ignoring duplicate reports, the reporting of income sources hardly increased with PDI: INDI respondents reported on average 1.9 sources compared to 2.1 sources with PDI (2.7 compared to 2.9 among respondents who reported at least one source). Including duplicate reports, the number of sources reported with PDI was 3.0 (4.1 among respondents who answered the income source questions). Although duplicate reporting increased the number of answers by 50%, the time to administer this section did not increase compared to INDI. Presumably respondents who were reporting on a source for the second time did not have to think much about the answers, nonetheless one would expect the timing to increase. This suggests that the income source questions were faster to administer with PDI, possibly because INDI respondents spent a lot of time at the first stage, sorting out which sources they received, and that this time was reduced when they were reminded of their previous answers.

4.4　Job history spells

In this section questions were also repeated as indeterminate loops, and therefore the net effect of PDI depended on the effect on under-reporting. On the other hand, eliminating the redundancy in reporting the previous current activity meant that efficiency gains should be expected. Since the number of questions was larger for employment spells, gains should be larger if employment was the prevalent activity.

The mean number of answers was reduced from 14.8 with INDI to 6.6 with PDI (-55%), while the number of open-ended answers was reduced from 2.1 to 0.4. Differences in coding costs for the job history questions were consequently even larger than for the current employment questions, with PDI reducing costs by 81%. The average cost for respondents who answered the job history questions was £0.95 with INDI and £1.13 with RDI, compared to £0.18 with PDI. Table 3 indicates the impact of reporting retrospective employment and non-employment spells on the combined administration time, with employment spells adding on average three minutes and non-employment spells adding 1.5 minutes. If the previous current activity had been an employment spell, eliminating the redundancy in the PDI job history section reduced the administration time by two minutes.

The large reduction in the number of (open-ended) answers indicates that employment was indeed the prevalent type of activity at the time of the former interview. Reminding respondents of their previous activity did not appear to increase reporting, since the average number of activity spells reported by INDI and PDI respondents was the same (0.4 among all respondents and 1.6 and 1.5 among respondents who answered the job history section). On the other hand, the average recall period for the PDI sample was one month shorter than for the INDI and RDI samples (17 instead of 18 months), because PDI respondents were only asked about their retrospective activities until the date of the previous interview, while INDI and RDI respondents were asked about their activities until the start of fieldwork for the previous wave. Whether the reminder and the shorter reference period had opposing effects on the number of spells reported is impossible to distinguish.

5　Summary and conclusions

This paper has provided a systematic comparison of the effects of different DI designs on the efficiency of data collection and respondent burden. Focusing on PDI the comparison highlighted the impact of different design features, both of the DI questions and the survey in general. In terms of question design, the first criterion is whether PDI is used to route around

redundant questions, or whether PDI merely adds questions. The second criterion is whether reminding the respondent of previous answers has any impact on the difficulty of the question. If PDI is used as an opportunity for additional routing, the impact depends on the degree of stability, largely determined by two general features of the survey: the length of the reference period and the nature of the characteristics of interest, in other words the survey topic.

The findings suggest that PDI offers the largest scope for improving efficiency and reducing burden if applied:

1. to route around open-ended questions which are subsequently coded, in which case both interview and coding time can be reduced,

2. to route around multiple follow-up questions, or loops,

3. to difficult questions where the reminder significantly accelerates respondent recall and reporting,

4. to simplify the nature of required answers, in particular by asking yes/no instead of open-ended questions,

5. to questions about relatively stable characteristics,

6. in surveys with short reference periods.

There are of course some trade-offs. First, the scope for gains through routing also depends on the reliability of data collected at the initial wave. The use of dependent interviewing at subsequent waves may therefore warrant more care and time at the initial wave. Second, the definition of efficiency in terms of administration and coding time ignores other aspects such as additional costs of preparing substantive data to be fed forward and costs of programming and testing complex DI questionnaires in CAPI. Programming costs are fixed, so the cost per respondent decreases with the size of the sample, while feed-forward costs are proportional to the sample size. For the present experiment data about such costs were unfortunately not available. On the other hand, PDI reduced coding time by two-thirds in the current employment section and by 80% in the job history section. For a sample of 10,000 this would represent savings in coding costs of approximately £8,100 per wave of data collection, assuming an employment rate of 60%. By the same token, PDI reduced the estimated duration of the current employment and the job history sections by two minutes each. The initial development costs for DI may therefore be offset by annual efficiency gains, especially for large sample surveys. Ultimately the decision whether to adopt dependent interviewing techniques should weigh net costs against, potentially substantial, improvements in data quality.

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