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**Measuring change in employment characteristics:  
The effects of dependent interviewing**

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## ABSTRACT

Surveys that take repeat measurements on the same individuals (panel or follow-up surveys) are often used to measure change in employment characteristics. This article is concerned with measurement error in such estimates of change and, specifically, how the error might be reduced by the use of dependent interviewing (DI) techniques. We use data from a large-scale experiment that involved two interviews at an interval of around 17 months and compare estimates of change that are obtained using three different interviewing techniques: traditional independent interviewing (INDI), proactive dependent interviewing (PDI) and reactive dependent interviewing (RDI). We examine three characteristics of the respondent's employment (occupation, employed status, and whether or not the respondent has managerial or supervisory responsibilities) and three characteristics of the employing organisation (industry, type of organisation, number of employees). We focus on the estimation of change in each of these six characteristics.

We find that PDI results in lower levels of observed change for occupation, industry and number of employees. This reduction in observed change appears to represent a reduction in measurement error as the effect of PDI is particularly pronounced amongst respondents who have not reported a change in job between survey waves. Levels of change in employment characteristics amongst INDI respondents who have not reported a change in job remain implausibly high.

The reduction in measurement error brought about by PDI is particularly associated with certain employment characteristics. A reduction in the observed level of change in occupation is associated with SOC major groups 1-4 and respondents working at workplaces with large number of employees. A reduction in the observed level of change in industry is associated with certain industries and with respondents who are managers or professionals (SOC major groups 1 or 2) or have foreman or supervisor status. A reduction with PDI in the observed level of change in number of employees at the workplace is associated with large workplaces, having foreman/supervisor status, being employed in the public administration or education sectors, and being in a craft or related occupation or a plant or machine operative. We also found that measurement error was particularly reduced by PDI amongst respondents aged 36 or over and amongst the most highly qualified respondents.

**Key words:** dependent interviewing, employment, industry coding, labour market transitions, measurement error, occupation coding

## 1. Introduction

Surveys that take repeat measurements on the same individuals (panel or follow-up surveys) are often used to measure change in employment characteristics. This article is concerned with measurement error in such estimates of change and, specifically, how the error might be reduced by the use of dependent interviewing (DI) techniques. We use data from a large-scale experiment that involved two interviews at an interval of around 17 months and compare estimates of change that are obtained using three different interviewing techniques: traditional independent interviewing (INDI), proactive dependent interviewing (PDI) and reactive dependent interviewing (RDI).

The substantive variables that we examine represent three characteristics of the respondent's employment (occupation, employed status, and whether or not the respondent has managerial or supervisory responsibilities) and three characteristics of the employing organisation (industry, type of organisation, number of employees). We focus on the estimation of change in each of these six characteristics.

After describing the data (section 2), we investigate whether estimated levels of change differ between INDI, PDI and RDI (section 3) and whether differences appear to be associated with different levels of measurement error (section 4). We further explore whether any differences are associated with certain characteristics of the employment (section 5) or of the respondent (section 6). We draw some conclusions regarding the effects of DI and point out some practical implications both for data analysts and for survey designers (section 7).

## 2. The Data

We use data collected in two interviews with a national sample of 1,034 persons aged 16 or over in the UK. The first interview constituted wave 8 of the UK part of the European Household Panel Survey and took place between September 2001 and February 2002. The second interview was part of the “Improving Survey Measurement of Income and Employment” project, carried out at the University of Essex and funded by the Research Methods Programme of the UK Economic and Social Research Council. This took place between February and May 2003. Both interviews were carried out in respondents’ own homes using computer-assisted personal interviewing (CAPI). We refer to the first interview as “wave 8” and the second as “ISMIE”. Further details of the sample design and ISMIE field work can be found in Jäckle et al (2004).

At wave 8, an identical survey instrument was administered to all sample members. At the ISMIE interview, the sample was randomly allocated to three treatment groups that we refer to as the INDI, PDI and RDI groups. For the INDI group, the questions about employment were identical to those asked at wave 8. The PDI group were instead presented with the answer they had given at wave 8 and asked if this still applied. If they replied “no”, the standard question was then asked. The RDI group were first asked the standard question, but this was followed up with a check question asking the respondent to confirm whether or not this represented a change since last time. For occupation and employer, the check question was asked of all RDI respondents, feeding back the answer given last time. For employee status, managerial status, and number of employees the check question was only asked if the answer given did not correspond with the answer given at wave 8. We are

concerned here with estimates of change in employment details and our analysis is therefore restricted to the 434 ISMIE sample members who reported being in employment at both interviews.

### **3. Estimates of Change**

We examine here three characteristics of the respondent's employment (occupation, employed status, whether the respondent has managerial or supervisory responsibilities) and three characteristics of his or her employing organisation (sector of industry, type of organisation, number of employees). We focus on the estimation of change in each of these characteristics.

For each characteristic, we constructed for each respondent an indicator of whether the characteristic appeared to have changed between the two survey interviews. The analysis is restricted to respondents who were in work at the time of both interviews. The proportion of in-work respondents whose survey responses indicated change is presented in Table 1 for each of the three treatment groups (left-hand panel).

**Table 1: Percentage reporting change in employment characteristics**

| Percentage reporting change   | All respondents in work at both waves |            |            | All respondents in same occupation at both waves |           |            |
|-------------------------------|---------------------------------------|------------|------------|--|-----------|------------|
|                               | INDI                                  | RDI        | PDI        | INDI   | RDI       | PDI        |
| <u>Occupation</u>             |                                       |            |            |  |           |            |
| Managerial duties (2)         | 14.7                                  | 9.2        | 8.9        | 16.1   | 1.3***    | 2.2***     |
| Employee/ self-employed       | 2.7                                   | 2.9        | 1.3        | 0  | 2.2       | 0.9        |
| SOC major group (9)           | 31.0                                  | 28.3       | 20.1*      | 23.7   | 15.2      | 0***       |
| SOC minor group (76)          | 46.5                                  | 35.5       | 20.8***    | 33.0   | 20.7+     | 0***       |
| SOC unit group (371)          | 52.8                                  | 41.3+      | 23.5***    | 37.1   | 25.0      | 0***       |
| <u>Employing Organisation</u> |                                       |            |            |  |           |            |
| Type of organisation (8)      | 10.1                                  | 9.2        | 6.7        | 8.0  | 7.7       | 4.3        |
| Number of employees (9)       | 49.6                                  | 42.4       | 32.8**     | 38.4   | 37.7      | 18.9**     |
| SIC sections (17)             | 26.6                                  | 22.0       | 16.4*      | 14.7   | 11.4      | 0***       |
| SIC divisions (60)            | 30.9                                  | 28.0       | 17.9*      | 18.9   | 15.9      | 0***       |
| SIC groups (222)              | 38.8                                  | 40.9       | 20.1***    | 25.3   | 29.5      | 0***       |
| SIC classes (503)             | 43.2                                  | 43.2       | 20.1***    | 30.5   | 33.0      | 0***       |
| <i>Base</i>                   | <i>146</i>                            | <i>138</i> | <i>150</i> | <i>97</i>  | <i>92</i> | <i>106</i> |

Note: bases for some estimates are slightly smaller than indicated due to item non-response. RDI and PDI are each compared separately with INDI using a one-sided Pearson  $\chi^2$  test on the relevant 2x2 table. + indicates  $0.06 \geq P > 0.05$ ; \*  $0.05 \geq P > 0.01$ ; \*\*  $0.01 \geq P > 0.001$ ; \*\*\*  $0.001 \geq P$ .

### 3.1 Characteristics of respondent's occupation

The respondent's occupation is classified according to the Standard Occupational Classification (SOC) (Employment Department Group and Office of Population Censuses and Surveys, 1990). The classification is hierarchical and we can therefore examine change in terms of any of the three levels of the hierarchy, which are identified by the digits of the SOC code. The full 3-digit code defines a "unit group", of which there are 371. These are divided into 76 SOC minor groups (defined by the first 2-digits of the code), which are in turn divided into nine SOC major groups, defined by the first digit of the code. SOC codes are assigned in the office post-fieldwork by trained coding staff. The code applied therefore depends on the words used by the respondent to describe their job, the words used by the interviewer to record this description, and the code chosen by the coder to best fit the words recorded. There could be a variation in outcome at any one of these three stages, even when the respondent is describing the same job. Campanelli *et al*

(1997) show reliability of between 0.78 and 0.82 across five studies of office occupation coding in the UK (including their own two studies). It therefore seems *a priori* likely that measurement error would lead to spurious apparent change when using INDI. Our expectation is therefore that DI is likely to reduce the apparent level of change in SOC, as measurement error in the assignation of a SOC code will no longer be independent between interview waves.

The INDI data show that 53% of in-work respondents are assigned a different SOC unit group at the two interviews, compared with 31% who are assigned to different SOC major groups. At each of the three levels of detail, the proportion assigned differently at the two interviews is significantly less ( $P < 0.05$ ) with PDI. And the differences are large in magnitude. The proportions who appear to have changed occupation are less than half those obtained with INDI for both unit groups (3-digit codes) and minor groups (2 digits), and around two-thirds of the INDI proportion for major groups. The estimates of change obtained under RDI lie somewhere between those for INDI and PDI. For 3-digit SOC, the difference between the RDI and INDI estimates of the level of change is of borderline significance ( $P = 0.054$ ). These findings are consistent with our expectations. DI appears to reduce systematic measurement error in measures of change. However, this does not imply that it reduces measurement error in SOC itself – merely that any errors will tend to be consistent.

The other two employment characteristics examined here are both measured as dichotomous indicators: whether the respondent is an employee or self-employed and whether the respondent has managerial or supervisory responsibilities. Our expectation is that the impact of measurement error on estimates of change is likely

to be less than for SOC, both because there are now only two categories to choose from and because there is no process of verbatim transcription and coding involved: the answer categories are pre-coded. For both measures we observe that estimated levels of change are lower with PDI (and, in the case of managerial responsibilities, with RDI) but these differences do not reach statistical significance ( $P < 0.05$ ).

### **3.2 Characteristics of employing organisation**

The industry sector of the respondent's employer is measured by the Standard Industrial Classification (SIC) (Central Statistical Office, 1992<sup>1</sup>). As with SOC, this is a hierarchical classification and we investigate change at each level of the hierarchy. SIC has five levels. There are 17 sections, 60 divisions, 222 groups, and 503 classes, a number of which are further divided into sub-classes (142 sub-classes). The SIC code (ignoring sub-classes) has four digits. The first two digits define the division and the first three define the group. Sections are defined as ranges of division codes (for example, Section D, manufacturing, consists of divisions 15 to 37). Many groups contain just a single class, with the result that analysis at those two levels produces similar results. The SIC code is based on responses given to the open-ended question, "What does the firm/organisation you work for actually make or do (at the place where you work)?" The process again involves interviewers recording answers verbatim and coders subsequently applying codes in the office.

With INDI, 27% of employed respondents are assigned to a different SIC section at the two interviews, 31% to a different division, 39% to a different group, and 43% to a different class.

At all four levels of SIC, the proportion assigned differently at the two interviews is significantly less ( $P < 0.05$ ) with PDI. And again differences are large in magnitude. The proportions who appear to have changed industry are around half those obtained with INDI for both SIC classes and SIC groups, and only slightly higher for SIC divisions. The estimates of change obtained under RDI are not significantly different from those for INDI.

The other two characteristics of the employing organisation that we study here are both categorical variables. Type of organisation refers to 8 pre-coded categories (private firm, company or plc; civil service/ central government; local government including local education, fire and police; National Health Service or State Higher Education; nationalised industry; non-profit making organisation; armed forces; other). Respondents are asked to choose one of nine categories in response to the question, "How many people are employed at the place where you work?" (1-2; 3-9; 10-24; 25-49; 50-99; 100-199; 200-499; 500-999; 1000 or more). PDI produces significantly lower levels of apparent change in the number of employees compared with INDI ( $P < 0.01$ ). The estimated level of change is also lower for type of organisation, though the difference is not significant. In both cases, the estimate under RDI lies between those under INDI and PDI.

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<sup>1</sup> A revised version of SIC was published in 2003, but we refer here to SIC92, as this was the coding frame used on both ECHP and ISMIE.

#### **4. Is the Reduction in Apparent Change also a Reduction in Measurement Error?**

The analysis of section 3 is based on all respondents who were in work at the time of both interviews, regardless of whether or not they may have changed jobs. We cannot therefore be sure whether the reduction in change assessed with PDI should be interpreted as a genuine reduction in measurement error. In this section we focus the analysis solely on respondents who have not changed their jobs between the two interviews. Amongst this group, genuine levels of change in the six target variables are likely to be very low, so reduction in the levels of observed change can be interpreted as a reduction in measurement error. We have therefore re-run the analyses of section 3 considering only respondents who have not changed occupation between wave 8 and ISMIE. In case of the INDI and of RDI, the analysis is carried out on respondents who reported at ISMIE a start date for their current employment that is prior to the wave 8 interview date. In case of PDI the analysis is carried out on interviewees who reported at ISMIE that their wave 8 occupation was still their current one. The results of the analysis are shown in the right-hand panel of table 1.

There is clear evidence of reduced measurement error with PDI, compared with INDI. Observed levels of change are implausibly high for most variables with INDI, whereas they are zero or very small with PDI for all variables other than number of employees (and even for this variable, the observed level of change is reduced to half that observed with INDI). RDI is rather less successful, producing a significant reduction in measurement error only for managerial duties, along with a modest

reduction of borderline significance for SOC. Overall, there can be little doubt that DI reduces measurement error in estimates of change for these variables. Additionally, it appears that PDI removes a large proportion of the measurement error, whereas RDI is less successful in that respect.

## **5. The Nature of Change**

In this section we assess whether the nature of change differs between treatment groups. We look at two aspects of the nature of change: first, the direction of change and second associations with other characteristics of the respondent's employment.

### **5.1 Direction of change**

In this section we explore whether the reduction in spurious change achieved by DI for certain variables is disproportionate across different categories of the variable. For example, in Table 1 we saw that PDI produces a reduction in the proportion of sample members who have appeared to change occupation, as measured by SOC code. Here we ask whether the spurious change observed with INDI is disproportionately associated with respondents in particular (observed) occupations. Table 2 shows the proportion in each of a number of categories of a variable (as measured at wave 8) for whom a change in category of that variable is observed (at ISMIE). We focus on SOC, SIC and number of employees, the variables for which DI was seen to produce a significant reduction in the overall estimate of levels of change (Table 1). Due to sample size restrictions, we have grouped categories of the variables. For example, the first row shows that 30% of INDI respondents who were classified at wave 8 as belonging to SOC major group 1 or 2 (managers,

administrators and professional occupations), were classified at ISMIE as belonging to a different SOC major group.

For SOC, there is a suggestion that the reduction in measurement error is particularly great amongst major groups 1-4. This is true both for observed change at the major group level and at the unit group level. For SIC section, the reduction in observed change reaches significance only for respondents in sections D, F or I (manufacturing, construction, hotels and restaurants), though this may partly be because the sample size is larger for this group of sections than any other. But for SIC class, significant, and apparently large, reductions are observed with DI within the three groups of sections (A, C, E), (D, F, I), and (L, M), but not within the other three groups. There is therefore a suggestion that the extent to which DI reduces measurement error varies across the industries in which respondents are employed. Regarding number of employees, there is a suggestion that spurious change with INDI is greater the larger the number of employees (Table 2).

## **5.2 Correlates of change**

Here we seek to identify employment characteristics (other than the target variable) that are associated with a tendency for DI to reduce the observed level of change. We do this for SOC, SIC and number of employees, the variables for which DI produced a significant reduction in the estimate of levels of change (Table 1). For each of those three variables, we look for associations of the reduction in observed change achieved with DI with the other five employment variables analysed in section 3.

**Table 2: Percentage reporting change in employment characteristics, by wave 8 status**

| Percentage reporting change      | Treatment groups |     |       | Base |     |     |
|----------------------------------|------------------|-----|-------|------|-----|-----|
|                                  | INDI             | RDI | PDI   | INDI | RDI | PDI |
| <u>SOC major group (1 digit)</u> |                  |     |       |      |     |     |
| 1, 2                             | 30               | 35  | 5*    | 20   | 26  | 19  |
| 3,4                              | 30               | 21  | 14+   | 37   | 39  | 36  |
| 6,7                              | 34               | 24  | 30    | 35   | 43  | 33  |
| 5,8,9                            | 30               | 35  | 22    | 50   | 40  | 51  |
| <u>SOC unit group (3 digits)</u> |                  |     |       |      |     |     |
| 1, 2                             | 55               | 46  | 5***  | 20   | 26  | 19  |
| 3,4                              | 60               | 44  | 14*** | 37   | 39  | 36  |
| 6,7                              | 43               | 30  | 33    | 35   | 43  | 33  |
| 5,8,9                            | 54               | 45  | 29**  | 50   | 40  | 51  |
| <u>SIC92 section</u>             |                  |     |       |      |     |     |
| <i>A, C, E</i>                   | 33               | 25  | 0     | 6    | 4   | 4   |
| <i>D, F, I</i>                   | 32               | 13* | 15*   | 38   | 32  | 41  |
| <i>G, H</i>                      | 28               | 24  | 25    | 29   | 29  | 24  |
| <i>J, K</i>                      | 17               | 25  | 13    | 18   | 16  | 16  |
| <i>L, M</i>                      | 21               | 18  | 5     | 14   | 22  | 19  |
| <i>N, O</i>                      | 27               | 31  | 23    | 34   | 29  | 30  |
| <u>SIC92 class</u>               |                  |     |       |      |     |     |
| <i>A, C, E</i>                   | 67               | 75  | 0*    | 6    | 4   | 4   |
| <i>D, F, I</i>                   | 50               | 53  | 17*** | 38   | 32  | 41  |
| <i>G, H</i>                      | 38               | 28  | 38    | 29   | 29  | 24  |
| <i>J, K</i>                      | 28               | 44  | 13    | 18   | 16  | 16  |
| <i>L, M</i>                      | 50               | 41  | 5**   | 14   | 22  | 19  |
| <i>N, O</i>                      | 41               | 45  | 27    | 34   | 29  | 30  |
| <u>Number of employees</u>       |                  |     |       |      |     |     |
| <i>1-24</i>                      | 48               | 44  | 48    | 44   | 52  | 50  |
| <i>25-199</i>                    | 46               | 47  | 24*   | 41   | 45  | 37  |
| <i>200 and more</i>              | 55               | 29* | 23*** | 40   | 21  | 44  |

Note: Percentages for RDI and PDI are compared separately with the corresponding percentage for INDI using a Pearson one way  $\chi^2$  test on the relevant 2 x 2 table. \* indicates  $0.01 < P \leq 0.05$ , \*\*  $0.001 < P \leq 0.01$ , \*\*\*  $P \leq 0.001$ , +  $p=0.051$ . SIC sections: A: Agriculture, Hunting and Forestry; B: Fishing; C: Mining and Quarrying; D: Manufacturing; E: Electricity, Gas and Water Supply; F: Construction; G: Wholesale and Retail Trade; H: Hotels and Restaurants; I: Transport, storage and Communication; J: Financial Intermediation; K: Real Estate, Renting and Business Activities; L: Public Administration and Defence; M: Education; N: Health and Social Work; O: Other Community, Social and Personal Service Activities. SOC major groups: 1: Managers & administrators; 2: Professional occupations; 3: Associate professional & technical occupations; 4: Clerical & secretarial occupations; 5: Craft & related occupations; 6: Personal & protective service occupations; 7: Sales occupations; 8: Plant & machine operatives; 9: Other occupations

We look first at change in the reported number of employees at the workplace (Table 3). We find that a reduction with PDI in the propensity to report a changed number of employees is associated with having foreman/supervisor status, being employed in

the public administration or education sectors, being in a craft or related occupation or a plant or machine operative and working in the public sector.

**Table 3: Percentage reporting change in number of employees**

|                             | Treatment groups |      |        | Base |     |     |
|-----------------------------|------------------|------|--------|------|-----|-----|
|                             | INDI             | RDI  | PDI    | INDI | RDI | PDI |
| <u>Managerial duties</u>    |                  |      |        |      |     |     |
| Manager                     | 46.2             | 25.0 | 22.2   | 13   | 20  | 18  |
| Foreman/Supervisor          | 45.5             | 41.7 | 10.5** | 22   | 12  | 19  |
| Not manager/supervisor      | 51.1             | 46.5 | 40.2   | 90   | 86  | 92  |
| <u>SIC1</u>                 |                  |      |        |      |     |     |
| A, C, E                     | 66.7             | 50.0 | 100.0  | 3    | 2   | 2   |
| D, F, I                     | 47.1             | 29.6 | 30.3   | 34   | 27  | 33  |
| G, H                        | 52.0             | 48.4 | 45.8   | 25   | 31  | 24  |
| J, K                        | 57.9             | 58.8 | 42.1   | 19   | 17  | 19  |
| L, M                        | 50.0             | 30.0 | 12.5*  | 14   | 20  | 16  |
| N, O                        | 44.0             | 44.4 | 22.7   | 25   | 18  | 22  |
| <u>SOC1</u>                 |                  |      |        |      |     |     |
| 1, 2                        | 35.7             | 35.7 | 35.3   | 14   | 17  | 17  |
| 3,4                         | 53.1             | 54.1 | 32.4*  | 32   | 37  | 37  |
| 6,7                         | 51.5             | 35.3 | 36.1   | 33   | 34  | 36  |
| 5,8,9                       | 52.4             | 40.0 | 30.0*  | 42   | 30  | 40  |
| <u>Type of organisation</u> |                  |      |        |      |     |     |
| Private                     | 47.7             | 42.9 | 35.1*  | 88   | 84  | 97  |
| Other sector                | 54.1             | 41.2 | 26.5** | 37   | 34  | 34  |

Note: Analysis by employment/self-employment status is not presented, as only 2 of the respondents who reported number of employees at both waves reported being self-employed. Percentages for RDI and PDI are compared separately with the corresponding percentage for INDI using a Pearson two ways  $\chi^2$  test on the relevant 2 x 2 table. \* indicates  $0.01 < P \leq 0.05$ , \*\*  $0.001 < P \leq 0.01$ , \*\*\*  $P \leq 0.001$ .

**Table 4: Percentage reporting change in SOC1 and SOC2**

|                                  | SOC1 |       |       | SOC2 |       |         | Base |     |     |
|----------------------------------|------|-------|-------|------|-------|---------|------|-----|-----|
|                                  | INDI | RDI   | PDI   | INDI | RDI   | PDI     | INDI | RDI | PDI |
| <u>Managerial duties</u>         |      |       |       |      |       |         |      |     |     |
| Manager                          | 15.4 | 30.4  | 17.6  | 38.5 | 30.4  | 17.6    | 13   | 23  | 17  |
| Foreman/Supervisor               | 28.6 | 16.7  | 10.0  | 52.4 | 33.3  | 10.0**  | 21   | 12  | 20  |
| Not manager/supervisor           | 34.8 | 30.7  | 25.3  | 48.9 | 39.8  | 26.3*** | 92   | 88  | 95  |
| <u>Employee or self-employed</u> |      |       |       |      |       |         |      |     |     |
| Employee                         | 31.7 | 29.3  | 22.0* | 48.4 | 51.6  | 22.7*** | 126  | 123 | 132 |
| Self-employed                    | 25.0 | 20.0  | 5.9   | 31.3 | 20.0  | 5.9~    | 16   | 15  | 17  |
| <u>Type of organisation</u>      |      |       |       |      |       |         |      |     |     |
| Private                          | 34.5 | 29.5  | 24.5  | 50.6 | 38.6  | 25.5*** | 87   | 88  | 98  |
| Other sector                     | 25.6 | 28.6  | 16.7  | 43.6 | 34.3  | 16.7*   | 39   | 35  | 36  |
| <u>Number of employees</u>       |      |       |       |      |       |         |      |     |     |
| 1-24                             | 23.7 | 34.6  | 27.9  | 34.2 | 34.6  | 30.2    | 38   | 52  | 43  |
| 25-119                           | 32.7 | 28.6  | 20.5  | 50.0 | 42.9  | 20.5**  | 52   | 49  | 44  |
| 200 and more                     | 39.4 | 19.0~ | 18.6* | 63.6 | 33.3* | 18.6*** | 33   | 21  | 43  |
| <u>SIC1</u>                      |      |       |       |      |       |         |      |     |     |
| A, C, E                          | 40   | 0     | 0     | 60.0 | 25.0  | 0*      | 5    | 4   | 4   |
| D, F, I                          | 30.0 | 21.9  | 12.5* | 62.5 | 28.1* | 15.0*** | 40   | 32  | 40  |
| G, H                             | 46.4 | 33.3  | 37.0  | 53.6 | 48.5  | 48.1    | 28   | 27  | 33  |
| J, K                             | 19.2 | 26.3  | 20.0  | 50.0 | 47.4  | 25.0    | 26   | 19  | 20  |
| L, M                             | 40.0 | 22.7  | 10.0* | 60.0 | 45.5  | 10.0*** | 15   | 22  | 20  |
| N, O                             | 22.2 | 41.7  | 8.3   | 37.0 | 41.7  | 8.3**   | 27   | 24  | 24  |

Note: Percentages for RDI and PDI are compared separately with the corresponding percentage for INDI using a Pearson two ways  $\chi^2$  test on the relevant 2 x 2 table. \* indicates  $0.01 < P \leq 0.05$ , \*\*  $0.001 < P \leq 0.01$ , \*\*\*  $P \leq 0.001$ , ~  $0.05 < P \leq 0.06$ .

With regard to SOC (Table 4), it appears that PDI reduces the observed level of change to a greater extent the greater the reported number of employees at the workplace. Indeed, this has the effect of reversing the observed association between number of employees and change in occupation. With INDI, the proportion of respondents who appear to have changed occupation between waves is greater amongst those employed in large workplaces; with PDI the proportion is greater amongst those in small workplaces. For the other four employment characteristics, apparent associations with the extent of reduction in the observed change in SOC

can perhaps largely be explained by differences in sample sizes, with reductions appearing significant for groups with larger sample sizes.

For industry (Table 5), reduction in observed change at both the section and division level with PDI was associated with being a manager or professional (SOC major groups 1 or 2) and with having foreman or supervisor status.

**Table 5: Percentage reporting change in SIC section and SIC division**

|                                 | SIC section |      |       | SIC division |      |       | Base |     |     |
|---------------------------------|-------------|------|-------|--------------|------|-------|------|-----|-----|
|                                 | INDI        | RDI  | PDI   | INDI         | RDI  | PDI   | INDI | RDI | PDI |
| <u>Managerial duties</u>        |             |      |       |              |      |       |      |     |     |
| Manager                         | 15.4        | 13.6 | 0     | 15.4         | 18.2 | 0     | 13   | 22  | 12  |
| Foreman/Supervisor              | 23.8        | 8.3  | 5.6~  | 33.3         | 25.0 | 5.6*  | 21   | 12  | 18  |
| Not manager/supervisor          | 28.1        | 27.7 | 21.8  | 32.6         | 32.5 | 24.1  | 89   | 83  | 87  |
| <u>Employee or Selfemployed</u> |             |      |       |              |      |       |      |     |     |
| Employee                        | 26.0        | 23.1 | 17.1* | 30.9         | 29.1 | 18.8* | 123  | 117 | 117 |
| Self-employed                   | 31.3        | 13.3 | 11.8  | 31.3         | 20.0 | 11.8  | 16   | 15  | 17  |
| <u>SOC</u>                      |             |      |       |              |      |       |      |     |     |
| 1, 2                            | 19.0        | 20.8 | 0*    | 23.8         | 29.2 | 0*    | 21   | 24  | 17  |
| 3,4                             | 27.8        | 31.6 | 16.2  | 27.8         | 31.6 | 18.9  | 36   | 38  | 37  |
| 6,7                             | 27.8        | 25.0 | 18.2  | 27.8         | 25.0 | 18.2  | 36   | 36  | 33  |
| 5,8,9                           | 28.3        | 8.8* | 21.3  | 39.1         | 26.5 | 23.4  | 46   | 34  | 47  |
| <u>Type of organisation</u>     |             |      |       |              |      |       |      |     |     |
| Private                         | 28.6        | 24.4 | 20.5  | 35.7         | 32.9 | 22.7* | 84   | 82  | 88  |
| Other sector                    | 20.5        | 20.0 | 9.7   | 20.5         | 20.0 | 9.7   | 39   | 35  | 31  |
| <u>Number of employees</u>      |             |      |       |              |      |       |      |     |     |
| 1-24                            | 21.6        | 31.3 | 18.4  | 29.7         | 37.5 | 23.7  | 37   | 48  | 38  |
| 25-119                          | 28.0        | 17.0 | 15.0  | 30.0         | 23.4 | 15.0  | 50   | 47  | 40  |
| 200 and more                    | 24.2        | 19.0 | 18.4  | 30.3         | 23.8 | 18.4  | 33   | 21  | 38  |

Note: Percentages for RDI and PDI are compared separately with the corresponding percentage for INDI using a Pearson  $\chi^2$  test on the relevant 2 x 2 table. \* indicates  $0.01 < P \leq 0.05$ , \*\*  $0.001 < P \leq 0.01$ , \*\*\*  $P \leq 0.001$ .

## 6. Socio-Demographic Correlates

It is of interest to know whether the reduction in estimated levels of change achieved with DI is concentrated amongst certain socio-demographic groups or, alternatively, whether the effect is approximately equal amongst all groups. This may have

implications for survey design and for the interpretation of survey findings. In Table 6 we present estimates of the effect of interviewing method separately for subgroups defined by sex, age and level of education. If the estimated level of change is significantly lower with DI in one group (e.g. men) but not in the complementary group (e.g. women), then we can conclude that the effect of DI is disproportionate across the socio-demographic groups.

The observed findings are not completely consistent but two findings stand out. First, it seems that PDI is less likely to make a difference to estimates of change for respondents aged under 36 than for those aged 36 or over. For all three levels of SIC and for SOC2, a significant reduction in the level of change is observed only for the two older groups. For SOC1, managerial responsibilities, type of organisation and number of employees, a significant reduction is observed for only one of the two older groups. Second, it appears that the effect of PDI is stronger for the most highly qualified respondents than for others. For two variables, managerial responsibilities and SOC3, the same also seems to be true for RDI. As regards sex, DI seems to be more likely to make a difference for men than for women, though differences are inconsistent. There are three measures for which RDI makes a difference for men only. With PDI, there are two measures for which only men are affected (SOC1 and SIC2) and one for which only women are affected (number of employees).

**Table 6: Socio-demographic correlates of the effect of dependent interviewing on estimates of change**

|                             |     | Men | Women | Age   |       |     | Qualifications |        |      |
|-----------------------------|-----|-----|-------|-------|-------|-----|----------------|--------|------|
|                             |     |     |       | 18-35 | 36-50 | 51+ | Low            | Medium | High |
| Managerial responsibilities | PDI |     |       |       | *     |     |                |        |      |
|                             | RDI | *   |       |       |       |     |                |        | **   |
| Employee / self-employed    | PDI |     |       |       |       |     |                |        |      |
|                             | RDI |     |       |       |       |     |                |        |      |
| SOC3                        | PDI | *** | **    | *     | ***   | **  | *              | ***    | ***  |
|                             | RDI | *   |       |       | *     |     |                |        | **   |
| SOC2                        | PDI | *** | **    |       | ***   | **  |                | **     | ***  |
|                             | RDI |     |       |       |       |     |                |        |      |
| SOC1                        | PDI | **  |       |       | *     |     |                |        | *    |
|                             | RDI |     |       |       |       |     |                |        |      |
| Type of organisation        | PDI |     |       |       | *     |     |                |        |      |
|                             | RDI |     |       |       |       |     |                |        |      |
| No. of Employees            | PDI |     | **    |       |       | *   | *              |        | *    |
|                             | RDI |     |       |       |       |     |                |        |      |
| SIC1                        | PDI |     |       |       | *     | **  |                |        | *    |
|                             | RDI | *   |       |       |       |     |                |        |      |
| SIC2                        | PDI | *   |       |       | **    | **  | *              |        | *    |
|                             | RDI |     |       | *     |       |     |                |        |      |
| SIC3                        | PDI | **  | **    |       | **    | **  | *              |        | *    |
|                             | RDI |     |       |       |       |     |                |        |      |
| SIC4                        | PDI | *** | **    |       | ***   | *** | *              | *      | **   |
|                             | RDI |     |       |       |       |     |                |        |      |

Notes: for each cell in the table, the proportion of respondents exhibiting a change in the relevant employment characteristic is compared with the INDI group using a one-sided Pearson  $\chi^2$  test. 'High' qualifications is defined as at least one 'A' level pass or equivalent; 'Medium' is at least one GCSE, 'O' level, CSE or equivalent pass; 'Low' is no pass at GCSE or equivalent. \* indicates  $0.05 \geq P > 0.01$ ; \*\*  $0.01 \geq P > 0.001$ ; \*\*\*  $0.001 \geq P$

## 7. Summary and Conclusions

Our analyses have demonstrated that the use of PDI results in lower levels of observed change in each of a number of characteristics of the respondent's employment. The reduction in observed change is particularly pronounced for SOC, SIC and the number of employees at the respondent's workplace. Furthermore, this reduction in observed change appears to represent a reduction in measurement error as the effect of PDI is particularly pronounced amongst respondents who have not reported a change in job between survey waves. Levels of change in

employment characteristics amongst INDI respondents who have not reported a change in job remain implausibly high.

Some evidence has been presented that the reduction in measurement error brought about by PDI is particularly associated with certain employment characteristics. A reduction in the observed level of change in occupation is associated with SOC major groups 1-4 and respondents working at workplaces with large number of employees. A reduction in the observed level of change in industry is associated with certain industries and with respondents who are managers or professionals (SOC major groups 1 or 2) or have foreman or supervisor status. A reduction with PDI in the observed level of change in number of employees at the workplace is associated with large workplaces, having foreman/supervisor status, being employed in the public administration or education sectors, and being in a craft or related occupation or a plant or machine operative.

Finally, we investigated demographic correlates of the effect of PDI and found that measurement error was particularly reduced amongst respondents aged 36 or over and amongst the most highly qualified respondents.

In attempting to summarise the nature of the characteristics, both employment and demographic, associated with a propensity for PDI to reduce measurement error in estimates of change, we would suggest that many of these characteristics may be those associated with an increased propensity to have complex jobs, the characteristics of which are difficult to describe. This is likely to be true of more highly qualified people, those in managerial, administrative or professional occupations and those working at large workplaces. The more difficult it is to describe a particular characteristic of a job, the more likely it is that it will be

described inconsistently in two survey interviews some time apart. This leads to measurement error in estimates of change. Thus, perhaps what we are observing here is simply that survey respondents who are more prone to measurement error with traditional independent interviewing will be more likely to have reduced measurement error if interviewed using PDI.

An alternative explanation might be PDI reduces the error disproportionately across sample subgroups due to differences in the way the change in interviewing method affects the cognitive processes during the interview. We find no obvious support for this. For example, if this explanation held we might expect to find a greater reduction in measurement error amongst respondents with lower levels of qualifications. We find the opposite. However, we would also note that such an effect might be difficult to identify due to the association of qualifications with employment characteristics. For example, people with lower qualifications may indeed be prone to greater levels of measurement error other things being equal, only for this effect to be outweighed by the greater tendency of people with lower qualifications to be in occupations that are easy to describe and easy for coders to recognise – i.e. occupations that are prone to lower levels of measurement error.

We conclude that PDI is an effective questioning method for the reduction of measurement error associated with measures of change in employment characteristics. Additionally, we would conclude that measurement error in measures of change from traditional independently-collected interviews is likely to be greater amongst occupations that are difficult to describe consistently. This is likely to include jobs where employees have a range of varied tasks, as opposed to routine

jobs involving a single task, or a limited number of closely-related tasks. Data analysts might be advised to allow for this possibility.

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