

WORKING PAPER SERIES

סדרת ניירות עבודה

מס' 4 No.

Characteristics of Wave Nonrespondents in the Israeli Labor Force Survey

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תכונות משיבים-לסירוגין בסקר כוח אדם

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אייר תשס"ד, מאי 2004 May

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Published by the Central Bureau of Statistics, 66 Kanfe Nesharim St.,

Corner Bachi St., P.O.B 34525, Jerusalem 91342, Israel

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ת"ד 34525, ירושלים 91342

טל': 6592666-02; פקס: 6521340-02

אתר הלמ"ס באינטרנט: www.cbs.gov.il

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תכונות משיבים-לסירוגין בסקר כוח אדם

תקציר

בעבודה זו אנו מדווחים על ממצאים של ניתוח נתוני משיבים-לסירוגין בסקר כוח אדם. משקי בית משיבים-לסירוגין הם משקי בית שהשיבו באחד עד שלושה גלים מתוך ארבעת גלי הסקר. המטרה העיקרית היא לבחון באיזו מידה תכונות דמוגרפיות ותכונות תעסוקה של משיבים-לסירוגין שונות מאלה של משיבים, וכן את ההשלכות האפשריות על הטיה באומדנים. אנו זוקפים ערכים למשתני הסקר עבור גלים חסרים ומשווים את הערכים הזקופים לערכים הנצפים עבור המשיבים, לפי סיבות אי השבה. כדי להעריך את ההטיה, אנו משווים את האומדנים המתקבלים עבור המשיבים בלבד לאלה המתקבלים עבור המדגם כולו, כאשר עבור המשיבים-לסירוגין אנו משתמשים בנתונים זקופים ועבור אלה שלא השיבו לכל הגלים אנו בוחנים מספר תרחישים.

הניתוח נתמך גם על-ידי בחינה של הקשר בין תהליכי עבודת השדה ומאפייני ההשבה מעבר לגלים לבין תכונות המשיבים-לסירוגין. אנו בוחנים דפוסים של אומדנים (כגון אחוז הנשואים ואחוז מועסקים) לפי מספר הביקורים של הסוקרים עד להשגת ראיון. כן אנו מתארים את ההשתנות באומדנים לפי מספר הראיונות שהושגו בארבעת הגלים, מספר הגלים בהם לא נוצר קשר עם משק הבית, ומספר הגלים עם סירובים. אם אי-השבה היא בעיה חמורה, אנו מצפים כי תהיה עקביות בין דפוסים אלה וההפרשים בין אומדני המשיבים והמשיבים-לסירוגין. ממצאי הניתוח התומך משמשים גם לחישוב חסמים על אומדני המדגם כולו.

כללית, אנו מוצאים הבדלים בין משיבים למשיבים-לסירוגין במספר תכונות דמוגרפיות ובצורת ישוב המגורים, וממצאים מעורבים עבור משתני תעסוקה. מבין המשתנים הדמוגרפים אנו מוצאים עדות ברורה לשיעורים גבוהים יותר של משקי בית בגודל אחד וראשי משק בית לא נשואים בקרב המשיבים-לסירוגין ועדות לשיעורים נמוכים יותר של משקי בית עם מבוגרים בלבד או עם ילדים בקרב המשיבים-לסירוגין. כמו כן, משיבים-לסירוגין נוטים יותר לגור בישובים עירוניים גדולים ופחות בישובים כפריים. אנו מוצאים הבדלים במשתני התעסוקה רק בשני הגלים האחרונים. גם הניתוח התומך אינו מספק מידע חד משמעי לגבי רמת התעסוקה: בין רמה גבוהה יותר של תעסוקה בקרב המשיבים-לסירוגין לעומת המשיבים להבדלים קטנים או אפסיים. לבסוף, החסמים על ההטיה של האומדנים עבור המדגם כולו מצביעים על הטיות קטנות יחסית הנובעות מאי-השבה.

מילות מפתח: הטיה; זקיפה; סקר פנלי; ערכים חסרים; שיטות דגימה חוזרת

Characteristics of Wave Nonrespondents in the Israeli Labor Force Survey

Abstract

In this paper, we report the findings of an analysis of wave non-response using recent panel data from the Israeli Labor Force Survey. Our primary purpose is to examine the extent to which the demographic characteristics and employment of wave non-respondents (WNRs) differ from those of respondents and the possible implications for bias. We impute data on survey measures for WNR households and compare the imputed values with the observed values for respondents. Imputed measures are also compared across reasons for non-response. To assess bias, we compare the estimated statistics for respondents to those for the full sample based on imputed values for WNRs and alternative assumptions regarding those who never respond.

An examination of process and cross-wave indicators of non-response bias supplements this analysis. We examine patterns of survey statistics (e.g., average marriage and employment rates) by the number of visits required to obtain an interview. In addition, we describe the variation in survey statistics by numbers of interviews, waves without contact, and waves with refusals. If non-response were a major problem, we would expect these patterns to line up with the estimated differences between respondents and WNRs. The findings are then used to provide bounds on the full-sample estimates.

Overall, we find evidence of differences between respondents and nonrespondents for selected demographic measures and location of the household and mixed evidence regarding employment measures. Among demographic measures, we find strong evidence of higher rates of single person households and unmarried heads of household among nonrespondents and fairly strong evidence of lower rates of households with only older adults or with children among nonrespondents. In addition, nonrespondents are more likely to live in large localities and less likely to live in small localities. We find differences in employment measures in only the last two waves; the supplemental analyses also provide a mixture of higher employment for nonrespondents and small or no differences. Finally, the bounds on the full-sample estimates suggest relatively small biases due to nonresponse.

Keywords: Bias; Bootstrap; Imputation; Missing values; Panel study

I. Introduction

In this paper, we analyze the characteristics of wave nonrespondents in the Israeli Labor Force Survey (LFS) between 1997 and 2000. The LFS is a panel study, in which residents of sampled dwellings are approached for four interviews spread over a year and a half. The interview rate in the study period was 91 percent. On average, 62 percent of eligible nonrespondents in each wave (i.e., quarterly investigation of the household) are wave nonrespondents (WNRs), that is, were interviewed in at least one of the four waves.

The response patterns in the study period, as well as the fieldwork processes, are described in detail in a previous paper (Wissoker and Nirel, 2003). Here, our objective is to analyze the differences in demographic and employment characteristics between respondents and WNRs and to propose bounds for the implied bias. The models we develop can be used to impute missing data for WNRs.

To gain insight into the differences between respondents and WNRs, we impute the characteristics and employment of WNRs and compare the predicted values to the values observed for respondents. Comparisons are also made separately by reason for nonresponse. To assess bias, we compare the estimated statistics for respondents to full-sample estimates based on imputed values for WNRs and alternative assumptions regarding those who never respond.

An examination of both process and cross-wave indicators of nonresponse supplements this analysis. We examine patterns of survey statistics (e.g., mean marriage and employment rates) by the number of visits required to obtain an interview. In addition, we describe the variation in survey statistics by numbers of interviews, waves without contact, and waves with refusals. If non-response were a major problem, we would expect these patterns to be consistent with the estimated differences between respondents and WNRs. The findings are then used to provide bounds on the full-sample estimates.

Overall, we find evidence of differences between respondents and nonrespondents for selected demographic measures and geographic location of the household and mixed evidence regarding employment measures. The bounds on the full-sample estimates suggest relatively small biases due to such differences.

We begin with an overview of the LFS, followed by a brief discussion of nonresponse theory, and a discussion of the data and methodology for the analysis. We then present the findings for each analysis of wave nonrespondents and the implications for overall nonresponse.

II. Overview of the Labor Force Survey and its Response Patterns

II.1 Background

The LFS is the primary source of data on labor force participation and unemployment rates in Israel. The data are obtained from a quarterly survey of households, which is conducted continuously through the year. Households are chosen at random using a two-stage cluster sample within strata, first selecting localities with probability according to size and then dwellings within localities. The vast majority of the sample units (over 85 percent) are drawn from municipal tax records. Most selected households are included in the sample for four interviews, with a rotation pattern of two quarterly interviews, a two-quarter break, and then two more quarterly interviews. Generally, the first and fourth interviews are conducted in-person, while the second and third are conducted by phone. Since the implementation of the computer assisted telephone interviewing (CATI) system in April 1999 for wave two and January 2000 for wave three, most telephone interviews for these waves are conducted from the central office in Jerusalem.

Dwellings are generally in the sample for four waves. Repeated inclusion in the sample is used to reduce the costs of drawing the sample, finding the sampled locations, and interviewing; and to increase the correlation between adjacent quarters and thus the precision of estimated changes in survey measures over time. In practice, our data show that only 64 percent of ever-eligible households are in the sample for four investigations. Sampled kibbutz households kibbutzim are asked to participate in one or two waves and most households in a supplementary sample of new buildings are asked to participate in fewer than four waves. Furthermore, households that move into or out of a dwelling between waves are not eligible for all investigations, since it is the dwelling that is sampled not the household.

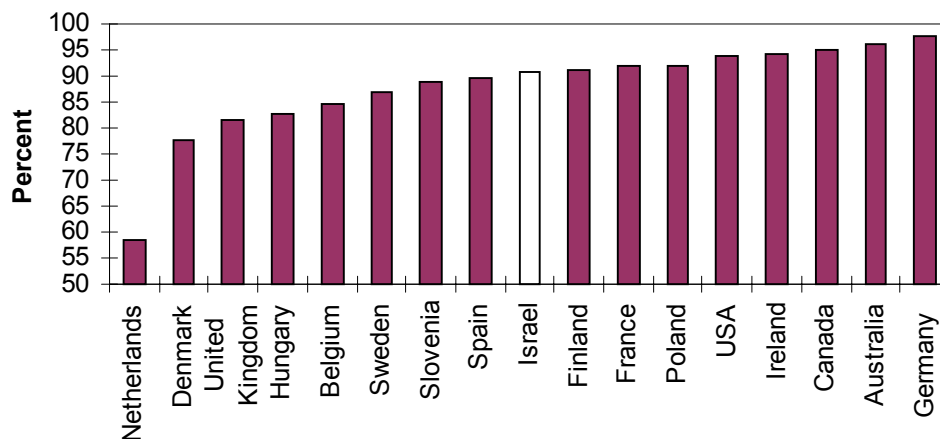
II.2 Response Rates

Over the period 1996 to 2000, the average quarterly LFS response rate as a share of *estimated* eligible cases was 91.0 percent, with a standard deviation of 1.3 percentage points. The estimated number of eligible cases is based on the estimate that approximately 80 percent of cases of unknown eligibility (e.g., never tried, not located) were eligible for the sample (Wissoker and Nirel, 2003).

The LFS annual report shows that response rates have been increasing slowly over time. Response rates as a share of eligible cases ranged from 86 to 89 percent between 1980 and 1988, from 89 to 91 percent between 1989 and 1995, and from roughly 89.7 to 92.7 between 1996-2000, after peaking in 1996.

These response rates place the Israeli LFS in the medium-to-high range of response rates to labor force surveys in 17 European and English-speaking countries (Figure 1). The averages are based on data reported by de Heer (1999). The order is presented in the chart below; however, it should be treated as an approximation, since the precise definitions of the rates are not available from the paper and undoubtedly vary across countries.

Figure 1: LFS Interview Rate by Country, 1991-1997



II.3 Contact, Cooperation, and Refusal Rates

The LFS contact rate for the period 1996-2000 is estimated to be 97.2 percent of estimated eligible cases. Among contacted eligible households, the interview rate is 93.7 percent. The refusal rate among contacted eligible households was 3.0 percent.

III. A Brief Overview of Survey Nonresponse Theory

Work by Groves and others argue that the correlates of nonresponse can best be understood by considering the survey process (Groves and Couper, 1998; Dillman et al, 2002). For a face-to-face survey, the survey process can be separated into three steps: location of the address and determination whether it is a dwelling; an attempt to contact residents of dwelling; and a request for an interview with contacted households found to be eligible. For a phone survey, the key steps are similar; however, there is nothing quite comparable to the attempt to locate the household.

Among eligible cases, three categories can be distinguished: noncontacts, refusals, and other contacted cases.¹ Reasons for nonresponse are thought to differ by category; as a result, the characteristics of nonrespondents are also thought to differ among, say, noncontacted cases and refusals. In noncontacted cases, interviewers are unable to make a request of the household. Such cases are believed to result from: a) schedules of the residents that make it more likely that they are not at home when the interviewer visits or calls; and b) impediments to accessing the residents to make a request. Interviewers must also be able to devote enough effort, with a diverse enough schedule of attempted contacts that they will find someone when they are at home. This leads to some expectations regarding contacted versus noncontacted households: Households with more persons and with children are thought to be easier to contact, while those with single persons who are employed are expected to be particularly difficult to contact. Dwellings with gates, guards instructed to keep out solicitors, etc., or telephones with caller ID or answering machines are thought to be more difficult to contact. The circumstances of noncontact are expected to be similar across surveys of comparable

¹ The definition of other contacted cases is expanded below to include cases of unknown eligibility.

populations, since neither household schedules nor the presence of an impediment depends on the details of the particular survey.

Refusals are thought to depend on a series of quick judgments. For instance, does the interviewee like the person requesting the interview? Does the interviewee owe it to the requestor or society to go along? Do persons with authority endorse the survey? Is it similar to things the interviewee has done in the past? Are the neighbors likely to be doing it? The response to these judgments is likely to depend on social environment (neighborhood characteristics, survey-taking climate); interviewee (predisposition and socio-demographic environment); survey design (topic, how it is administered); interviewer (characteristics, experience) and the interactions among them. For instance, a recently fired worker may be less likely to participate in a survey on labor force participation, but be perfectly happy to participate in a survey on food preferences.

Finally, cases in the category “other” are an idiosyncratic mixture, typically including households with a temporary problem (e.g., mourning or illness) or no one present who can be interviewed (including those with language barriers and only a baby sitter at home with the children); as well as cases that were never tried or never located. In the second and third wave of the LFS, this category also includes all cases, other than refusals, that were tried only by phone. It is difficult to form expectations regarding the category other. Some of the cases may be soft refusals – households that continue to claim inconvenience without ever agreeing or refusing to be interviewed. Others in this category may be immigrants, etc. Finally, those that were not contacted by phone and were never tried in person in the second or third waves may most closely resemble noncontacted households.

A recent paper by Lefkowski and Couper (2001) on participation in the second wave of a panel survey provides additional insight into nonresponse in later waves of the LFS. In their model, contact depends on the number of call attempts, timing, and the survey organization’s use of prior information to determine when to contact the household, the householder’s characteristics and likelihood of being at home. In addition, ease of contact could depend on whether contact is attempted in person or by phone, with contact by phone considered easier. Time between waves may affect ease of contact, as contacting the household is more difficult if the original household has moved. Cooperation is expected to depend on whether the interviewer is the same across waves, the experience on the previous wave, whether contact was made between waves, as well as situational factors such as current unemployment or marriage difficulties.

Overall, nonresponse bias is a weighted combination of the biases associated with noncontact, refusals and other nonresponse. Theory suggests that noncontact bias is most likely in factors correlated with “at-homeness” and the presence of impediments. But as noted above, refusals depend on the interaction of social context, the interviewee, the interviewer, and the survey request; as a result, the biases associated with refusals are somewhat idiosyncratic and difficult to predict. The average overall bias is thus the average of a predictable and unpredictable set of characteristics, the direction of which requires empirical investigation.

IV. Data

The data file contains one record for each household in each of the 12 panels drawn from 1996 through 1998. Each record contains data for up to four interviews with a household, including selected survey measures for each completed interview and reason codes for waves without an interview. The unit of analysis is the household, with some measures defined as averages or counts of data for household members (e.g., employment rate) and others defined for the household head (e.g., marital status). Interviews were attempted between October 1996 and December 2000, with the average date of interview at the start of 1999.

The file may include multiple records for a single dwelling. If a dwelling has two resident households, a separate record is included for each household. Furthermore, if the resident household changes between waves, a record will exist for each household. Each record

contains full information for waves when the household is in the sample and a code “out of sample” for waves when the household is not living in the dwelling.

Counts of the number of interviews by number of waves of eligibility for the household are reported in Table 1 for households that were eligible in at least one wave. Eligibility is defined here, and in the remainder of the paper, to include both households that are known to be eligible and those with unknown eligibility. The table indicates that of the 5151 cases that were eligible in one of the waves (last row, second column from the left), 4051 were interviewed in that wave and 1100 were not. Of the 5551 cases eligible in two waves (next column), 4367 were interviewed in both waves.

Number of Interviews	Number of Eligible Waves*				
	1	2	3	4	Total
0	1100	411	170	423	2124
1	4051	773	218	397	5439
2		4367	635	776	5778
3			1717	2346	4063
4				20560	20560
Total	5151	5551	2760	24502	37964

* Eligible investigations include those of known and unknown eligibility.

IV.1 Survey Participation

For each household, a final status code is attached for each wave:

- Interviewed
- Eligible noninterview or unknown eligibility, including
 - o Refusal
 - o Noncontact;
 - o Other, including temporary problems, no one available to interview (language problem, etc.), tried only by phone, not located, not tried, and not sure if dwelling;
- Noneligible noninterview; and
- Out of the sample.

The coding is based on three different sources of data. After each failed in-person interview attempt, the interviewer is required to complete a detailed non-interview questionnaire explaining the reason for non-response. If a noninterview questionnaire is not completed – often if the attempts are by telephone – the data come from process records (either paper or electronic) and have much less detailed information. Cases are assigned response codes for each wave that summarize the results of the interview attempts.

The data available for the second and third waves cannot identify all noncontacted households with certainty. Noncontacted households that are not tried in person are coded as “other”. In the pre-CATI years, such cases were rare, since it was straightforward to try a face-to-face interview for cases not contacted by phone. Hence, noncontacted cases not tried in the field comprised a small share of the “other” category. However, after the implementation of CATI and the centralization of calling, this became a more significant problem. A much larger number of cases were not sent for in-person interviews and the percentage of cases coded as “other” grew dramatically: from about 2% to 4-5% in wave two, and from 2-3% to more than 6%, in wave three. For exact numbers see Table 4 in Wissoker and Nirel (2003). We note that the post-CATI panels of waves two and three cover approximately one fourth of the cases for these waves.

IV.2 Selected Indicators and Process Data

For each case, the file includes:

- Panel identifier;
- Sample type (indicating whether drawn from municipal tax records, new buildings sample, kibbutzim, moshavim and Jewish and Arab villages, immigrant absorption centers, hotels, dormitories, or East Jerusalem);
- Indicator of whether households share a common dwelling; and
- Locality type – size and whether Jewish for urban localities, type of rural locality (kibbutz, cooperative moshav, etc.) and identifiers for the four cities over 200,000 inhabitants.

For interviewed cases, the file includes:

- Whether interview was in-person, phone, or absentee questionnaire; and
- For in-person interviews, the number of visits required to obtain an interview.

IV.3 Survey Data for Respondents

In Table 2, we define the set of survey measures used in our analyses of nonresponse. The measures are key statistics for the LFS and/or plausibly related to nonresponse. The unemployment rate is listed, although it is used only in our secondary analyses.²

Household composition measures are functions of the household age distribution and are defined for the entire household. They include indicators of single person household, presence of children, young children, and only persons over age 64, as well as the number of adults in the household. These measures were created by grouping data from five age categories for children (0-1, 2-4, 5-9, 10-14) and four categories for adults (15-17, 18-24, 25-64, and over 64).

Other household characteristics refer to the reported head of household. These include indicators of whether married, whether an immigrant or a recent immigrant (at most five years since immigration) and years of education. The household head is defined as the main wage earner of the household and is not fixed between waves.³

Employment measures are defined using two sets of questions and refer to household members aged 15 and above. The first set of measures is based on questions about employment in the previous week and are household-based versions of measures commonly used to describe the state of the labor market. The percent employed, percent in the labor force, and percent working full time are defined for all adults, while the unemployment rate is defined only for households with an adult in the labor force. A second set of measures, based on questions about months of work in the past year for each person 15 and above, includes the average number of months worked, whether no adults worked at all, and whether all adults worked all of the year.

IV.4 Wave and Full Nonrespondents

This paper focuses on WNR households. On average, among all eligible nonrespondents in a wave, 62 percent are WNRs – that is, households with a response in at least one wave. This varies by wave, from 57 percent in wave one to 68 percent in wave four. Overall, 71 percent of the households in the data with at least one wave of eligible nonresponse also have a wave of response.

² The unemployment rate, which is defined as a share of those in the labor force, is not used in the primary analysis because it is hard to predict by household. To predict values for nonrespondents requires predicting both labor force participation and unemployment given participation. It is a good area for future investigation.

³ If more than one person fits this description, the interviewee determines headship.

Recall that it is the dwelling that is sampled and not the household. Therefore, households that move into or out of a dwelling between waves are not eligible for all investigations. We find that most full nonrespondents (FNRs) – those eligible nonrespondent households without an observed response – are in the sample fewer than four waves.⁴ Of the non-kibbutz FNRs, 51 percent were eligible in one wave, 19 percent in two, 9 percent in three, and only 20 percent in all four waves. Non-kibbutz FNRs that were eligible in all four waves refused in 51 percent of the waves, were not contacted in 21 percent, and were categorized as “other” in 28 percent. At the other end of the spectrum, among non-kibbutz FNRs with only one eligible wave, 17 percent refused, 41 percent could not be contacted, and 42 percent were nonrespondents for other reasons.

IV.5 Data Limitations

Prediction relies on consistent data across waves. Data are more likely to be inconsistent when the respondent changes across waves – as different respondents are likely to remember information differently – and information from proxies will be less consistent in households where people do not know precise information for all other adults in the household. This may lead to particular problems for the retrospective employment questions, which involve recall. Respondents may not remember the exact number of months worked by each household member over the past year. Simple tabulations show an imperfect match between such retrospective measures and the responses to the questions requiring only short-term recall.

Second, the household head can vary across survey waves. For employment measures, we define outcomes based on all adults in the household and thus avoid the bias in analyzing data for the person who works the most.⁵ For demographic measures, however, we use data for the household head. Since the data from various waves do not always refer to the same person, this weakens our ability to predict using cross-wave data.

Other limitations include a lack of data on income, primarily an issue for assessing the Income Survey that is asked following the fourth wave of the survey, and an important socio-economic indicator. In addition, more detailed data on the locality such as location and locality-specific historical employment averages, could improve our ability to predict employment.

V. Methodology

In this section, we describe our approach to assessing the similarity of respondents and nonrespondents and the likelihood of nonresponse bias in key statistics. We first describe the method for comparing respondents and wave nonrespondents and then discuss supplementary analyses using variation in effort and cross-wave response patterns.

V.1 Comparison of Respondents and Wave Nonrespondents

In our first analysis, we compare survey measures for respondents with predictions for nonrespondents obtained from a regression model. The goal of the regression is to obtain the best prediction of the outcome for WNR cases, using what is known about the households from other waves. A regression model or hot deck method is preferred over substituting data from neighboring waves when measures of interest vary across waves. The regression allows for both imperfect correlation across waves and the influence of multiple variables that may predict the outcome.

⁴ Estimates of FNR would be lower if we structured the data on dwelling rather than household, since many FNR households have a respondent within the dwelling. However, when we experimented with using cross-wave data from different households in the same dwelling, we found that the correlations were too low to be of use.

⁵ As a result, the unweighted average household measures used in our analysis do not exactly match figures calculated at the individual level.

The variables of interest have correlations across waves that are high enough that we believe that they can be predicted across waves and low enough that we prefer not simply to substitute data from other waves. For instance, as shown in Table 3, indicators of marriage in waves one and two have a correlation of 0.93 as do the numbers of adults, while the correlations of the household employment and labor force participation are each 0.85. Measures that have more variation in their measurement or are likely to change more easily between waves have lower correlations (0.63 for household help, 0.81 for full-time employment, and 0.77 for all adults worked for the past year). The correlations between waves two and three are lower, since the time between investigations is greater.

Regression model. Imputations are based on separate regression models for each wave and each survey measure. The regressions are estimated on all households interviewed in both the wave of interest and at least one other wave. By limiting the sample in this way, we exclude households for which we have no survey data to use in prediction and estimate the model on a sample comparable to the one for which the prediction will be made.⁶

The regression models are of a common form. Each survey measure in wave w , y_w , is a function of a linear combination of p independent variables, $x_{1w}, x_{2w}, \dots, x_{pw}$, plus an additive disturbance, ε_w . For a set of n observations we write $\mathbf{y}_w = F(\mathbf{X}_w \boldsymbol{\beta}_w) + \boldsymbol{\varepsilon}_w$, where \mathbf{X}_w is an $n \times p$ data matrix for wave w and $\boldsymbol{\beta}_w$ a $p \times 1$ vector of parameters. In general, the matrix \mathbf{X}_w includes:

- Measures of y in each wave not equal to w ;
- Measures of household-level correlates of y from the nearest wave;
- Dummy variables indicating the timing of responses in other waves,
- Indicators of whether the locality is Arab or Jewish and whether it is a kibbutz; and
- Interactions of response patterns and measures of y from the other waves.

These independent variables are based on observed data wherever possible. If a measure is not available (e.g., y in waves not equal to w), we substitute the mean for all cases with a response in that wave (as a rough imputation for item nonresponse). The set of independent variables included in a model of a survey measure was chosen based on statistical tests, a desire for roughly comparable models, and a comparison of mean-squared errors of the various models.

The functional form, $F(\cdot)$ depends on the distribution of the dependent variable. For each measure, the functional form used is listed in Table 2. For continuous outcomes, we estimate ordinary least squares. For binary variables, such as whether any children live in household, we estimate logit models. For proportions, we estimate logit models, weighted by the number of persons in the household with each of the two outcomes. For instance, in the employment rate model, a household with $n_{h,1}$ workers and $(n_h - n_{h,1})$ nonworkers contributes n_h observations to the logit model: $n_{h,1}$ indicating employment and $(n_h - n_{h,1})$ indicating nonemployment.

We experimented with tobit models to predict the employment rate and the average number of months of employment. The tobit model is a commonly used econometric model for dependent variables with a piling up of cases at the maximum and/or minimum and a distribution of values in between for which OLS would be appropriate. For the employment rate, this is not the right model as values also pile up at 50 percent.

For the average number of months employed, the tobit model provides a reasonable description of the data. One possible concern with the tobit model is that the data are heteroskedastic, as the variance of the outcome depends on the number of adults in the household used in its calculation. We chose to use OLS because of its simplicity. Future work

⁶ Cases without a response in other waves could be included in both our estimation sample and our prediction sample for nonrespondents. The regression would produce a prediction for FNR roughly equal to the average for those who only responded in the given wave. This is likely to be a poor estimate—with little data available to test it—and greatly affect the estimated average. As a result, we prefer to exclude such cases from the analysis.

may wish to consider using weighted least squares to account for the variation in the number of adults across households.⁷

For a few variables, we use a more complicated procedure because of the relationship between locality and the variable. For instance, in predicting the probability of being Jewish, we find no Jewish households in Arab localities. Therefore, we estimate the model only on households outside of Arab localities and assign cases from the Arab localities to be non-Jewish. This approach was also used to predict whether the head is an immigrant or recent immigrant, as our data also show no immigrants in Arab localities.

We found that a regression model of the form described above, leads to a better prediction of y_w than simply using $y_{nearest}$ – the y from the nearest wave with a response – or a regression of y_w on $y_{nearest}$. For all measures, the more complex regression estimate was preferred based on a comparison of their cross-validated mean squared errors. For instance, for the employment rate, the mean-squared errors by wave from the logit model are between 82 and 91 percent of those from a regression based only on the outcome from the closest period with a response.

For survey measures with noncontinuous outcomes, we compared the use of ordinary least squares (OLS) with nonlinear models that take into account the measure's distribution. Although the OLS estimates were sometimes preferred to the nonlinear alternatives on a mean squared error criterion, we generally chose the nonlinear models to constrain the predictions (e.g., between zero and one). For instance, we chose to use a weighted logit model to predict the employment rate, although the mean-squared errors for the logit model are between one and four percent higher than those from OLS.

Prediction for WNR households and comparison to respondents. We predict survey measures for WNR households in each wave using the conditional expectation of the estimated model and compare that to the average value observed for respondents. Define N_{int} as the number of interviews in four waves for a household. Hence, N_{int} equals 0 if there are no interviews; 1 if there is one interview, and so on. For a given wave, we compare the observed survey measures for *all* respondents ($N_{int}>0$) to the imputed values for nonrespondents with at least one response (also $N_{int}>0$). By requiring one or more interviews over the four waves for each group, we impose the same condition on both respondents and nonrespondents.⁸

Quality of predictions. To assess the quality of the prediction models, we estimated the models in a randomly selected half of the data and then examined the model fit in the non-estimation half of the sample.

Table 4 presents the means of actual and predicted values for interviewed cases and their correlation. Each statistic is an unweighted average of the statistics for individual waves. The predictions reproduce the actual values reasonably well. For most household characteristics, the correlation of the actual and predicted values is above 0.91. The exceptions are household help ($\rho=0.68$) and education of head ($\rho=0.87$), which also showed low cross-wave correlations in Table 3. Employment characteristics show a somewhat lower level of correlation between the actual and predicted values, with all correlations between 0.8 and 0.9. The lower correlation of employment measures is expected, as employment is likely to vary across waves of the survey more than demographic characteristics.

⁷ Similar problems may exist for modeling the probabilities that all adults worked all year and no adults worked during the year. Although we estimated logit models with the household as the unit of observation, future work may wish to consider weighting to account for the number of adults.

⁸ An equally reasonable approach is to compare respondents with at least one other response ($N_{int}>1$) with nonrespondents with at least one response ($N_{int}>0$). By requiring that both respondents and WNR have to respond in one of the three other waves, it excludes respondents to the current wave with no other response, which were included in the previous approach. Fortunately, it is rare that the choice of approach matters, as only three to seven percent of the respondents in each wave have their only response in that wave.

Standard errors of estimated differences. Standard errors for differences between the means of the actual respondent and imputed nonrespondent data are estimated using non-analytic bootstrap methods. The main reason for choosing the bootstrap is the complexity of our estimates. The bootstrap can easily be set up to accommodate nonlinear (e.g., weighted logit) models, prediction out of the original sample, and variability of X .⁹

The method is quite straightforward. For a given wave, let n be the total sample size (respondents and WNRs). We draw B repeated samples of size n with replacement from our original sample. The procedure is applied one wave at a time, with replicates drawn to ensure that both the numbers of respondents and nonrespondents by reason for nonresponse match those in the original sample.

Let d be the difference between average measures for respondents and WNRs, y_R and \mathbf{X}_R the vector of respondents' outcome and \mathbf{X} matrix, respectively. For each replicate sample, $b=1, \dots, B$, we follow the complete procedure used to estimate the respondent-nonrespondent difference in the original sample:

- Estimate coefficients of the regression model $y_{b,R} = F(\mathbf{X}_{b,R} \boldsymbol{\beta}) + \varepsilon : \hat{\boldsymbol{\beta}}_b$;
- Using $\hat{\boldsymbol{\beta}}_b$, calculate the average prediction for each category of nonrespondents with at least one response: $\text{mean}[F(\mathbf{X}_b, \hat{\boldsymbol{\beta}}_b)]$;
- Calculate the mean for all respondents: $\text{mean}[y_{b,R}]$; and
- Calculate the difference: $\hat{d}_b = \text{mean}[F(\mathbf{X}_b, \hat{\boldsymbol{\beta}}_b)] - \text{mean}[y_{b,R}]$.

The standard error of d from the original sample is the standard deviation of the \hat{d}_b for the $B=250$ samples, calculated as $\left[\frac{1}{249} \sum_{b=1}^{250} (\hat{d}_b - \bar{\hat{d}})^2 \right]^{1/2}$. The standard deviation is

calculated relative to $\bar{\hat{d}}$, the average of the estimates for the replicates. Note that the estimate of d is based on the original sample. A similar procedure is used to calculate the standard error of the difference by reason for nonresponse.

Caveat. Imputation using data from across the waves requires stability over waves. We assume that nonresponse is missing at random, conditional on the observed variables. If nonresponse is related to changes in otherwise stable variables (e.g., not answering questions on employment because the respondent was recently fired), an imputation approach will not capture this pattern.

V.2 Other Analyses

Analyses of effort and cross-wave variation provide additional insight into the extent to which nonrespondents are likely to differ from respondents. Each analysis takes advantage of variation that is not incorporated into the previous analysis of actual and predicted values.

Effort Analyses. We examine the relationship between the survey statistics (e.g., mean employment rate) and the number of in-person visits until an interview to learn whether households that require more visits to obtain an interview have different characteristics than those requiring fewer visits. If such differences were observed, we would have reason to expect nonrespondents to differ from respondents. Furthermore, we might also expect nonrespondents to be more similar to households requiring a lot of effort rather than to those who were easily interviewed.

⁹ We include the variability of the X s in the estimate of the standard error to account for the limited sample of wave nonrespondents used to infer to all WNR.

In the LFS, data on the number of in-person visits until an interview are primarily of interest in the first and fourth waves for which most calls are made in person. (Data on the number of phone calls until the interview would be of interest on the second and third waves, but such data are not currently available.) We report the average of the household and employment measures by number of visits until an interview, whether the interview was by phone, or by absentee questionnaire (a self-completed questionnaire used in cases where a full interview cannot be obtained. See also Section I.3 in Wissoker and Nirel, 2003). Statistics for households with a common number of visits, etc., are averaged over waves one and four, weighting by the proportion of cases in the category in each wave. The average for households in the waves in which the interview occurred by phone are of lesser interest, because we do not know whether the interview occurred after the in-person visits and thus cannot judge the relative effort required.¹⁰

Ideally, this analysis would be performed separately by reason that multiple visits were required – i.e., number of visits without contact and number of refusals. This would allow us to estimate how household characteristics vary with effort, for distinct reasons. Currently, however, the data are only available on the total number of in-person visits for those interviewed on each wave and whether the interview took place by phone.¹¹

Analyses based on cross-wave patterns. In the remaining analyses, we focus on how survey statistics vary with cross-wave response patterns. Variation of such statistics with the number of interviews is taken as evidence that respondents and nonrespondents may also differ. The analysis is limited to WNR households that are eligible for interviews in all waves.

We calculate for each household, the cross-wave average of household and employment measures, using a simple average over the measures from each wave with an interview. We then perform three subanalyses:

- a) Among all cases, examine how survey statistics are related to the number of interviews, regardless of reason for nonresponse;
- b) Among cases that were only either interviewed or refused, examine how survey statistics are related to the number of waves with a refusal; and
- c) Among cases that were only either interviewed or not contacted, examine how survey statistics are related to the number of waves without contact.

Evidence of a strong and monotonic relationship between the survey measures and the number of interviews would suggest that willingness to respond is correlated with household characteristics and employment status. As a result, we would also expect differences between respondents and nonrespondents. Analyses b) and c) use the data from across waves to understand whether the overall relationship appears to differ by reason for noninterview.

Standard error for other analyses. Bootstrap estimators are used to obtain standard errors of the estimates for each analysis.

For the effort analysis, we calculate the bootstrap estimates of the standard error of the sample mean, \bar{y} . For cases with v visits in either wave, for each variable Y we draw $B=250$ repeated samples with replacement ensuring that the numbers of cases with v visits in wave one, wave four, and both waves match the numbers in the sample. For each replicate sample we calculate \bar{y}_b , the average y , where cases with v visits in each wave are included in the average once for each wave. The standard error of \bar{y} is the standard deviation of \bar{y}_b for the

¹⁰ We exclude from the calculations, kibbutzim residents who are automatically called by phone and wave- four residents of moshavim (who are not eligible for the income survey and are called by phone).

¹¹ One might also measure effort in these data as the time required to obtain an interview. However, a longer time until the interview could result from household preferences or circumstances, a change in the household residing in the dwelling, or fieldwork considerations/constraints. Correlation observed between characteristics of households interviewed and time of interview might reflect any of these factors.

B=250 samples, calculated as $\left[\frac{1}{249} \sum_{b=1}^{250} (\bar{y}_b - \bar{\bar{y}})^2 \right]^{1/2}$, where $\bar{\bar{y}}$ is the average of the estimates over all replicates.

For the bootstrap estimator of the standard error of the mean of survey measures for cases with a given number of interviews, refusals, and noncontacts, we assign all households eligible in all four waves to sub-groups g by the number of interviews (or refusals or contacts, as appropriate). For each sub-group of size n_g , we carry out a traditional bootstrap, as before obtaining standard errors that account for cross-wave correlations.

V.3 Comparison of WNRs and Full Nonrespondents

The analyses in this paper are limited to describing nonresponse for those cases with a response in at least one wave. Only very limited data are available in our data set to assess the similarity of wave (occasional) and permanent nonrespondents. In Section VI below, we use data on locality to describe those differences between WNRs and FNRs.

V.4 Weighting

For these analyses, we use unweighted data. As noted earlier, the ultimate sampling probabilities are equal for observations sampled within a year. Because the sampling probabilities are similar within our sampling period, weighting by the inverse of these probabilities is unlikely to affect the results.

One might also consider using weights, such as those used for making survey estimates, that make the data line up to demographic distributions. The goal would be to distinguish differences that result from the sampling variation from those due to nonresponse. However, (1) the standard errors should account for likely sampling variation; (2) such weights can only be constructed for respondent households and would not work for our primary analyses; and (3) for analyses based solely on respondents, it is hard to know how to interpret the findings, once a partial correction for factors highly correlated with underrepresented groups has been done. Finally, since our analysis is based on several years of data, the variation due to sampling variation is smaller than that found when using shorter time intervals.

V.5 Model of Propensity to Respond

After the imputation models are constructed, we estimate a propensity (logit) model to predict the probability of nonresponse, given selected household and employment measures. The purpose of the model is to improve our understanding of how the variables contribute to an explanation of nonresponse within a multivariate context.

The logit model assumes a relationship between the probability of nonresponse, p , and the vector of independent variables, \mathbf{x} , of the form $\ln(p/(1-p)) = \mathbf{x}'\boldsymbol{\beta}$, or equivalently, $p = e^{\mathbf{x}'\boldsymbol{\beta}} / (1 + e^{\mathbf{x}'\boldsymbol{\beta}})$. The model is estimated using maximum likelihood. The independent variables are equal to the observed values for respondents and predicted values for WNR cases. FNR cases are excluded from the model.

The results are presented as odds ratios, defined as $\frac{p(x_j+1)/[1-p(x_j+1)]}{p(x_j)/[1-p(x_j)]} = \exp(\beta_j)$,

where $p(x_j)$ is the predicted probability with the j th x equal to x_j , evaluated at fixed \mathbf{x}_i and $\boldsymbol{\beta}$. Note that the odds ratio does not depend on the values assigned to other variables because of the functional form. An important case is a binary X , for which we substitute $x_j=0$. In this case, the odds ratio approximates how much more likely it is for the outcome to occur for

those with $x_j = 1$ as compared with $x_j = 0$. For continuous variables the odds ratio expresses the increased risk for every unit change in the variable. Note that a variable for which the odds ratio is greater than one also has $\hat{\beta} > 0$ and thus has a probability of nonresponse that is increasing with x_j .

We estimate the standard errors of the model coefficients using the maximum likelihood estimates, ignoring that the values are predicted for WNRs. As a result, we expect that the standard errors are understated.

The predictive accuracy of the model is assessed using the area under ROC curve. The ROC curve plots the rate of correct prediction of nonresponse against one minus the rate of correct prediction of response, for alternative cutoff points used to assign the predicted probability as either a respondent or nonrespondent. The area under this curve provides an estimate of the percentage of randomly drawn pairs of respondents and nonrespondents for which the nonrespondent has a higher predicted value. Values range from 0.5 to 1.0, with higher values indicating more accuracy.

We have some reservations regarding this model. The independent variables are created differently depending on the value of the dependent variable: actual values are used for respondents and predicted values for WNR cases. As a result, the range and variance of the independent variables are smaller for WNR cases than for respondents. On average, standard deviations of the imputed measures are 13 percent less than for the observed measures. Furthermore, the imputed values for subsets of variables are predicted using a similar set of variables, often leading to higher covariance among the measures for WNR households. (For instance, the covariance of full time employment and employment is 0.84 - 0.87 among WNRs and 0.78 among respondents.) These known limitations are expected to have some effect on the bias and variance of the estimated parameters. The subject should be further examined and incorporated in the estimation process. Nevertheless, we include the model in this report for discussion, first, to illustrate the method, and, second, because we believe that it adds some insight into the characteristics of WNRs.

VI. Findings

VI.1 Comparison of Means for Wave Nonrespondents and Respondents

In this subsection, we present estimates of the differences in locality, household characteristics, and employment between WNRs and respondents: both overall and by reason for nonresponse. For each measure, the estimated difference is defined as the mean imputed value for nonrespondents minus the mean value for respondents. A positive difference implies a higher mean for nonrespondents than for respondents.

Locality. Data on locality of residence are the only measures available for both WNR and FNR households. We examine indicators of residence in large (greater than 100,000 persons) and rural (fewer than 2000 persons) localities.

Findings are presented in Table 5. The left panel shows the comparison between *wave* nonrespondents and respondents, while the right panel compares *all* nonrespondents and respondents. Sample sizes by wave for respondents and both wave and all nonrespondents are presented at the bottom of the table.

Starting with the left panel, the leftmost column under the heading “Difference” shows that the share of WNR households in large localities is greater and the share living in rural areas is lower than for respondents.¹² Moving to the right panel, we see that inclusion of FNR dwellings leads to a larger differential in the share in large localities, particularly in waves one and two. This suggests that there are differences in the rates of residence in large cities for

¹² For example, the percentage of respondent households located in a large locality in wave one is 46.7. The percentage for WNR households is 53.1, calculated as the sum of 46.7 and the differential of 6.4.

WNR and FNR households. In contrast, the share living in rural localities is similar for WNRs and all nonrespondents. For each group of measures for both wave and all nonrespondents, differences versus respondents are generally consistent in size across waves and always statistically significant.

The patterns by reason for nonresponse (presented in the three rightmost columns of each panel) show differences of the same sign for refusal and noncontacted cases, while other cases are of mixed sign. A comparison of wave and all nonrespondents suggests much higher rates of residence in large localities for two groups of FNR cases: those not contacted in the first three waves and other cases, particularly in wave one. However, noncontacted cases still have a lower probability of living in rural localities than refusal cases. Presumably, this is because it is easy to contact households in rural locations such as kibbutzim and moshavim.

Household composition. For measures of household composition, comparison of wave nonrespondent and respondent means reveals some large differences (Table 6). Nonrespondent households are estimated to contain more single-person households, fewer adults and married couples, and fewer households with children in all waves. Interviewed households are also more likely to contain only adults over the age of 65 in the last three waves. These differences are relatively large and statistically different from zero. An exception to this pattern is the presence of children under age 5: Nonrespondents are somewhat less likely to have young children, however, the differences are small and only statistically significant in the last wave.

Differences by reason for nonresponse show that the overall differential for nonrespondents consistently picks up the pattern of the noncontacted households. As suggested by theory, noncontacted cases are much more likely than respondents to be single person households, contain fewer adults, no children, and have an unmarried head. The differences for refusal cases are typically in the same direction but smaller.¹³ One exception is the rate of households with only persons over 65, which shows strong refusal effects in waves one through three, though the direction switches. The switch in the refusal pattern fits with an initial reluctance to participate on the part of the elderly.

The differences for the category “other” vary by wave. In the first and fourth waves, which are generally conducted in person, many differences are near zero. Exceptions include the presence of children and only adults over age 65. For the former, the differences are positive for these waves. This might be expected, since the category includes homes with no one able to answer the survey (perhaps because a baby sitter is there) or with a temporary problem. For the latter, a relatively strong negative differential is associated with other, although the reason for fewer elderly only households among the other category is unclear.

For the second and third waves, which are typically conducted by phone, the cases in the category other resemble a less dramatic version of the noncontacted cases. A sizeable majority of these cases were tried only by telephone, particularly after the start of CATI. If a non-negligible share of phone-only cases had only minimal contact, the mean characteristics of households in the category other might be expected to resemble those of the noncontacted households.

Characteristics of household members. Among characteristics of households (Table 7), no strong pattern can be seen. Differences in the number of years of education are higher for WNR households in the last two waves, with these differences attributable to noncontacted households (and those in the category other in wave three). Note that the education variable is the number of years of education not the highest level attained. It thus may not reflect income, as those with the most years of schooling may be Orthodox Jews studying at a yeshiva, a

¹³ One might expect that the types of persons who cannot be contacted for an interview are also less likely to have time to be interviewed if they happen to be at home. In the absence of other factors distinguishing refusal cases, it may be suggested that the mechanism that causes refusal echoes the pattern for noncontact.

group unlikely to have high earnings. The probability of being Jewish is higher among WNR cases in the last two waves. The percentage differential is quite large (over 30 percent) when expressed as a share of households with non-Jewish heads. The differential appears to result largely from higher refusal rates among the Jewish population.

Immigrant status does not show a consistent relationship to nonresponse. Nonrespondents are somewhat less likely than respondents to be immigrants, but the difference is only statistically significant in one wave. The evidence on recent immigration is mixed, with one quarter showing significantly higher rates of recent immigration for respondents and another showing higher rates for nonrespondents.

Rooms per person and use of any household help, which were intended to indicate household income, show opposing patterns. In each wave, number of rooms per person is significantly greater for noninterviewed cases, while use of household help is significantly less. The same pattern can be seen by reason for nonresponse as well. One explanation for the discrepancy in the direction of the two measures is that the measure of rooms per person does not reflect income, but instead reflects the differential associated with household size; the pattern of nonresponse across waves and reasons matches that for single person households. The interpretation of use of household help is also unclear. It may reflect differentials of household size and composition as well as income as the pattern of nonresponse across waves and reasons matches those for married, any children and number of adults.

Employment. Table 8 provides evidence that labor market participation by WNRs is higher than that of respondents by relatively small amounts. The overall difference is below 7 percent for the first four measures, which are of the most interest. However, underlying these aggregate findings is a distinct pattern across waves: For five of the six indicators of labor market participation, no difference between nonrespondents and respondents is seen in waves one and two; however, in waves three and four, labor market participation is significantly greater among nonrespondents. The sole exception is the share of households without employment in the past year, which occurs at higher rates among nonrespondents to the first two waves.

The overall pattern of negative to very small positive differentials in the first two waves and significant positive differentials in the latter two waves is a combination of two distinct patterns for the refusal and noncontacted cases, as shown for the employment rate in Figure 2. The pattern for the other category, which represents between a third and a half of all nonrespondents, is quite similar to the overall pattern.

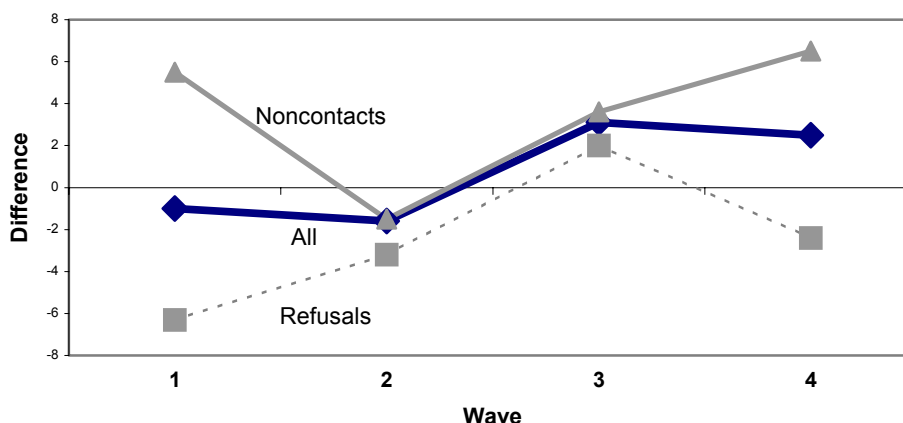
As expected, for the first wave, noncontacted WNR cases have higher rates of employment than do respondents, in keeping with employed persons being more difficult to find at home. In the second wave, however, we unexpectedly see no differential for noncontacted cases. The rate of employment among noncontacted cases increases in wave 3 (after a lag of 6 months) and surpasses the rate of wave 1 in wave 4. For the first two waves, refusal WNRs have lower rates of employment than do respondents, but this difference becomes insignificant in later waves.¹⁴ Thus, the null effect in the first wave is a result of high, but opposite patterns for the refusals and noncontacted households. This could result from workers being harder to contact and nonworkers being more likely to refuse. In wave 2 the null effect is a result of two null effects and for the last two waves the differentials for those refusing are small while noncontact becomes dominant. Further research is needed to understand these patterns for refusal and noncontact cases.

The category other typically shows consistent significant and positive differences, but only in the third and sometimes in the fourth waves. In each case, the differences are in the same direction as the noncontacted cases. This does not fit with the pattern seen in Table 6, where other cases in the second and third waves were quite similar.¹⁵

¹⁴ One partial explanation is that households with employment problems become less likely to refuse over the survey. However, this does not explain the consistent (though not always significant) change in sign in the fourth wave.

¹⁵ Again, the findings by reason for no one working in the household show somewhat different patterns.

Figure 2: Differences for employment rate by wave



VI.2 Measures of Effort

We next examine how key survey measures vary with the effort required to obtain participation. Our measure of effort is the number of in-person visits to the household. Households that require more visits are expected to be more similar to nonrespondents, since many of them only responded because of the extra effort. If the implied picture of nonrespondent characteristics matches those found in the previous analysis (Tables 5-8), we will view it as support for those findings.

Means of survey measures by number of in-person visits are presented in the first four columns of Table 9. Overall, the trends support the findings of the previous analysis. Measures of household composition, which showed strong differences between respondents and WNRs, show similar trends here. As before, we see higher percentages of single person households, lower percentages of married couples and elderly-only households, and fewer adults among households that require more visits to obtain an interview. Similar, although somewhat weaker, patterns are seen for presence of children and young children.

The measures of characteristics of residents, which showed mixed relationships in the previous analysis, also show mixed relationships here. More educated persons and Jews are more commonly found among those interviewed in later visits, in keeping with the differences in the later waves in Table 7.

As before, the findings imply a higher number of rooms per person for nonrespondents, in keeping with the pattern of single person households. Use of household help is more common among those with two or more visits as compared with one visit. Although this is not a strong result (all of the change occurs between one and two visits), the change in pattern as compared with the previous analysis is enough to raise questions about the findings for this measure. The difference could result from focusing only on cases from waves one and four, or possibly from the weakness of the model used for prediction.

Locality measures are also in line with the previous comparison of WNRs and respondents. Dwellings located in large localities are more common among those interviewed in later visits, while those in rural localities are more common on earlier visits.

Finally, the patterns for measures of employment are generally in line with the overall higher employment of wave nonrespondents seen earlier. Differences between each pair of visits show higher employment among those requiring more visits. Patterns are typically monotonic with statistically significant differences between households requiring k and $k+1$ visits. However, here, nonemployment in the past year fits more neatly with the other employment measures, showing higher rates of households without any employment among those contacted on earlier visits to the household.

VI.3 Characteristics by Numbers of Interviews, Refusals, and Noncontacts

The next three tables describe the correlation of survey measures with patterns of participation across the four waves of the survey. Table 10 presents data on variation with the number of interviews, while Tables 11 and 12 show the variation with numbers of refusals and noncontacts. Each analysis is limited to WNR households with eligibility in all four waves. The analyses by numbers of refusals are further limited to households with only refusals and interviews; a parallel restriction is used for analysis of noncontacts. The standard errors are large, particularly in the rightmost column of each table. As a result, we do not have the power to distinguish between a pattern that shows no variation with the number of interviews, refusals, or noncontacts and one that shows slight monotonicity or non-monotonicity. Results are discussed by topic.

Household measures. The findings are consistent with earlier analyses: Household measures that show large and consistent differences between respondents and nonrespondents show a pattern here. We see strong monotonic patterns for percentages of single person households and percent married, as well as presence of children in the household. As before, households with adults over 65 are more common among those consistently interviewed. Although households with fewer adults are seen among those less likely to respond, the pattern is weaker than for other demographic measures.

Non-demographic household measures continue to show a mixture of implied differences for nonrespondents. As before, Jews are more likely to be nonrespondents. Number of rooms per person again is consistent with the increased presence of single person households among households with fewer interviews. The measure of household help implies less use of household help among nonrespondent households, matching our first analysis (Table 7).

Separate analyses by reason tend to confirm our earlier results. Measures that are positively correlated with the number of persons in the household also have a strong positive correlation with the number of noncontacts, while the relationships with the number of refusals are more variable. Sharp gradients are observed for single person households who comprise 50.3% of those with two noncontacts and only 14.4% of those always contacted, and for, its mirror reflection, of married people who comprise about 70% of those always contacted and only 33.8% of those not contacted twice. The one exception is presence of only adults over 65, for which patterns are not monotonic by either refusals or noncontacts.

For other household characteristics, the patterns by numbers of contacts and refusals generally provide little insight. Notably, however, we see that the probability of being Jewish and having any household help are consistently related to refusals. A similar finding was reported in Table 7.

Locality measures. Households with fewer interviews across the four waves are more likely to live in large localities as was found in previous analyses; however, the evidence here is weak as the pattern is not monotonic. As in previous analyses, we see a smaller percentage of cases in rural localities among households with fewer interviews across the four waves. By reason for nonresponse, we see: 1) a sharp difference in the share of large locality cases between households with zero and one or two refusals and between households with zero and one noncontact; and 2) no difference in the share living in rural localities by number of refusals, but a strong difference by number of noncontacts, with no rural households among those with two noncontacts.

The results for large localities demonstrate a weakness of the method. From actual observation (Table 5), we know that nonrespondents are more likely to be from large localities; yet, the mean is lower for those with two interviews as compared with three interviews. Clearly, lack of a monotonic pattern cannot always be taken as evidence against the overall pattern.

Employment. The employment measures typically show little variation with the number of interviews. Most of the standard errors on the means for households with one or two interviews are large enough that we cannot distinguish them from the means for households with four interviews. However, we see lower employment involvement among households with four interviews as compared to those interviewed in three waves, and would see a similar pattern if we aggregated those with three or fewer interviews.

Note that the rate of unemployment increases as the number of interviews decrease, particularly when comparing those with four and three interviews, in apparent opposition to the pattern seen for labor force participation rates and employment. However, this pattern results from the definition of unemployment as a fraction of the labor force participation rate and the fact that labor force participation increases faster than employment.

VI.4 Implications of Estimates

In Table 14, we estimate the overall sample mean using alternative assumptions regarding the FNR households. On average, 90.9 percent of eligible cases are interviewed, 5.7 percent are wave nonrespondents, and 3.4 percent never respond. We vary the assumptions for those who never respond. In the second column, we assume that the imputed mean for the wave nonrespondent sample applies to both WNR and FNR households. In the third and fourth columns, we choose extreme low and high values for those who never respond – based on the minimum and maximum values observed in Tables 9-12 – and then calculate the overall mean. In the table, we report y_{ALL} / y_R , where y_{ALL} is the estimate for the full sample and y_R is the observed value for respondents.

The results presented are generally reassuring. The estimates of the employment rate, labor force participation rate, which are the most important items analyzed here, are off by at most a half a percent. This is similar to the coefficient of variation for the labor force participation rate calculated on an annual level (.45 percent). For the rate of full-time employment, even with extreme assumptions, the estimate is off by at most 1.1 percent. A notable difference is seen for the indicator of whether everyone in the household worked all of the past year, a measure that is included in the analysis because we expected it to be correlated with noncontact.

The largest ratio in the analysis is for the indicator of single person household, which we estimate to be 7 percent smaller among the respondents than among the population as a whole. The bounds estimates show that the difference could be as large as 11 percent. Ratios smaller than one, indicating overestimates of respondents by 1.1-1.3 percent are seen for the rate married, presence of children and elderly-only households. The corresponding bounds on these estimates indicate differences of no more than 1.7 - 2.6 percent. The issue with inclusion of single person households is not new. A publication for the 1983 Census also discusses the source of low rates of single-family households in the LFS (State of Israel Central Bureau of Statistics, 1986, p. xxxii).

These findings put the overall analysis in perspective. Although differences between respondents and WNRs are observed, they result in relatively modest estimates of bias for the population. This is because WNRs and FNRs account for small shares of the eligible population. As a result, even fairly large assumed differences between respondents and FNR lead to relatively modest estimates of bias for the population estimates.

VI.5 Propensity to Respond

Finally, we model the probability of nonresponse as a function of the actual and imputed measures of household, locality, and employment. Our model specification is relatively simple, avoiding multiple measures of a single concept. For instance, we include variables for marriage and number of adults, but not for single person household. The odds ratios from the model and their standard errors are reported in Table 15; the asterisks indicate odds ratios that are significantly different from one.

Overall, our models show weak explanatory power. The area under the ROC curve provides an estimate of the probability that if we randomly draw one respondent and one nonrespondent, the nonrespondent will have the higher predicted probability of nonresponse. For wave one, we have only a 57 percent chance of correctly allocating two such cases – not much better than assigning them at random. The predictive value improves to 64% in wave three. The weaker predictive power in the first wave is undoubtedly related to the weaker differences observed in the comparisons of WNRs and respondents in the first wave (Tables 5-8).

The findings show that number of adults, presence of only adults 65 and older and the indicator of location in large cities to be significant in all waves. Full-time work and rural location are significant or near significant in all waves. Education is not significant in any wave.

Perhaps of the most interest is the emergence of multivariate relationships, which are naturally not observed in the univariate context. In particular, presence of children and marriage have weaker relationships to nonresponse than in a univariate model. The model suggests that the overall effect of children occurs at least partially through marriage; similarly the effect of marriage occurs partially through the number of adults.

Furthermore, inclusion of both full-time employment and any employment in the model yields an unexpected pattern: Households with employment and no full-time work have lower nonresponse rates than households with no employment, while households in which everyone works full time have nonresponse rates similar to those without employment in waves one and two and higher nonresponse rates in waves three and four. This pattern might result if workers refuse less than nonworkers and noncontact is highest among full-time workers.

The range of predicted values is not wide, indicating the difficulty of predicting who will not respond. In Table 16, we present the predicted values for two types of households, based on the observed logit coefficients over the four waves. Type I households are relatively unlikely to respond, while Type II households are relatively likely to respond. Precise definitions are found in the table. Type I households are predicted to have a probability of nonresponse of nearly 9 percent in the first two waves and 12-13 percent in the last two waves, while Type II households have between a 0.8 and 2.2 percent probability of nonresponse, with a large percentage difference in probabilities between the two types. The variation in predicted probabilities between waves for the first type appears to result from the variation in the relationships between nonresponse and employment. Although the two household types represent range of predicted probabilities of response, it is worth noting that even those most likely to be nonrespondents have probabilities of response of 87 percent. This suggests the difficulty of targeting population subgroups with very low levels of participation in the LFS.

VII. Summary

In this report, data for LFS samples drawn between 1996 and 1998 are used to evaluate whether respondents and wave nonrespondents (WNRs) to the LFS have similar characteristics. We imputed data on survey measures for WNR households and compared the imputed values to those observed for respondents. Furthermore, we examined process and cross-wave indicators of non-response bias to see whether these analyses support the findings of the imputation analysis. To assess bias, we compared the estimated statistics for respondents to those for the full sample using imputed values for WNRs and alternative assumptions regarding those who never respond. Findings across the several analyses are summarized in Table 17 for selected variables.

Overall, we find evidence of differences between respondents and nonrespondents for selected demographic measures and locality of the household and mixed evidence regarding employment. Among demographic measures, we find strong evidence of higher rates of single person households and unmarried heads of household among nonrespondents and fairly strong evidence of lower rates of households with only older adults or with children among nonrespondents. We also find evidence that nonresponse is higher among Jewish heads of

household. In addition, nonrespondents are more likely to live in large localities and less likely to live in small localities. We find differences in employment measures in only the last two waves; the supplemental analyses also show mixed results, with the effort analysis showing a small difference and the cross-wave analysis indicating a small (or no) increase.

Finally, the bounds on the ratio between the full-sample and the respondent estimates suggests relatively small biases due to nonresponse. For instance, the employment rate and labor force participation rates are predicted to differ from the respondent measures by at most half a percent and the rate of full-time employment at most 1.2 percent. Differences for demographic characteristics tend to be a bit larger, but still show bounds of 2.6 percent or less. One exception is the percentage of single person households, for which we find population estimates between 4 and 11 percent higher than found from the respondents alone. These relatively small differences in the full-sample estimates occur despite moderate-sized differences between the characteristics of respondents and wave nonrespondents. The response rate is high enough that even moderate differences will lead only to small biases in the full-sample estimate.

Such differences may be addressed in part by the weighting procedures. The weights line up the estimated numbers of persons by sex and age category within groups of localities to demographic estimates. This is intended to control for randomness in sampling, as well as adjust for differential nonresponse correlated with sex, age and geographic variables. A calibration procedure is then carried out to assign equal weights to all persons within a household. In 1998, for instance, the weighted estimate of the percent of single person households is 2.7 percent higher than the unweighted estimate, accounting for over a third of the estimated bias; the weighted estimate of the employment rate is 2.4 percent higher than the unweighted estimate, an adjustment much larger than our finding of bias. However, because such estimates also adjust for randomness in sampling, and apply uniform weights within households, one cannot simply infer that the weights over- or under-adjust.

The imputation procedure used here efficiently incorporates the data from respondent waves in the estimation of data for waves without interviews for wave nonrespondents. Such procedures provide a substantial improvement in prediction over simply taking the data from the nearest wave with a response. CBS staff may want to explore whether such methods can be incorporated into the imputations used for determining the demographic distributions, which are then used as part of the adjustment procedures for other surveys. The approach in this paper estimates each measure separately, though as function of a common set of characteristics, so any application may need to explore whether these procedures typically lead to predictions that are consistent for the various measures. For broader purposes, predicted values for binary measures may also need to be allocated to discrete categories.

The analysis provides some insight into the sources of nonresponse bias. Bias in the demographic composition of the household appears to be strongly related to the differential characteristics of noncontacted households in all waves and other households in waves two and three. Two measures, Jewish head and use of household help, show strong correlation with refusal. The employment differential combines a reluctance to participate of those not employed in the first wave and a consistent difficulty in contacting households with employed adults in later waves.

This analysis provides a good initial picture of wave nonrespondents, based on characteristics from other waves. A broader set of measures might provide additional insight into the selectivity of the sample. For example, one might get insight into earnings potential using the measure of highest educational degree, which is available on the most recent years of the LFS. Data on income could also be obtained for those who respond to both wave four of the survey and the Income Survey that follows.

Future work may want to incorporate other data from the frame to assess the similarity of wave and permanent nonrespondents, even if they are available only for selected geographic areas. Possibilities include the number of rooms in a house and an imperfect measure of whether the flat is owned or rented. Further study of full nonrespondent (FNR) cases, by linking to the 1995 census or Population Register, would have increasing advantages as matching procedures and tools improve. Detailed data on location might also assist in

obtaining reliable estimates for nonrespondents or in observing area-level data from the census or other sources for all nonrespondents. Additional data on the interview process would also be valuable, including data to understand the effort made for households interviewed by phone, and data on the difficulty of contacting the household and number of refusals. Furthermore, the cross-wave analysis might usefully be extended to take into account the pattern of response across waves rather than simply the overall number of interviews, non-contacts or refusals.

VIII. Conclusions and Closing Remarks

The study of nonresponse aims to reduce bias in the estimates by promoting both data collection processes and estimation procedures.

In the present study, the estimated bounds of the bias in the overall estimates are relatively small. However, biases in specific groups (e.g. single person households in large localities) can become substantial. The present study suggests directions and tools that can contribute towards bias reduction:

- *Data collection:* The findings suggest that more effort should be put into making contact with cases in certain sub-populations (e.g., households with an unmarried head, single person households in large localities). Similarly, sub-populations prone to refusal (e.g., older people on wave one) should be handled with improved protocols. To achieve improvement, it is suggested that data on potential problem cases be obtained from the frame and from the Population Register, for all waves; and from previous waves, for waves two onward. Once details on a potential problem-case are identified, an appropriate fieldwork protocol should be applied.
- *Estimation.* The paper suggests improved imputation models for WNRs, as compared to existing practice. In addition, assuming that full nonrespondents (FNRs) resemble WNRs, the findings also indicate relevant variables for constructing imputation groups for FNRs.

One of the objectives of this work is to introduce common approaches in nonresponse methodology to the study of nonresponse in the Israeli CBS. It is hoped that similar analyses will be carried out for additional surveys. There is room for improvement in the specific models that are used here by adding covariates that were not included in the data we had. Statistical issues such as variance heterogeneity (e.g. accounting for variable number of adults per household) and correlations between observed and missing data (see Pfeffermann and Nathan, 2001) should be further addressed.

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Acknowledgements

In preparing this report, we have benefited greatly from conversations with Sivan Weiss, John Engberg, Hagit Glickman, Gad Natan, Natalie Shlomo and Alexandra Smolensky. We thank Charles Kamen for a most detailed and helpful review of an earlier version of this paper. The data files were prepared by Alon Evron. Their assistance is greatly appreciated.

Table 2: Definitions of Survey Measures and Models Used for Prediction

Item	Definitions	Prediction Model
Household Measures:		
Single Person Household	=100 if one person in household; =0 otherwise	Logit
# Adults	Number of eligible adults in household, age 15+	OLS
Any children	=100 if any children aged 0-14 reside in the household; = 0 otherwise	Logit
Any children under age 5	=100 if any children aged 0-4 reside in the household; = 0 otherwise	Logit
Married	=100 if head is married; = 0 otherwise	Logit
Only Adults 65 and older	=100 if only persons 65 and older live in household; = 0 otherwise	Logit
Education of head, years	Number of years of education, head	OLS
Jewish, head	=100 if head is Jewish; = 0 otherwise	Logit
Immigrant, head	=100 if head is an immigrant; = 0 otherwise	Logit
Recent Immigrant, head	=100 if head immigrated 5 or fewer years earlier; = 0 otherwise	Logit
Rooms per person	Number of rooms occupied by household divided by number of persons in household	OLS
Any household help	=100 if reported employing any household help for wages, including child care; = 0 otherwise	Logit
Locality Measures:		
Large locality	=100 if locality of residence is >=100,000 persons; = 0 otherwise	None
Rural locality	=100 if locality of residence is moshav, kibbutz, Jewish or Arab village; = 0 otherwise	None
Employment Measures:		
Employment rate	Percent employed or absent from work in previous week, persons 15+	Weighted Logit
Labor force participation rate	Percent working, absent from work, or looking for work in the previous week, persons 15+	Weighted logit
Unemployment rate	Percent in the labor force who are unemployed, persons 15+	None
Full time employment	Percent who usually work 35+ hours per week, persons 15+	Weighted logit
Months worked in past year	Average number of months worked in the past year, persons 15+	OLS
All adults worked all of past year	=100 if no one in household worked 12 months during the past year, persons 15+; =0 otherwise	Logit
No adults worked in past year	=100 if no one in household worked during the past year, persons 15+; = 0 otherwise	Logit

Table 3: Correlations of Key Measures across Waves, Israeli LFS, Panels drawn in 1996-1998			
Item	Waves		
	1 and 2	2 and 3	3 and 4
<i>Household Characteristics:</i>			
Single person household	0.95	0.92	0.95
Number of adults	0.97	0.94	0.96
Any children	0.97	0.94	0.97
Any children under age 5	0.94	0.88	0.94
Married	0.93	0.91	0.93
Only Adults 65 and older	0.97	0.95	0.96
Education of head, years	0.84	0.82	0.84
Jewish, head	0.97	0.97	0.96
Immigrant, head	0.94	0.93	0.94
Recent immigrant, head	0.93	0.89	0.94
Rooms per person	0.95	0.93	0.94
Any household help	0.63	0.60	0.63
<i>Employment Measures:</i>			
Employment rate	0.85	0.80	0.86
Labor force participation rate	0.85	0.81	0.85
Full time employment	0.81	0.75	0.81
Months worked in past year	0.89	0.85	0.89
All adults worked all of past year	0.77	0.70	0.77
No adults worked in past year	0.85	0.83	0.86

Table 4: Comparison of Actual and Predicted Values, Averaged Over All Waves, Non-estimation Sample with at Least One Interview, Israeli LFS, Panels Drawn 1996-1998

Item	Actual	Predicted	Correlation
<i>Household Measures</i>			
Single person household	16.6	16.6	0.948
Number of Adults	2.47	2.47	0.963
Any children	44.0	44.0	0.969
Any children under age 5	22.0	22.0	0.937
Marriage	67.2	67.2	0.936
Only adults 65 or over	15.8	15.8	0.967
Education of head, years	12.2	12.2	0.869
Jewish, head	87.2	87.2	0.976
Immigrant, head	50.4	50.4	0.949
Recent immigrant, head	6.7	6.7	0.939
Rooms per person	1.31	1.31	0.940
Any household help	13.6	13.5	0.680
<i>Employment Measures:</i>			
Employment rate	49.4	49.4	0.871
Labor force participation rate	53.2	53.3	0.869
Full-time employment	37.0	37.0	0.833
Months worked in past year	5.77	5.76	0.899
All adults worked all of past year	20.6	20.4	0.807
No adults worked in past year	25.1	25.0	0.877

**Table 5: Estimated Differences in Location of Nonrespondents (Imputed) and Respondents (Actual),
By Category and Wave, Israeli LFS, Panels Drawn 1996-1998**

Standard errors in italics

Item	Wave	Respondent Mean	<i>Difference:</i>				<i>Difference:</i>			
			<i>Wave nonrespondents versus respondents</i>				<i>All nonrespondents versus respondents</i>			
			All NR	Refusals	Noncontacts	Other	All NR	Refusals	Noncontacts	Other
Large localities	1	46.7	6.4*	10.3*	8.7*	-2.5	11.2*	13.0*	14.4*	5.0*
			<i>1.3</i>	<i>2.0</i>	<i>2.1</i>	<i>2.4</i>	<i>1.0</i>	<i>1.5</i>	<i>1.5</i>	<i>1.7</i>
	2	47.0	7.2*	12.1*	10.5*	2.5	10.6*	13.2*	15.3*	6.2*
			<i>1.3</i>	<i>2.3</i>	<i>2.7</i>	<i>1.9</i>	<i>1.0</i>	<i>2.0</i>	<i>1.9</i>	<i>1.5</i>
	3	46.8	7.3*	7.8*	8.1*	6.6*	9.1*	10.3*	14.0*	5.9*
			<i>1.2</i>	<i>2.2</i>	<i>2.3</i>	<i>1.6</i>	<i>1.0</i>	<i>1.7</i>	<i>1.7</i>	<i>1.4</i>
	4	46.8	8.8*	11.7*	11.5*	1.3	10.5*	12.5*	14.3*	2.6
			<i>1.1</i>	<i>2.0</i>	<i>1.8</i>	<i>2.3</i>	<i>1.0</i>	<i>1.7</i>	<i>1.5</i>	<i>1.9</i>
Rural localities	1	7.1	-4.0*	-3.6*	-5.0*	-3.2*	-3.9*	-3.6*	-5.5*	-2.3*
			<i>0.5</i>	<i>0.7</i>	<i>0.6</i>	<i>0.9</i>	<i>0.4</i>	<i>0.6</i>	<i>0.4</i>	<i>0.8</i>
	2	6.8	-1.9*	-2.3*	-5.7*	0.3	-2.6*	-3.2*	-5.9*	-0.3
			<i>0.6</i>	<i>1.0</i>	<i>0.6</i>	<i>0.9</i>	<i>0.4</i>	<i>0.7</i>	<i>0.4</i>	<i>0.7</i>
	3	6.8	-2.4*	-1.8*	-5.9*	-0.9	-2.3*	-2.5*	-5.8*	-0.3
			<i>0.5</i>	<i>0.9</i>	<i>0.5</i>	<i>0.8</i>	<i>0.4</i>	<i>0.7</i>	<i>0.4</i>	<i>0.7</i>
	4	6.8	-3.5*	-3.2*	-5.6*	-0.8	-3.1*	-3.7*	-5.3*	0.6
			<i>0.4</i>	<i>0.8</i>	<i>0.4</i>	<i>1.0</i>	<i>0.4</i>	<i>0.6</i>	<i>0.4</i>	<i>1.0</i>
N	1	27,148	1741	685	592	464	3067	1102	1087	878
	2	27,975	1514	443	358	713	2537	775	642	1120
	3	28,113	1902	540	448	914	2919	860	699	1360
	4	28,188	1776	578	720	478	2594	917	981	696

*p<=.05

Table 6: Estimated Differences in Household Composition between Nonrespondent (Imputed) and Respondent (Actual) Means, By Category and Wave, Israeli LFS Panels Drawn 1996-1998						
<i>Standard errors in italics</i>						
Item	Wave	Respondent Mean	Difference versus Respondents			
			All NR	Refusals	Noncontacts	Other
Single person household	1	17.4	6.4*	3.6*	15.2*	-0.6
			<i>1.0</i>	<i>1.5</i>	<i>1.8</i>	<i>1.5</i>
	2	17.5	10.0*	0.6	17.6*	12.0*
			<i>1.1</i>	<i>1.8</i>	<i>2.5</i>	<i>1.6</i>
	3	17.5	12.0*	3.3	20.3*	13.1*
			<i>1.8</i>	<i>2.0</i>	<i>2.6</i>	<i>2.2</i>
	4	17.9	10.2*	5.5*	20.0*	1.3
			<i>1.7</i>	<i>2.3</i>	<i>2.1</i>	<i>2.0</i>
Number of adults	1	2.44	-0.18*	-0.06	-0.47*	0.04
			<i>0.03</i>	<i>0.05</i>	<i>0.04</i>	<i>0.06</i>
	2	2.44	-0.22*	0.04	-0.52*	-0.24
			<i>0.03</i>	<i>0.06</i>	<i>0.05</i>	<i>0.05</i>
	3	2.45	-0.33*	-0.06	-0.57*	-0.38*
			<i>0.03</i>	<i>0.06</i>	<i>0.05</i>	<i>0.04</i>
	4	2.43	-0.24*	-0.07	-0.57*	0.07
			<i>0.03</i>	<i>0.05</i>	<i>0.04</i>	<i>0.06</i>
Any children	1	43.6	-4.1*	-2.9	-12.7*	5.0*
			<i>1.2</i>	<i>2.0</i>	<i>1.9</i>	<i>2.2</i>
	2	43.6	-7.3*	-2.7	-15.1*	-6.2*
			<i>1.7</i>	<i>2.9</i>	<i>2.7</i>	<i>1.8</i>
	3	42.9	-4.4*	0.1	-12.4*	-3.1
			<i>1.2</i>	<i>2.1</i>	<i>2.0</i>	<i>1.6</i>
	4	42.7	-5.5*	-2.6	-14.6*	4.5*
			<i>1.3</i>	<i>2.3</i>	<i>1.7</i>	<i>2.3</i>
Any children under age 5	1	22.4	-0.4	-1.7	-2.2	3.8
			<i>1.0</i>	<i>1.5</i>	<i>1.6</i>	<i>2.0</i>
	2	22.3	-0.9	-0.8	-2.1	-0.7
			<i>1.4</i>	<i>2.4</i>	<i>2.4</i>	<i>1.4</i>
	3	21.8	-1.0	0.4	-3.3	-0.6
			<i>1.0</i>	<i>1.6</i>	<i>1.8</i>	<i>1.3</i>
	4	21.9	-2.5*	-2.9	-5.2*	2.1
			<i>1.0</i>	<i>1.6</i>	<i>1.2</i>	<i>1.7</i>
Married	1	66.6	-4.5*	0.0	-14.4*	1.5
			<i>1.2</i>	<i>1.8</i>	<i>1.9</i>	<i>1.9</i>
	2	66.2	-11.3*	-1.3	-17.2*	-14.6*
			<i>1.8</i>	<i>2.7</i>	<i>3.0</i>	<i>1.9</i>
	3	66.0	-15.4*	-5.8*	-21.6*	-18.0*
			<i>1.2</i>	<i>2.1</i>	<i>2.2</i>	<i>1.7</i>
	4	65.5	-11.3*	-7.9*	-20.5*	-1.7
			<i>1.3</i>	<i>2.2</i>	<i>1.9</i>	<i>2.0</i>
Only adults over age 65	1	15.3	0.8	4.1*	0.0	-3.0*
			<i>1.0</i>	<i>1.6</i>	<i>1.6</i>	<i>1.5</i>
	2	15.4	-2.8*	-4.3*	-1.2	-2.8*
			<i>0.9</i>	<i>1.5</i>	<i>1.9</i>	<i>1.1</i>
	3	15.6	-3.5*	-3.9*	-3.6*	-3.2*
			<i>0.8</i>	<i>1.4</i>	<i>1.4</i>	<i>1.1</i>
	4	15.7	-4.1*	-2.0	-4.4*	-6.3*
			<i>0.9</i>	<i>1.6</i>	<i>1.2</i>	<i>1.4</i>

*p<=.05

Table 7: Estimated Differences in Characteristics between Nonrespondent (Imputed) and Respondent (Actual) Means, By Category and Wave, Israeli LFS, Panels Drawn 1996-1998 <i>Standard errors in italics</i>						
Item	Wave	Respondent Mean	Difference versus Respondents			
			All NR	Refusals	Noncontacts	Other
Education of head, years	1	12.23	-0.08 <i>0.10</i>	-0.41* <i>0.15</i>	0.47* <i>0.17</i>	-0.29 <i>0.19</i>
	2	12.32	-0.03 <i>0.11</i>	-0.17 <i>0.18</i>	0.39 <i>0.20</i>	-0.16 <i>0.13</i>
	3	12.30	0.29* <i>0.10</i>	0.08 <i>0.16</i>	0.37* <i>0.18</i>	0.37* <i>0.13</i>
	4	12.35	0.26* <i>0.11</i>	0.02 <i>0.17</i>	0.57* <i>0.16</i>	0.08 <i>0.17</i>
Jewish, head	1	87.3	1.8 <i>1.7</i>	4.3* <i>1.9</i>	2.8 <i>1.9</i>	-3.1 <i>2.4</i>
	2	87.7	1.6* <i>0.8</i>	5.1* <i>1.1</i>	-0.8 <i>1.8</i>	0.5 <i>1.2</i>
	3	87.3	4.1* <i>0.6</i>	7.1* <i>0.9</i>	0.4 <i>1.5</i>	4.2* <i>0.9</i>
	4	87.0	4.7* <i>0.7</i>	7.3* <i>1.1</i>	4.7* <i>1.0</i>	1.5 <i>1.3</i>
Immigrant, head	1	50.2	-1.6 <i>1.2</i>	-1.1 <i>1.8</i>	-2.4 <i>2.0</i>	-1.5 <i>2.2</i>
	2	50.0	-4.0* <i>1.4</i>	-4.4 <i>2.2</i>	-4.5 <i>2.6</i>	-3.5* <i>1.8</i>
	3	50.0	-3.4 <i>1.9</i>	-3.7 <i>2.7</i>	-6.3* <i>2.7</i>	-1.8 <i>2.1</i>
	4	49.7	-2.4 <i>1.4</i>	-2.6 <i>2.3</i>	-4.5* <i>1.8</i>	1.0 <i>2.2</i>
Recent immigrant, head	1	7.5	-1.5* <i>0.6</i>	-3.2* <i>0.7</i>	-0.3 <i>1.0</i>	-0.5 <i>1.2</i>
	2	7.3	1.0 <i>0.8</i>	-3.3* <i>0.8</i>	3.9* <i>1.6</i>	2.3* <i>1.2</i>
	3	6.9	3.0* <i>0.8</i>	-1.6 <i>1.0</i>	2.5* <i>1.3</i>	5.9* <i>1.2</i>
	4	7.1	0.0 <i>0.7</i>	-1.5 <i>0.9</i>	0.8 <i>1.0</i>	0.6 <i>1.1</i>
Rooms per person	1	1.31	0.14* <i>0.02</i>	0.09* <i>0.04</i>	0.37* <i>0.04</i>	-0.04 <i>0.03</i>
	2	1.31	0.10* <i>0.02</i>	0.02 <i>0.04</i>	0.19* <i>0.05</i>	0.11* <i>0.03</i>
	3	1.32	0.13* <i>0.02</i>	0.08* <i>0.03</i>	0.23* <i>0.04</i>	0.11* <i>0.03</i>
	4	1.33	0.14* <i>0.02</i>	0.08* <i>0.04</i>	0.29* <i>0.03</i>	-0.01 <i>0.03</i>
Any household help	1	13.3	-1.5* <i>0.8</i>	-2.7* <i>1.0</i>	-0.5 <i>1.0</i>	-1.2 <i>1.1</i>
	2	13.2	-2.9* <i>0.8</i>	-2.7* <i>1.1</i>	-4.2* <i>1.0</i>	-2.3* <i>0.9</i>
	3	13.4	-3.4* <i>0.7</i>	-3.6* <i>0.9</i>	-3.4* <i>1.0</i>	-3.3* <i>0.8</i>
	4	13.5	-2.0* <i>0.7</i>	-3.3* <i>0.9</i>	-1.0 <i>0.9</i>	-1.9 <i>1.0</i>

*p<=.05

Table 8: Estimated Differences in Employment Between Nonrespondent (Imputed) and Respondent (Actual) Means, By Category and Wave, Israeli LFS, Panels Drawn 1996-1998 <i>Standard errors in italics</i>						
Item	Wave	Respondent Mean	Difference versus Respondents			
			All NR	Refusals	Noncontacts	Other
Employment rate	1	51.0	-1.0	-6.3*	5.5*	-1.4
			<i>0.9</i>	<i>1.2</i>	<i>1.4</i>	<i>1.5</i>
	2	50.7	-1.6	-3.2*	-1.5	-0.6
			<i>0.9</i>	<i>1.5</i>	<i>1.7</i>	<i>1.2</i>
	3	50.1	3.1*	2.0	3.6*	3.5*
			<i>0.9</i>	<i>1.4</i>	<i>1.6</i>	<i>1.2</i>
	4	50.0	2.5*	-2.4	6.5*	2.2
			<i>0.9</i>	<i>1.3</i>	<i>1.3</i>	<i>1.5</i>
Labor force participation rate	1	54.8	-1.2	-6.3*	4.8*	-1.2
			<i>0.9</i>	<i>1.3</i>	<i>1.4</i>	<i>1.5</i>
	2	54.5	-0.6	-2.3	-0.2	0.3
			<i>0.9</i>	<i>1.6</i>	<i>1.8</i>	<i>1.1</i>
	3	54.0	4.1*	2.9*	4.9*	4.4*
			<i>0.9</i>	<i>1.4</i>	<i>1.6</i>	<i>1.2</i>
	4	53.9	3.2*	-1.6	7.3*	3.0*
			<i>0.8</i>	<i>1.3</i>	<i>1.2</i>	<i>1.4</i>
Percent working full time	1	37.9	0.1	-4.3*	5.4*	-0.1
			<i>0.9</i>	<i>1.1</i>	<i>1.4</i>	<i>1.4</i>
	2	37.9	0.1	-1.5	1.6	0.4
			<i>0.8</i>	<i>1.4</i>	<i>1.5</i>	<i>1.1</i>
	3	37.4	3.3*	2.4	4.1*	3.5*
			<i>0.9</i>	<i>1.2</i>	<i>1.6</i>	<i>1.1</i>
	4	36.9	4.0*	-0.3	7.3*	4.2*
			<i>0.9</i>	<i>1.3</i>	<i>1.3</i>	<i>1.4</i>
Months worked in past year	1	5.93	-0.13	-0.76*	0.68*	-0.23
			<i>0.10</i>	<i>0.15</i>	<i>0.17</i>	<i>0.18</i>
	2	5.88	-0.23*	-0.39*	-0.19	-0.15
			<i>0.11</i>	<i>0.18</i>	<i>0.21</i>	<i>0.14</i>
	3	5.81	0.31*	0.11	0.46*	0.36*
			<i>0.11</i>	<i>0.16</i>	<i>0.20</i>	<i>0.14</i>
	4	5.80	0.42*	-0.13	0.92*	0.32
			<i>0.11</i>	<i>0.18</i>	<i>0.16</i>	<i>0.18</i>
Everyone in household worked in past year	1	21.9	1.7	-3.5*	10.7*	-2.1
			<i>1.0</i>	<i>1.2</i>	<i>1.6</i>	<i>1.4</i>
	2	22.3	1.2	-3.2*	4.2*	2.3
			<i>1.0</i>	<i>1.5</i>	<i>2.0</i>	<i>1.3</i>
	3	21.9	4.5*	0.3	8.3*	5.0*
			<i>1.3</i>	<i>1.6</i>	<i>2.1</i>	<i>1.5</i>
	4	21.3	5.3*	0.5	11.3*	2.0
			<i>1.0</i>	<i>1.6</i>	<i>1.5</i>	<i>1.6</i>
No one in household worked in past year	1	24.2	3.2*	7.0*	1.2	0.1
			<i>1.0</i>	<i>1.6</i>	<i>1.6</i>	<i>1.6</i>
	2	24.6	4.4*	2.9	7.1*	3.9*
			<i>1.2</i>	<i>1.9</i>	<i>2.1</i>	<i>1.5</i>
	3	25.1	-0.6	-2.0	1.8	-0.9
			<i>1.1</i>	<i>1.6</i>	<i>1.8</i>	<i>1.3</i>
	4	25.5	-1.7	1.3	-2.4	-4.1*
			<i>1.2</i>	<i>1.9</i>	<i>1.5</i>	<i>1.8</i>

*p<=.05

Table 9: Characteristics by Mode and Number of Visits, Waves 1 and 4, LFS 1996-1998 samples <i>Standard errors in italics</i>						
Item	Visit 1	Visit 2	Visit 3	Visit 4	Phone**	Absentee
Household Characteristics:						
Single Person Household	14.9 <i>0.2</i>	16.9 <i>0.4</i>	20.6 <i>0.7</i>	26.0 <i>0.9</i>	24.7 <i>0.6</i>	20.8 <i>2.0</i>
# Adults	2.55 <i>0.01</i>	2.39 <i>0.01</i>	2.30 <i>0.02</i>	2.09 <i>0.02</i>	2.20 <i>0.01</i>	2.26 <i>0.05</i>
Any children	44.3 <i>0.3</i>	44.2 <i>0.6</i>	43.5 <i>0.9</i>	38.0 <i>1.2</i>	38.7 <i>0.7</i>	36.5 <i>2.1</i>
Any children under age 5	23.1 <i>0.3</i>	22.0 <i>0.5</i>	21.1 <i>0.7</i>	20.2 <i>0.9</i>	20.1 <i>0.5</i>	18.1 <i>1.8</i>
Married	67.7 <i>0.3</i>	67.1 <i>0.5</i>	62.5 <i>0.9</i>	55.8 <i>1.1</i>	61.8 <i>0.6</i>	66.2 <i>2.2</i>
Only Adults 65 and older	16.3 <i>0.3</i>	14.1 <i>0.4</i>	11.6 <i>0.6</i>	11.9 <i>0.7</i>	16.7 <i>0.5</i>	11.9 <i>1.5</i>
Education of head, years	11.89 <i>0.03</i>	12.65 <i>0.05</i>	13.09 <i>0.07</i>	13.03 <i>0.10</i>	12.77 <i>0.06</i>	13.89 <i>0.18</i>
Jewish, head	81.7 <i>0.3</i>	92.3 <i>0.3</i>	95.3 <i>0.4</i>	96.6 <i>0.4</i>	94.8 <i>0.3</i>	99.6 <i>0.3</i>
Immigrant, head	50.3 <i>0.3</i>	51.0 <i>0.5</i>	50.5 <i>0.9</i>	46.6 <i>1.1</i>	51.1 <i>0.7</i>	44.2 <i>2.3</i>
Recent Immigrant, head	8.4 <i>0.2</i>	6.9 <i>0.3</i>	6.6 <i>0.5</i>	5.6 <i>0.5</i>	5.8 <i>0.3</i>	2.6 <i>0.8</i>
Rooms per person	1.25 <i>0.01</i>	1.34 <i>0.01</i>	1.41 <i>0.02</i>	1.52 <i>0.02</i>	1.48 <i>0.01</i>	1.57 <i>0.04</i>
Any household help	12.4 <i>0.2</i>	15.4 <i>0.4</i>	15.8 <i>0.7</i>	15.8 <i>0.9</i>	14.8 <i>0.5</i>	--
Locality Measures						
Large locality	44.2 <i>0.4</i>	53.5 <i>0.6</i>	58.8 <i>1</i>	65.8 <i>1.1</i>	52.7 <i>0.7</i>	63.1 <i>2.3</i>
Rural locality	3.2 <i>0.1</i>	1.7 <i>0.1</i>	1.3 <i>0.2</i>	0.6 <i>0.2</i>	6 <i>0.3</i>	4.2 <i>0.6</i>
Employment Measures:						
Employment rate	45.8 <i>0.2</i>	53.2 <i>0.4</i>	57.8 <i>0.7</i>	60.2 <i>0.9</i>	53.6 <i>0.6</i>	60.4 <i>1.9</i>
Labor force participation rate	50.9 <i>0.2</i>	57.2 <i>0.4</i>	61.4 <i>0.7</i>	63.6 <i>0.9</i>	57.2 <i>0.5</i>	62.8 <i>1.8</i>
Unemployment rate	8.41 <i>0.17</i>	7.05 <i>0.26</i>	6.07 <i>0.4</i>	5.64 <i>0.52</i>	6.17 <i>0.31</i>	4.06 <i>0.86</i>
Full time employment	33.8 <i>0.2</i>	39.3 <i>0.4</i>	43.2 <i>0.7</i>	45.5 <i>0.9</i>	40.6 <i>0.5</i>	46.7 <i>1.9</i>
Months worked in past year	5.35 <i>0.03</i>	6.17 <i>0.05</i>	6.67 <i>0.08</i>	6.92 <i>0.1</i>	6.21 <i>0.06</i>	6.5 <i>0.25</i>
All adults worked all of past year	16.8 <i>0.2</i>	22.6 <i>0.4</i>	27 <i>0.8</i>	31.7 <i>1</i>	26.8 <i>0.6</i>	31.8 <i>2.4</i>
No adults worked in past year	27 <i>0.3</i>	22.6 <i>0.5</i>	20 <i>0.7</i>	20 <i>0.9</i>	25.8 <i>0.6</i>	26.3 <i>2.3</i>
N*	31831	9298	3221	1843	6411	452

*N is correct for most variables; N for unemployment rate is 25 percent less, number of rooms is 17 percent less and for household help, one percent less, based on all cases.

** Phone excludes cases from kibbutzim and wave 4 cases from moshavim

Table 10: Characteristics by Number of Interviews: For Sample Eligible in Four Waves and One or More Interviews, Israeli LFS, Panels Drawn 1996-1998				
<i>Standard errors in italics</i>				
Item	Number of Interviews			
	Four	Three	Two	One
Household Measures:				
Single person household	14.4 <i>0.2</i>	20.0 <i>0.8</i>	26.4 <i>1.6</i>	29.0 <i>2.2</i>
Number of Adults	2.56 <i>0.01</i>	2.43 <i>0.03</i>	2.22 <i>0.05</i>	2.24 <i>0.07</i>
Any children	44.4 <i>0.3</i>	42.0 <i>1.0</i>	39.2 <i>1.7</i>	33.2 <i>2.4</i>
Any children under age 5	22.1 <i>0.3</i>	21.4 <i>0.8</i>	23.0 <i>1.3</i>	16.6 <i>1.8</i>
Marriage	69.7 <i>0.3</i>	63.3 <i>0.9</i>	57.9 <i>1.8</i>	49.6 <i>2.5</i>
Only adults 65 or over	16.6 <i>0.3</i>	15.4 <i>0.7</i>	14.7 <i>1.2</i>	11.1 <i>1.6</i>
Education of head, years	12.10 <i>0.03</i>	12.23 <i>0.08</i>	12.09 <i>0.16</i>	11.95 <i>0.25</i>
Jewish, head	86.1 <i>0.2</i>	89.6 <i>0.6</i>	89.4 <i>1.1</i>	93.2 <i>1.2</i>
Immigrant, head	50.6 <i>0.3</i>	49.4 <i>1.0</i>	46.6 <i>1.7</i>	44.3 <i>2.4</i>
Recent immigrant, head	5.0 <i>0.1</i>	5.3 <i>0.4</i>	5.8 <i>0.8</i>	4.4 <i>1.1</i>
Rooms per person	1.30 <i>0.01</i>	1.39 <i>0.17</i>	1.46 <i>0.03</i>	1.52 <i>0.05</i>
Any household help	14.7 <i>0.2</i>	13.4 <i>0.6</i>	10.9 <i>0.9</i>	9.0 <i>1.5</i>
Locality Measures:				
Large locality	45.3 <i>0.3</i>	51.8 <i>1.0</i>	47.9 <i>1.9</i>	55.9 <i>2.7</i>
Rural locality	5.0 <i>0.2</i>	4.3 <i>0.4</i>	3.7 <i>0.7</i>	2.8 <i>0.9</i>
Employment Measures:				
Employment rate	48.0 <i>0.2</i>	49.4 <i>0.7</i>	49.1 <i>1.4</i>	48.7 <i>2.2</i>
Labor force participation rate	51.6 <i>0.2</i>	53.7 <i>0.7</i>	53.7 <i>1.3</i>	54.3 <i>2.2</i>
Unemployment rate	8.44 <i>0.16</i>	9.56 <i>0.47</i>	9.85 <i>0.99</i>	10.0 <i>1.59</i>
Full-time employment	35.6 <i>0.2</i>	37.7 <i>0.7</i>	37.8 <i>1.26</i>	38.3 <i>2.1</i>
Months worked in past year	5.61 <i>.03</i>	5.77 <i>0.08</i>	5.76 <i>0.16</i>	5.63 <i>0.25</i>
All adults worked all of past year	18.6 <i>0.2</i>	22.0 <i>0.8</i>	23.9 <i>1.4</i>	24.6 <i>2.3</i>
No adults worked in past year	25.6 <i>0.3</i>	25.8 <i>0.8</i>	29.5 <i>1.6</i>	29.7 <i>2.5</i>
N*	20560	2346	776	394

*Sample size for unemployment rate is approximately 80 percent of N; samples for selected other measures are also slightly smaller due to missing data.

Table 11: Characteristics by Number of Refusals: Sample with At Least One Interview and Four Waves with an Interview or Refusal, Israeli LFS, Panels Drawn 1996-1998 <i>Standard errors in italics</i>			
Item	Number of Investigations with Refusals		
	Never refused	One refusal	Two or Three refusals
Household Measures:			
Single person household	14.4 <i>0.2</i>	17.1 <i>1.3</i>	20.1 <i>2.3</i>
Number of Adults	2.56 <i>0.01</i>	2.53 <i>0.05</i>	2.51 <i>0.08</i>
Any children	44.4 <i>0.3</i>	42.2 <i>1.9</i>	42.6 <i>2.7</i>
Any children under age 5	22.1 <i>0.3</i>	19.8 <i>1.4</i>	20.6 <i>2.3</i>
Marriage	69.7 <i>0.3</i>	68.5 <i>1.7</i>	64.7 <i>2.5</i>
Only adults 65 or over	16.6 <i>0.3</i>	19.1 <i>1.5</i>	15.4 <i>1.9</i>
Education of head, years	12.10 <i>0.03</i>	12.04 <i>0.13</i>	11.63 <i>0.26</i>
Jewish, head	86.1 <i>0.2</i>	93.6 <i>1.0</i>	94.5 <i>1.2</i>
Immigrant, head	50.6 <i>0.3</i>	51.8 <i>1.8</i>	47.7 <i>3.0</i>
Recent immigrant, head	5.0 <i>0.1</i>	3.1 <i>0.6</i>	3.3 <i>1.0</i>
Rooms per person	1.30 <i>0.01</i>	1.34 <i>0.03</i>	1.38 <i>0.05</i>
Any household help	14.7 <i>0.2</i>	12.0 <i>1.1</i>	7.9 <i>1.4</i>
Locality Measures:			
Large locality	45.3 <i>0.3</i>	57.2 <i>1.9</i>	56.0 <i>2.5</i>
Rural locality	5.0 <i>0.2</i>	4.9 <i>0.8</i>	4.9 <i>1.3</i>
Employment Measures:			
Employment rate	48.0 <i>0.2</i>	45.0 <i>1.2</i>	44.0 <i>2.1</i>
Labor force participation rate	51.6 <i>0.2</i>	49.3 <i>1.3</i>	48.3 <i>2.1</i>
Unemployment rate	8.44 <i>0.16</i>	8.81 <i>0.75</i>	9.10 <i>1.38</i>
Full-time employment	35.6 <i>0.2</i>	33.2 <i>1.1</i>	32.3 <i>1.9</i>
Months worked in past year	5.61 <i>.03</i>	5.22 <i>0.14</i>	5.13 <i>0.25</i>
All adults worked all of past year	18.6 <i>0.2</i>	16.4 <i>1.2</i>	16.7 <i>2.0</i>
No adults worked in past year	25.6 <i>0.3</i>	28.0 <i>1.6</i>	31.7 <i>2.5</i>
N*	20560	689	309

* Sample size for unemployment rate is approximately 80 percent of N; samples for selected other measures are also slightly smaller due to missing data.

Table 12: Characteristics by Number of <i>Noncontacts</i>: Sample with At Least One Interview and Four Waves with Interview or Noncontact, Israeli LFS, Panels Drawn 1996-1998			
<i>Standard errors in italics</i>			
Item	Number of Investigations without Contact		
	Always contacted	One noncontact	Two or Three noncontacts
<i>Household Characteristics:</i>			
Single person household	14.4 <i>0.2</i>	28.3 <i>1.7</i>	50.3 <i>3.8</i>
Number of Adults	2.56 <i>0.01</i>	2.06 <i>0.04</i>	1.63 <i>0.07</i>
Any children	44.4 <i>0.3</i>	34.3 <i>1.7</i>	19.6 <i>3.3</i>
Any children under age 5	22.1 <i>0.3</i>	20.2 <i>1.4</i>	13.0 <i>2.7</i>
Marriage	69.7 <i>0.3</i>	55.0 <i>1.6</i>	33.8 <i>3.7</i>
Only adults 65 or over	16.6 <i>0.3</i>	15.1 <i>1.2</i>	18.2 <i>3.2</i>
Education of head, years	12.10 <i>0.03</i>	12.62 <i>0.18</i>	12.98 <i>0.40</i>
Jewish, head	86.1 <i>0.2</i>	89.1 <i>1.1</i>	89.2 <i>2.7</i>
Immigrant, head	50.6 <i>0.2</i>	46.7 <i>1.9</i>	45.9 <i>3.9</i>
Recent immigrant, head	5.0 <i>0.1</i>	4.7 <i>0.7</i>	9.5 <i>2.2</i>
Rooms per person	1.30 <i>0.01</i>	1.58 <i>0.03</i>	1.83 <i>0.09</i>
Any household help	14.7 <i>0.2</i>	13.3 <i>1.0</i>	11.9 <i>2.4</i>
<i>Locality Measures:</i>			
Large locality	45.3 <i>0.3</i>	55.1 <i>1.8</i>	46.6 <i>4.0</i>
Rural locality	5.0 <i>0.2</i>	2.0 <i>0.5</i>	0.0 <i>--</i>
<i>Employment Measures:</i>			
Employment rate	48.0 <i>0.2</i>	53.6 <i>1.4</i>	50.7 <i>3.5</i>
Labor force participation rate	51.6 <i>0.2</i>	57.8 <i>1.4</i>	55.2 <i>3.5</i>
Unemployment rate	8.44 <i>0.16</i>	8.92 <i>0.81</i>	9.08 <i>2.33</i>
Full-time employment	35.6 <i>0.2</i>	41.6 <i>1.3</i>	40.5 <i>3.2</i>
Months worked in past year	5.61 <i>.03</i>	6.29 <i>0.16</i>	6.01 <i>0.40</i>
All adults worked all of past year	18.6 <i>0.2</i>	29.9 <i>1.5</i>	31.1 <i>3.3</i>
No adults worked in past year	25.6 <i>0.3</i>	26.4 <i>1.5</i>	34.8 <i>3.8</i>
N*	20560	753	148

* Sample size for unemployment rate is approximately 80 percent of N; samples for selected other measures are also slightly smaller due to missing data.

Table 13: Employment Measures by Number of Interviews in Other Waves, For Households Eligible in Four Waves, Israeli LFS, Panels Drawn 1996-1998			
<i>Standard errors in italics</i>			
Item and Wave	Always Interviewed	Three Interviews	One or Two Interviews
Employment rate:			
Wave 1	48.8 <i>0.2</i>	50.8 <i>1.02</i>	54.0 <i>1.7</i>
Wave 2	48.2 <i>0.3</i>	50.7 <i>0.8</i>	52.7 <i>1.9</i>
Wave 3	47.4 <i>0.3</i>	49.4 <i>0.9</i>	47.7 <i>2.0</i>
Wave 4	47.5 <i>0.3</i>	46.5 <i>0.9</i>	41.8 <i>1.7</i>
N*	20560	1759	487
Labor force participation rate:			
Wave 1	52.4 <i>0.3</i>	55.0 <i>1.0</i>	59.2 <i>1.7</i>
Wave 2	51.8 <i>0.3</i>	55.1 <i>0.8</i>	56.0 <i>1.9</i>
Wave 3	51.1 <i>0.3</i>	53.5 <i>1.0</i>	52.9 <i>1.9</i>
Wave 4	51.1 <i>0.3</i>	50.9 <i>0.5</i>	47.1 <i>1.8</i>
N*	20560	1759	487
Unemployment rate:			
Wave 1	7.06 <i>0.17</i>	8.15 <i>0.67</i>	8.67 <i>1.16</i>
Wave 2	7.11 <i>0.17</i>	8.00 <i>0.56</i>	6.25 <i>1.05</i>
Wave 3	7.37 <i>0.19</i>	8.23 <i>0.61</i>	9.93 <i>1.47</i>
Wave 4	7.26 <i>0.19</i>	8.83 <i>0.74</i>	11.3 <i>1.49</i>
N*	15353	1312	351

* Number of cases is averaged across waves

Table 14: Ratio of Average Estimates for All Eligible Households and for Respondents, Israeli LFS, Panels Drawn 1996-1998

Item	Respondent Mean	Imputed Based on Wave Nonrespondents	Min Bound	Max Bound
<i>Household Characteristics:</i>				
Single person household	17.6	1.072	1.040	1.109
Number of Adults	2.439	0.993	0.984	0.997
Any children	43.2	0.989	0.974	0.994
Any children under age 5	22.1	0.995	0.983	0.998
Marriage	66.1	0.986	0.974	0.993
Only adults 65 or over	15.5	0.987	0.983	0.999
Education of head, years	12.30	1.001	0.999	1.005
Jewish, head	87.3	1.003	1.000	1.007
Immigrant, head	50.0	0.995	0.993	0.998
Recent immigrant, head	7.2	1.007	0.983	1.016
Rooms per person	1.317	1.009	1.004	1.019
Any household help	13.4	0.984	0.976	0.996
<i>Employment Measures:</i>				
Employment rate	50.4	1.001	0.996	1.005
Labor force participation rate	54.3	1.002	0.997	1.004
Full-time employment	37.5	1.004	0.998	1.012
Months worked in past year	5.85	1.001	0.997	1.007
All adults worked all of past year	21.8	1.013	1.000	1.024
No adults worked in past year	24.8	1.005	0.996	1.016

Table 15: Logit Model of Probability of Nonresponse on Household Characteristics, Locality and Employment, by Wave Israeli LFS, Panels Drawn 1996-1998 <i>Standard errors of odds ratios in parentheses</i>				
Item	Odds Ratios			
	Wave 1	Wave 2	Wave 3	Wave 4
Household Characteristics:				
Number of Adults	0.896* (0.022)	0.906* (0.023)	0.857* (0.021)	0.915* (0.022)
Any children/100	0.903 (0.054)	0.820* (0.052)	1.027 (0.059)	0.877* (0.051)
Marriage/100	0.942 (0.057)	0.701* (0.045)	0.563* (0.033)	0.666* (0.039)
Only adults 65 or over/100	0.816* (0.071)	0.507* (0.050)	0.555* (0.050)	0.519* (0.049)
Education of head, years	0.995 (0.006)	0.995 (0.007)	1.001 (0.006)	1.001 (0.006)
Jewish, head/100	1.099 (0.095)	1.034 (0.096)	1.383* (0.125)	1.505* (0.142)
Recent immigrant, head/100	0.739* (0.077)	1.026 (0.102)	1.349* (0.112)	0.897 (0.088)
Locality Measures:				
Large locality/100	1.130* (0.061)	1.216* (0.071)	1.125* (0.058)	1.190* (0.633)
Rural locality/100	0.446* (0.064)	0.830 (0.107)	0.677* (0.081)	0.483* (0.068)
Employment Measures:				
Employment rate	0.844 (0.096)	0.656* (0.080)	0.900 (0.095)	0.701* (0.079)
Full-time employment	1.186 (0.135)	1.339* (0.165)	1.289* (0.133)	1.662* (0.186)
Area under ROC curve	0.572	0.603	0.635	0.619
Log-likelihood	-6456.7	-5777.6	-6837.1	-6550.2
N	28646	29221	29774	29785

*p<=.05 for test of coefficient equal to zero (equivalent to test of odds ratio equal to one)

Item	Wave 1	Wave 2	Wave 3	Wave 4
Type I: Nonresponder	0.089	0.088	0.130	0.124
Type II: Responder	0.022	0.016	0.017	0.008

Type I: Single person, employed full time, Jewish, not a recent immigrant, 12.2 years education living in a large locality.

Type II: Three non-employed adults over 65, no children, head is married, recent immigrant, not Jewish, living in a rural locality.

	<i>Predicted WNR</i>	<i>Effort Analysis</i>	<i>Cross-wave</i>
Single person households	Higher	Higher	Higher
Number of adults	Lower	Lower	Lower
Children present	Lower	Lower	Lower
Married	Lower	Lower	Lower
Only adults over 65	Lower in $\frac{3}{4}$ waves	Lower	Lower
Jewish head	Higher in $\frac{3}{4}$ waves	Higher	Higher
Recent Immigrant	Mixed	Lower	Mixed
Household Help	Lower	Higher	Lower
Labor Force Participation rate	Higher $\frac{2}{4}$ waves	Higher	Slightly higher
Employment Rate	Higher $\frac{2}{4}$ waves	Higher	Flat
Full-time employment rate	Higher $\frac{2}{4}$ waves	Higher	Slightly Higher