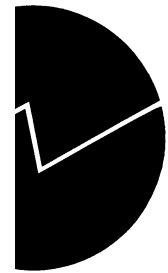


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Longitudinal non-response:
Evidence from the Norwegian
Income Panel

Documents



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Longitudinal non-response: Evidence from the Norwegian Income Panel

Abstract:

This report compares the distribution of the gross and the net sample after four successive waves of the income panel of the Norwegian Income Distribution Survey, in order to examine the amount and nature of longitudinal non-response. The availability of administrative data makes it possible to have detailed information not just on panel members that drop out of a survey after the first wave (attrition) but also on panel members that never participated in the household interview (initial non-respondents).

By comparing the distribution of the gross and the net sample it can be concluded that over the years there are very few of the panel members that are permanent non-respondents, i.e. panel members that decline to participate in any of the household interviews. However, a substantial number of panel members turn out to be non-respondents in at least one of the four waves. Four out of ten panel members were found to be permanent respondents, i.e. they participated in all the four waves. There are furthermore important differences in respect to characteristics such as sex, age, education, income and family composition among panel members that participate always, sometimes or never in panel surveys. By the passage of time this leads to a deterioration of sample representativeness. However, if prior-wave non-respondents are brought back into the panel this has a positive effect on sample representativity.

Keywords: Cross-sectional and longitudinal non-response, panel survey, sample representativity.

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1. Introduction

Despite strong efforts by data collectors to achieve high response rates there will always be non-response in household surveys. There might be several reasons for why individuals fail to participate in surveys. Usually refusal is the most frequent reason for non-response in European surveys (Eurostat, 1997), but recently there has also been an increase in the magnitude of non-response due to non-contact.¹ Non-response will, however, mainly be a problem when it is selective, i.e. when the respondents deviate from the initial sample in respect to important social characteristics. Non-response may be more of a problem in panel surveys than in traditional cross-sectional surveys because if the initial sample is suffering from a bias, then subsequent waves will suffer from this bias too. In addition, there is always the problem of attrition in panel surveys, i.e. when former panel members drop out of the sample.

There have been conducted several studies on attrition in panel surveys, and some general conclusions can be made. Over the years the magnitude of attrition will be substantial. For example, both the German SOEP panel and the Dutch SEP experienced a level of attrition that left only 60 - 65 % of all first wave respondents in the panel after seven waves (Winkels and Davies 1992). Also the US PSID has experienced a substantial attrition rate with the passage of time (Lillard 1989). As for cross-sectional non-response attrition will basically be a problem when it is selective. However, a study of the Dutch SEP conducted by Winkels and Davies (1992) concluded that when one compares subsequent waves to the first wave one finds that attrition is not strongly correlated with socio-economic and demographic characteristics. Only in respect to residential mobility did they find that the net sample was biased. Households that had remained at the same address were somewhat over-represented among the respondents compared to households that had been mobile. These findings are also in line with a similar German study on the SOEP panel (Rentel 1994).

Most studies on non-response in panel surveys focus mainly on *attrition*, i.e. those households that participated in the first wave, but failed to participate in subsequent waves. But many household panels experience a substantial first wave non-response. Both the SOEP and the SEP panel had for instance a first wave non-response of 40 - 50 % (Wagner, Schupp and Rendtel 1991, Winkels and Davies 1992), while the PSID had an initial non-response rate of 25 % (Duncan & Hill 1989). Due to lack of information very little is known about the social characteristics of first wave non-respondents. The Norwegian income panel is, however, able to throw some light even on these households, due to extensive use of administrative registers. In cases where households fail to respond to the interview, they will nevertheless be included in the Norwegian survey. For non-response households, missing information on household composition from the interview is substituted with information on family composition from the Central Population Register. In general there is good overlap between household composition reported in the interview and the family composition derived from administrative registers. All other information (e.g. sex, age, education, income etc.) is collected from administrative registers.

The object of this report is to investigate the amount and nature of longitudinal non-response in the Norwegian income panel. The aim is to study the longitudinal representativeness of the net sample compared to the gross sample after several consecutive waves. The distribution of core persons in the gross sample (i.e. the original sample selected for the survey) will be compared with the distribution of core persons in the net sample (i.e. the response households) in respect to several social characteristics. Furthermore we will assess the magnitude of non-response over time. Questions to be addressed are:

¹ In the Norwegian Level of Living Survey the proportion of total non-response due to non-contact increased from 15 to 20 percent between 1983 and 1995 (Statistics Norway, 1985 and 1996).

- Are some panel members more likely to be non-respondents than others?
- Will non-response panel members in one wave also be non-respondents in subsequent waves, or are some panel members only temporarily non-respondents?
- Are there any differences in the social characteristics of longitudinal respondents and non-respondents?
- Will the representativeness of the sample be deteriorated with the passage of time?

The period of analysis will be 1990-1994 (four waves).

2. The data

The Norwegian income panel was first introduced as early as in 1979 as part of the Level of Living Survey.² The panel was later on «adopted» by the Income Distribution Survey, and has been part of that survey annually since 1986.

The panel consists of a gross sample of approximately 2 400 core persons between 16 and 79 years old. The panel is rejuvenated each year by adding a sample of new panel members. These new members are selected from young persons turning 16 years old during the survey year and from immigrants who entered Norway the previous year. The panel is similarly adjusted by dropping persons reaching the age limit of 80 during the survey year and persons who either have died or emigrated during the year. The design of the Norwegian panel thus deviate to some extent from other household panels. The Norwegian panel is a representative sample of individuals (core persons), and data is collected for all core persons as well as for all household members currently residing with the core person. However, in cases where the households experience a split-off (e.g. divorce, children moving out etc.), *only those household members residing with the core person will be monitored*. The panel has detailed information on income from tax files and other administrative registers. Register data is also used to collect biographical information like sex, age, level of education, socio-economic status, place of residence etc. (An overview of links to external registers is provided in Appendix 1). Household composition is established after a household interview. In cases of non-response the household is, however, not dropped from the survey. Instead, the household composition is substituted with information on the family from The Central Population Register (CPR). In this register all persons sharing the same address and belonging to the same family share a unique family number. Previous studies have shown that the overlap between the family composition derived from the CPR and the actual household composition reported in the interview is close to 70 % (Epland, 1996). For this reason the panel can provide important information even for those panel members who never responded to the household interview. In addition there will be no item non-response due to the use of administrative data.

In this report we will make use of the four most recent waves of the income panel. This includes the surveys for the income years 1990, 1992, 1993 and 1994. The 1991 survey is not included in this analysis. The reason for this is that it was not conducted a household interview that particular year, due to organisational changes in the Income Distribution Survey. The income panel is a sub-sample of the annual Income Distribution Survey in Norway.³

In table 1 we present the development of the gross sample of the panel for the period of analysis. The table shows, for instance, that out of a total number of 2380 core persons in 1990, there were 2179 persons, or 92 %, that had participated in all subsequent waves, including the 1994 survey.

² An overview of survey design, sampling procedure etc. of the initial wave of the panel is given in Statistics Norway (1982).

³ 1990 is chosen as the initial year of this study because this was the year that introduced a more comprehensive household interview through personal interviewing (the panel survey was also part of the Level of Living Survey that year). In subsequent waves, however, CATI has been used as the method of data collection.

Table 1
The development of the gross sample: 1990-1994. The income panel *

	1990	1991	1992	1993	1994
	Sample size				
1990	2380	2323	2301	2241	2179
1991		2386	2355	2293	2229
1992			2416	2349	2284
1993				2406	2339
1994					2396
	Percent				
1990	100	98	97	94	92
1991		100	99	96	93
1992			100	97	95
1993				100	97
1994					100

* The table reports the number of core persons (age 16-79).

3. Representativity of the panel

As mentioned earlier the Norwegian income panel was established as early as in 1979. Despite careful maintenance of the panel, one might expect a certain loss of representativeness to take place given its long life. In order to assess the sample representativeness we have compared the distribution of the gross sample with comparable figures from administrative sources. Table 2 compares the distribution in respect to *age groups* at two points in time: 1990 and 1994.

The table shows that the gross sample of the panel still has an age distribution that compares well with population figures (from population statistics). The largest difference between sample estimates and population statistics concerns the age groups 30-39 and 40-49, where in 1994 the sample estimates somewhat underestimate the number of persons in the thirties and similarly over-represent the number of persons in their forties. For none of these age groups are the differences bigger than two percentage points, though.

In table 3 a similar comparison is made in respect to *income, socio-economic status (i.e. largest source of income) and marital status*. As can be seen there is an under-estimation of persons with very low income in the sample, compared to register data, but the difference is small: about one percentage point. The representativeness of the sample is even better in respect to socio-economic status, where there are hardly any noticeable differences between the sample and register data. In respect to marital status, however, there is an over-estimation (2.5 percentage points) of persons that are married in the sample, compared to register data, while there is an under-estimation of those never married. The number of never married are, however, underestimated in the sample by less than 7 %.

Summary

The tables presented in this section suggest that, despite some minor differences between sample data and register figures, the gross sample of the income panel has maintained much of its initial representativeness. Despite its coming of age it is still very much a representative sample of the population at large.

Table 2
Distribution of the gross sample and population statistics, by sex and age. 1990 and 1994

Age	1990		1994	
	Sample (%)	Population (%)	Sample (%)	Population (%)
All				
16-24 years	18.7	18.3	16.2	16.6
25-29 years	8.6	10.1	10.5	10.5
30-39 years	19.6	19.4	17.4	19.6
40-49 years	18.1	17.7	20.5	18.8
50-59 years	11.6	11.9	12.6	13.0
60-69 years	12.9	12.5	12.4	11.1
70-79 years	10.4	10.1	10.4	10.3
N	2380	3.227 519	2396	3.277 328
Men				
16-24 years	10.0	9.3	7.8	8.4
25-29 years	4.2	5.2	5.7	5.4
30-39 years	10.0	9.9	8.5	10.0
40-49 years	9.4	9.1	10.5	9.7
50-59 years	5.7	5.9	6.6	6.5
60-69 years	6.3	5.9	5.8	5.3
70-79 years	4.5	4.3	4.5	4.4
N	1196	1.605 551	1183	1.631 852
Women				
16-24 years	8.7	8.9	8.3	8.1
25-29 years	4.4	4.9	4.8	5.1
30-39 years	9.6	9.4	8.9	9.6
40-49 years	8.7	8.6	10.1	9.2
50-59 years	5.9	6.0	6.0	6.5
60-69 years	6.6	6.5	6.6	5.8
70-79 years	5.8	5.8	5.9	5.9
N	1184	1.621 968	1214	1.645 476

Table 3
The distribution of the gross sample and the Tax Return statistics, by income groups, socio-economic status and marital status. 1994

	Sample (%)	Tax Return Register (%)
<i>Taxable gross income (1000 Nkr)</i>		
-49	16.9	18.2
50-99	17.1	17.6
100-149	17.3	16.6
150-199	15.5	16.7
200-249	15.3	14.1
250-300	7.9	7.5
300-	9.9	9.4
<i>Socio- economic status</i>		
Self-employed		
-in agriculture	1.9	1.9
-in other industries	3.5	3.1
Employees	54.3	53.6
Pensioners	23.1	23.4
Other inactives	17.2	18.0
<i>Marital status</i>		
Never married	32.0	34.2
Married	53.6	51.1
Widowed	5.2	5.7
Divorced	7.5	7.2
Separated	1.8	1.8
N	2396	3.276 289

4. Cross-sectional non-response

In this section we will take a closer look at the cross-sectional non-response in the panel by comparing the distribution of the net sample, i.e. those panel members that responded to the survey, with the distribution of the gross sample, i.e. those panel members originally selected to participate in the survey. With the presence of register information linked to all the sample units it is possible to have the same kind of information for both respondents and non-respondents.

Of a total of 2380 panel members (core persons) originally selected to participate in the 1990 survey, 1721 members responded to the household interview. This gives a overall non-response rate of approximately 28 %.

Table 4 compares the distribution of the net sample and the gross sample in respect to *sex and age groups*. When looking at the age distribution for both men and women combined one may conclude that there are very small differences between the net sample and the gross sample. There is, however, a small under-estimation of persons aged 70-79 years in the net sample (8.9 %), compared to the gross sample (10.4 %). The main reason for this is that there is a particularly high non-response rate (41 %) among older women. This finding seems, furthermore, to be in agreement with other studies of cross-sectional non-response, for instance a recent Danish study carried out for Eurostat (Eurostat, 1995).

The next table (table 5) compares the distribution in respect to variables such as *income, socio-economic status, marital status* and whether or not there are any *children in the family*. The table shows that the income distribution is quite similar for the gross and the net sample. There is, however, a small under-estimation of core persons with low income in the net sample, compared to the gross sample. Low-income panel members are also more likely to be non-respondents than panel members that are better-off.

The difference between the gross and the net sample becomes larger when we differentiate according to socio-economic status and marital status. The net sample has an over-estimation of members that are employees and an under-estimation of pensioners and self-employed in other industries than agriculture. The response rate among self-employed and pensioners are noticeably lower than for employees. There is also a clear over-estimation of panel members that are married in the net sample. The reason for this is that married panel members have a much higher response rate than panel members that are not married. Table 5 also indicates that there is a distinct over-estimation of households with children in the net sample, compared to the gross sample. The response rate is also much higher for households with children, compared to households without children. A plausible explanation for this is that the probability of finding someone at home is much higher in respect to households with children/married couples than in respect to households without children/singles. In addition larger households (e.g. married couples and households with children) are more likely to be respondents than smaller households because of the possibility of getting (at least) a proxy interview.

Table 4
Comparison of the gross sample and the net sample, by sex and age. 1990

Age	Net sample %	Gross sample %	Non-response rate %
All			
16-24 years	18.8	18.7	27.4
25-29 years	8.9	8.6	24.9
30-39 years	20.1	19.6	25.9
40-49 years	19.1	18.1	23.9
50-59 years	11.6	11.6	27.5
60-69 years	12.6	12.9	29.9
70-79 years	8.9	10.4	38.1
N	1721	2380	
Men			
16-24 years	9.9	10.0	28.5
25-29 years	4.2	4.2	27.0
30-39 years	9.9	10.0	28.9
40-49 years	9.8	9.4	25.0
50-59 years	6.0	5.7	24.3
60-69 years	5.8	6.3	34.0
70-79 years	4.1	4.5	34.3
N	855	1196	
Women			
16-24 years	8.9	8.7	26.1
25-29 years	4.7	4.4	22.9
30-39 years	10.2	9.6	22.8
40-49 years	9.3	8.7	22.7
50-59 years	5.6	5.9	30.7
60-69 years	6.8	6.6	25.9
70-79 years	4.8	5.8	41.0
N	866	1184	

Table 5
**Comparison of the net sample and the gross sample, by income/socio-economic status/
marital status/the number of children in the family. 1990**

	Net sample %	Gross sample %	Non-response rate %
<i>Taxable gross income (1000 Nkr)</i>			
-49	20.3	21.2	30.6
50-99	19.1	20.9	34.1
100-149	16.9	16.9	27.6
150-199	17.8	17.0	24.3
200-249	13.2	12.3	22.2
250-299	5.7	5.3	21.6
300-	6.9	6.5	22.7
<i>Socio-economic status</i>			
Self-employed			
-in agriculture	2.8	2.5	18.6
-in other industries	3.0	3.6	39.5
Employees	56.7	52.9	22.4
Pensioners	18.2	21.1	37.6
Other inactives	19.2	19.9	30.2
<i>Marital status</i>			
Never married	28.8	30.7	32.1
Married	58.5	55.4	23.7
Widowed	5.3	5.7	33.1
Divorced	5.1	5.5	32.3
Separated	2.3	2.6	38.1
<i>Children in the family</i>			
At least one child	39.5	35.7	20.0
No children	60.5	64.3	31.9
N	1721	2380	

The last table in this section compares the distribution in respect to the panel members *level of education, type of tenure, size of residential community* and whether or not the panel members (or any of the household members) are receivers of *social assistance* (table 6).

Table 6
Comparison of the net sample and the gross sample, by level of education/housing tenure/social assistance and size of municipality. 1990

	Net sample %	Gross sample %	Non-response rate %
<i>Level of education</i>			
Low	27.4	30.2	34.3
Medium	52.7	51.1	25.5
High	19.9	18.7	23.1
<i>Housing tenure</i>			
Owners	73.4	71.3	25.5
Tenants	26.6	28.7	33.1
<i>Social assistance</i>			
Recipient	6.4	7.4	37.1
Non-recipient	93.6	92.6	26.9
<i>Size of municipality (1000 inhabitants)</i>			
-9.9	31.6	30.9	26.2
10-49.9	41.8	41.2	26.6
50-	26.6	27.9	30.9
N	1721	2380	

From the figures in the table it is apparent that there is an over-estimation in the net sample of panel members with medium and high education, at the expense of people with lower education. Panel members with lower education also have a substantially greater probability of being non-respondents than those with more years of education. Turning next to type of tenure we find a clear over-estimation of home owners in the net sample, compared to the gross sample. The reason for this, it seems, is that tenants are much more likely to be non-respondents than home owners. The same also applies for receivers of social assistance. As the figures in table 6 indicate, core persons residing in households who receive social assistance are somewhat under-represented in the net sample compared

to the gross sample and those who receive social assistance have a much higher non-response rate (37 %) compared to those who do not receive this kind of benefit (27 %). This is again in agreement with findings from other European countries, for instance, recent studies conducted in Sweden and the Netherlands (van Tuinen, 1996).

With respect to the differentiation according to size of municipality there are, however, only marginal differences between the net and the gross sample. The table shows, however, that non-response is a little bit more common among persons residing in the largest municipalities than among those residing in smaller municipalities.

Summary

From this review we conclude that there is a certain bias in the net sample compared to the initial sample in respect to certain social characteristics. There are certain sub-groups of the population that display a higher level of non-response than other groups and this to some extent weakens the representativeness of the net sample. Table 7 identifies the sub-groups associated with a high cross-sectional non-response rate.

Table 7
Sub-groups displaying high non-response level

-
- Older people, in particular women
 - Pensioners and self-employed in other industries than agriculture
 - People that are not married and who live in households without children
 - People with low education
 - Tenants
 - Those who receive social assistance
-

Many of the social characteristics that are associated with a high probability of being a non-respondent, most likely correlate with each other. People who receive social assistance are, for instance, often tenants and have a low level of education, and many of the pensioners are older women living alone (widowed). This again suggests that much of the difference between the gross and the net sample can be corrected for by the use of weighting.

5. Longitudinal non-response

In this section, we shall take a closer look at the amount and nature of the longitudinal non-response in the panel. The object will be to study the development of the representativeness of the panel after several subsequent waves. We will also see what effect the inclusion of re-entries, i.e. prior-wave non-respondents, will have on the representativeness of the panel. In addition we shall identify different types of non-respondents, both those who are only temporary non-respondents and those who are more permanent non-respondents. The availability of register data will allow us to make comparisons of the social characteristics of these temporary and longer-term non-respondents with those who are respondents.

5.1 Non-response patterns

The overall response rate for the panel survey has remained relatively stable between 1990 and 1994. Table 8 shows the cross-sectional response rate of the panel for each of the waves between 1990 and 1994. As can be seen the response rate has gone slightly down, from 72 % in 1990 to 66 % in 1994. One should, however, bear in mind that the Norwegian panel has existed for several year prior to the 1990 wave, so it might not be surprising that a certain kind of fatigue was to take place over the years. This is furthermore confirmed by the most recent figures. In the 1997 wave of the panel the response rate was just 62 % (Øyangen, 1998).⁴

Table 8
Cross-sectional response rates of the income panel. 1990-1994

	1990	1992	1993	1994
Respondents	1721	1670	1615	1585
Non-respondents	659	746	791	812
All	2380	2416	2406	2397
Response rate	72,3 %	69,1 %	67,1 %	66,1 %

Since the non-response rate was relatively stable between 1990 and 1994 one might suspect that it would be the same individuals that make up the non-respondent group for each year. But, as table 9 indicates, this is clearly not the case. In the four waves between 1990 and 1994 about 42 % all panel members responded to the household interview in all the four waves. The second largest group were those that were respondents in three out of four waves (25 %), while approximately 13 % participated in two out of four waves. Furthermore about 11 % of the panel members only responded to one out of four interviews, while just about 10 % of the panel members declined to be interviewed in any of the four waves.

⁴ This figure can be compared to the first year of the panel (1979) when the response rate was 76 % (Statistics Norway, 1982)

The table also makes it clear that there is a large number of panel members reentering the panel after prior non-response.

Table 9
The distribution of response patterns in four waves. 1990-1994

	Core persons	Per cent
All core persons	2181	100.0
Four wave respondents		
XXXX	907	41.6
One wave non-respondents	535	24.5
OXXX	106	4.9
XOXX	114	5.2
XXOX	131	6.0
XXXO	184	8.4
Two wave non-respondents	281	12.9
XXOO	66	3.0
XOOX	54	2.5
XOXO	47	2.2
OXOX	39	1.8
OXXO	37	1.7
OOXX	38	1.7
Three wave non-respondents	236	10.8
XOOO	94	4.3
OXOO	51	2.3
OOXO	44	2.0
OOOX	47	2.2
Four wave non-respondents		
OOOO	222	10.2

X = respondent

O = non-respondent

From table 9 we can divide the panel members into four different groups:

- (a) *Permanent respondents*, i.e. panel members that participated in all the four waves.
- (b) *Temporary short-term non-respondents*, i.e. panel members that only declined to participate in one out of four waves.
- (c) *Temporary longer-term non-respondents*, i.e. panel members that failed to participate in two or three out of four waves.
- (d) *Permanent non-respondents*, i.e. panel members that did not participate in any of the four household interviews.

In the next section we will study the social characteristics of these four groups of panel members. We will explore to what extent the distribution within these four groups deviate from the overall distribution of the original (gross) sample. Any such deviation will be an indication of to what extent some social groups are under- or over-represented among the four different categories.

5.2 Social characteristics of longitudinal respondents and non-respondents

Tables 10 to 12 summarise the difference in distribution between, on the one hand, respondents and non-respondents, and on the other hand, the gross sample.

We first present the distribution in respect to *sex and age groups* (table 10). From the table it can be concluded that there is a clear under-representation of young people among the permanent respondents. Compared to the gross sample there was, for instance, an under-representation of those who were between 20 and 24 years old in 1994 with as much as 3.5 percentage points. In contrast, there is an over-representation of middle aged panel members (40 to 60 years) among the permanent respondents. Turning next to the temporary non-respondents, i.e. both the short-term and the longer-term, a different picture emerges. Within these categories there is a noticeable over-representation of the young. From this it may be concluded that despite the fact that many young people often drop out of the panel, many of them will return at some later point in time.

The last category - the permanent non-respondents - also has a distribution that differs from the gross sample. There is a distinct over-representation of older panel members (70-79 years), and in particular older women, among those that never participated in any household interview.

Table 11 presents the differences according to the following variables: *size of income, level of education, type of tenure, social assistance and size of municipality*.

Table 10
Deviations from the gross sample after four waves:
respondents and non-respondents by sex and age groups

Age in 1994	Permanent respondents	Temporary short-term non-respondents	Temporary longer-term non-respondents	Permanent non-respondents
20-24	-3.5	3.5	3.4	-2.1
25-29	-2.6	2.3	2.8	-1.3
30-39	1.3	-0.4	-0.9	-2.1
40-49	2.4	0.0	-4.7	1.1
50-59	2.3	-0.5	-2.7	-2.0
60-69	1.2	-3.5	1.3	0.8
70-79	-1.2	-1.3	1.0	5.7
All	0.0	0.0	0.0	0.0
16-24	-1.3	1.0	1.8	-1.3
25-29	-2.0	1.1	2.4	-0.1
30-39	0.2	-0.5	0.5	-0.8
40-49	1.9	-2.6	-2.1	3.6
50-59	1.8	-0.4	-1.7	-2.2
60-69	0.7	-2.1	0.2	1.7
70-79	-0.7	0.3	0.7	0.5
All men	0.6	-3.2	1.7	1.4
16-24	-2.1	2.4	1.5	-0.8
25-29	-0.6	1.2	0.4	-1.2
30-39	1.1	0.1	-1.5	-1.3
40-49	0.6	2.6	-2.6	-2.6
50-59	2.3	-0.1	-1.0	0.2
60-69	-0.2	-1.4	1.1	-0.9
70-79	-2.2	-1.6	0.3	5.2
All women	-0.6	3.2	-1.7	-1.4
N	907	535	517	222

Table 11
Deviations from the gross sample after four waves:
respondents and non-respondents by income/level of education/
type of tenure/social assistance and size of municipality

	Permanent respondents	Temporary short-term non-respondents	Temporary longer-term non-respondents	Permanent non-respondents
<i>Taxable gross income (1000 Nkr)</i>				
-74	-1.7	1.1	1.6	0.5
75-99	-1.7	-1.4	2.7	3.9
100-149	-2.0	-0.4	2.5	2.6
150-199	-2.1	-1.7	3.4	4.7
200-249	-0.4	3.4	-1.9	-2.0
250-	4.7	0.4	-5.3	-7.7
<i>Level of education</i>				
Low	-4.2	-1.5	3.6	12.3
Medium	0.7	-1.0	2.6	-6.4
High	4.0	2.0	-5.7	-7.9
<i>Type of tenure</i>				
Owner	8.6	-1.0	-8.5	-12.6
Tenants	-8.6	1.0	8.5	12.6
<i>Social assistance</i>				
Recipient	-0.2	-1.5	0.8	1.0
Non-recipient	0.2	1.5	-0.8	-1.0
At least once	-5.6	-0.6	6.9	8.0
<i>Size of municipality (1000 inhab.)</i>				
-9.9	0.7	0.6	0.1	-4.4
10-49.9	2.0	0.3	-3.5	-0.7
50-	-2.7	-0.9	3.4	5.1
N	907	535	517	222

The table suggests that there is a certain pattern in the way in which the different groups deviate from the gross sample. There is, for instance, a clear tendency that compared to the gross sample, there is an over-representation of high income earners and people with higher education in the permanent respondent group. Likewise, there is an over-representation of home owners among the permanent respondents, while there is an under-representation of persons who receive social assistance and who live in larger communities. We note, however, that the univariate p-values indicate that there is no significant relationship between size of municipality and being a permanent respondent (Appendix 2, table 1).

On the other extreme we find the permanent non-respondents. Within this group the distribution is almost the opposite of the respondents. The permanent non-respondents deviate from the gross sample by having an over-representation of low-income earners and people with lower education. There are also relatively fewer home owners among the permanent non-respondents, while there are relatively more people who are receivers of social assistance. There is also a tendency that people residing in the larger municipalities are over-represented among the permanent non-respondents. However, as table 1 in Appendix 2 shows this classification variable alone is not statistically significant.

The temporary non-respondents have a distribution that falls somewhere between the two extremes; the distribution of the longer-term non-respondents being closer to the permanent non-respondents, while the shorter-term non-respondents being closer the permanent respondents.

Table 12
Deviations from the gross sample after four waves:
respondents and non-respondents by marital status and whether or not there
are any children in the family

	Permanent respondents	Temporary short-term non-respondents	Temporary longer-term non-respondents	Permanent non-respondents
<i>Marital status</i>				
Never married	-9.4	2.3	9.9	9.7
Married	12.6	-2.5	-12.6	-16.3
Widowed	-0.1	-1.4	0.3	2.9
Divorced	-2.1	0.7	2.4	1.4
Separated	-1.0	0.8	0.0	2.3
<i>Children in the family</i>				
At least one child	6.8	0.5	-8.0	-10.0
No children	-6.8	-0.5	8.0	10.0
N	907	535	517	222

Table 12 presents the distribution in respect to *marital status* and whether or not there are any *children in the family*. Again there is a clear pattern in respect to the differences between the permanent respondents and the permanent non-respondents. There is, for instance, a substantial over-representation of married people among the permanent respondents, while there is an (even stronger) under-representation of married people among the permanent non-respondents. Likewise, there are far too many children in the households of the permanent respondent group, relative to the gross sample, while exactly the opposite is true in respect to the permanent non-respondents.

As we saw in table 11, the two temporary non-respondent groups have a distribution that lies somewhere between the two extremes, with the longer-term non-respondents displaying a distribution not too different from the permanent non-respondents. The temporary short-term non-respondents are the ones that deviate the least from the gross sample, and a test of significance shows that neither marital status nor the presence of children in the household alone was found to be statistically significant for this group (table A.1, Appendix 2).

The strong positive association between, on the one hand, being married and having children in the household and, on the other, being a longitudinal respondent resembles the findings presented in chapter 4 on cross-sectional non-response patterns. Most likely it is also the same factors that explain the high longitudinal response rate for this group, i.e. less chances of non-contacts and the possibility of conducting proxy interviews.

Some studies of panel attrition have shown that factors such as residential mobility and changes in life situation, like for example retirement, seem to be strongly associated with attrition from the panel (Winkels and Davies 1992, Lillard 1989, Taylor 1994). In order to study if any such changes are related to non-response in the Norwegian panel, table 13 presents the distribution of the panel members that have experienced certain events during the four waves. These events are *change in marital status*, i.e. from married (1990) to divorced/separated/widowed (1994), *moved out of parental home*, *moved to another municipality* and *retirement*.

From table 13 it seems clear that these events are not strongly associated with non-response in the Norwegian panel. There is admittedly an under-representation in the permanent respondent group of panel members who have left their parental home or who have moved to some other municipality, and correspondingly there is an over-representation of these panel members within the non-respondent groups, but the deviation from the gross sample is not particularly large, - at least compared to some of the other variables. In relation to changes in marital status and on the work-retirement transition there are hardly any differences at all between the distribution in the gross sample and the distribution within the respondent/non-respondent groups. The test of significance presented in table A.1 in Appendix 2 confirms these findings.

It may be a bit surprising that the association between non-response and mobility is not stronger. One reason for this may be that, unlike the Dutch SEP and the US PSID, the Norwegian household interview has a rather limited scope. Since most of the data (e.g. sensitive issues like income data and biographical data) will be collected from administrative registers, the size of the household questionnaire can be kept at a minimum (limited to questions on household composition, economic activity, the dwelling and the value of some real assets). For this reason it has been common practice to use computer assisted telephone interviewing (CATI) and not personal interviewing. When a more comprehensive interview is to be conducted, as is the case for both the SEP and the PSID, then personal interviewing usually is preferred. However, when panel members move to another part of the country this may sometimes lead to a change of interviewer. This again often leads to non-response in subsequent waves. Most likely a short CATI interview will be less affected by residential mobility, than a comprehensive personal interview.

Table 13
Deviations from the gross sample after four waves:
respondents and non-respondents that have experienced certain events
between 1990 and 1994

	Permanent respondents	Temporary short-term non-respondents	Temporary longer-term non-respondents	Permanent non-respondents
From married to divorced/ separated/ widowed	-0.6	0.6	-0.4	2.1
Left parental home	-3.1	2.6	2.0	1.8
Moved to another municipality	-2.8	2.4	1.0	3.3
Retired	0.2	-1.5	0.8	1.0
N	907	535	517	222

Summary

This section presented the results on how the distribution of respondents and non-respondents deviated from the initial sample, with the passage of time. Based on the tables presented above we are now able to give a “social profile” on those individuals who will most likely always, sometimes or never participate in panel surveys.

- (a) The *permanent respondents* have a distribution that is different from the gross sample. In brief, they can be characterised in the following way:
- There is an over-representation of people in their middle-ages (30-60 year old);
 - They have incomes above the average;
 - They have a higher level of education than the population at large;
 - There is an over-representation of home owners;
 - There is an over-representation of married couples; and
 - There is an over-weight of households with children.

However, when all explanatory variables are included in a probability model, it appears that only the classifications based on *education, tenure, marital status* and the *presence of children* are found to be statistically significant (table A.2, Appendix 2).

- (b) The *temporary short-term non-respondents*, i.e. those who only missed one out of four household interviews, are on the other hand very much a mirror of the population at large, i.e. they have a distribution that do not deviate much from the gross sample. The only variables that were found to be statistically significant in a multivariate analysis (table A.2, Appendix 2) were *age* (there is an over-representation of young people among the temporary short-term respondents compared to the gross sample) and *social assistance* (there were relatively fewer receivers of social assistance in the temporary short-term non-respondent group compared to the gross sample).
- (c) The *temporary longer-terms non-respondents* are panel members that only participated in one or two out of four household interviews. This group deviates to some extent from the gross sample. They can be categorised in the following way:
- They have income below average;
 - They have less education than the gross sample;
 - There are fewer home owners;
 - There are more receivers of social assistance;
 - There are fewer married couples; and
 - There are fewer households with children.

The p-values from the multivariate analysis indicate that except for income and tenure, all of these variables are statistically significant (table A.2, Appendix 2).

- (d) The *permanent non-respondents* also have a distribution that is quite different from the gross sample and they can briefly be categorised the following way:
- There is an over-weight of older people, in particular older women;
 - They have less education than the average population;
 - There are relatively fewer home owners compared to the population at large; and
 - There is an under-representation of married people compared to the population at large.

All of these variables are found to be of statistical significance in a multivariate analysis (table A.2, Appendix 2).

5.3 The longitudinal representativeness of the panel

Ideally a panel survey should provide a continuous representation of the total population. All events and changes that are observed over time in the sample should reflect similar changes taking place in the whole population. But, as we have seen in the previous section, certain groups of households stand out as being more likely to be non-respondents than others. One should, therefore, expect that the representativeness of the sample will deteriorate with the passage of time.

In order to test whether or not the representativeness of the net sample actually deteriorates over time, we apply the same methodology as in previous sections, i.e. by comparing the distribution of certain characteristics within the net sample with the those of the initial sample (the gross sample).

A second issue that will be addressed is the importance of reentries, i.e. former non-response households that have reentered the panel. The procedure of the Norwegian panel survey is that an attempt is always made to re-interview previous non-respondents, including the initial wave non-respondents (except in cases where panel members very firmly have expressed their unwillingness to participate any further in the survey). From table 14 it seems clear that the number of reentries is quite substantial. Close to 40 % of all non-respondents in each of the years 1990 - 1993 in fact reentered the panel the very next year.⁵ The table thus indicates, that it is well worth the effort to approach former non-response households.

Table 14
Non-respondents reentering the panel. 1990 - 1993

	The proportion of non-respondents reentering the panel the next wave
1990	39.8
1992	37.1
1993	38.4

By including reentries one also improves the representativeness of the sample. This can be seen from table 15. The table compares the distribution of the net sample and the gross sample of the panel in respect to *sex and age groups*. The table shows the extent to which the distribution of the net sample deviates from the gross sample after several subsequent waves. As can be seen, the net sample becomes somewhat more biased with the passage of time. Whereas there were hardly any differences in the distribution between the gross and the net sample after the first wave (W1), there is a clear under-representation of the younger age-groups after the fourth wave (W4). This should not, however, come as a surprise since it only confirms the findings in section 6.2 where the young were clearly under-represented among the permanent respondents.

⁵ Surprisingly this is about the same proportion of previous non-respondents as Duncan (1992) estimated could be brought back into the US PSID if a rule of attempting interviews with prior-wave non-respondents was applied.

However, when reentries are included in the sample this clearly improves the representativity of the panel. We note, for instance, that while there is a 3.5 percentage points under-representation of the young (16-24 years) in the net sample after four waves without the inclusion of the reentries, this figure is reduced to 1.9 percentage points when reentries are included. Again this is consistent with findings presented in section 6.2 where particularly the young were over-represented among the temporary non-respondents.⁶

The loss of representativeness comes more clearly into view when we compare the distribution in respect to other social characteristics. Table 16 presents the longitudinal representativeness of the net sample in respect to *income, level of education, tenure, social assistance and size of municipality*.

Differentiation according to size of income shows that with the passage of time the net sample becomes slightly biased in the sense that there will be proportionately more well-off people in the net sample compared to the gross sample. Likewise, there will be an under-representation of persons with low income in the net sample.

The differences between the gross and the net sample also become apparent in respect to level of education. The net sample increasingly becomes over-represented with people with higher education, at the expense of people with lower education. After four consecutive waves people with higher education are over-represented with about 4 percentage points in the net sample compared to the gross sample.

There is also a clear discrepancy between the gross and the net sample in respect to type of tenure. As can be seen from table 16, the net sample over-estimates the number of home owners in the first wave, and this over-estimation increases in subsequent waves. After four waves the difference between the gross and the net sample is close to 9 percentage points.

The difference between the gross and the net sample is far less pronounced in respect to social assistance and size of municipality, although the trend is similar: With the passage of time the difference in the distribution between the gross and the net sample increases.

Table 16 also illustrates the positive effect with respect to sample representativeness by including prior non-respondents. When the reentries are included, then the representativeness of the net sample - measured as deviation from the gross sample - improves significantly for almost all social characteristics.

⁶ Despite the positive effect on panel representativeness, the inclusion of prior-wave non-respondents may create a problem in respect to missing data. Some of the data that will be lost due to temporary non-response might, however, be reconstructed or imputed on the basis of information collected in waves before and after non-response, while other types of data cannot be reconstructed. The consequence is that for some dynamic analysis reentries must be left out of the dataset, while for other types of analysis, for instance to study changes between two points in time the inclusion of reentries will improve data quality.

Table 15
Representativeness of the net sample after four waves, by sex and age groups.
Deviation from the gross sample

Age (1990)	Without reentries				With reentries			
	W1	W2	W3	W4	W1	W2	W3	W4
16-24	-0.2	-1.1	-2.8	-3.5	-0.2	-1.1	-2.2	-1.9
25-29	0.3	-0.2	-0.6	-2.6	0.3	-0.2	-0.2	-1.6
30-39	0.5	0.4	0.2	1.3	0.5	0.4	0.6	1.2
40-49	0.9	1.6	2.8	2.4	0.9	1.6	2.3	1.9
50-59	0.0	0.6	1.3	2.3	0.0	0.6	1.0	1.3
60-69	-0.3	-0.2	0.5	1.2	-0.3	-0.2	0.3	0.3
70-79	-1.1	-1.2	-1.5	-1.2	-1.1	-1.2	-1.8	-1.2
All	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16-24	-0.2	-0.5	-1.3	-1.3	-0.2	-0.5	-1.1	-0.3
25-29	0.0	-0.3	-1.2	-2.0	0.0	-0.3	-1.0	-1.5
30-39	-0.1	-0.2	-0.5	0.2	-0.1	-0.2	-0.2	0.3
40-49	0.2	1.0	1.8	1.9	0.2	1.0	1.2	0.7
50-59	0.3	0.6	1.0	1.8	0.3	0.6	0.8	0.8
60-69	-0.5	-0.4	0.2	0.7	-0.5	-0.4	0.3	0.3
70-79	-0.1	-0.3	-0.5	-0.7	-0.1	-0.3	-0.7	-0.4
All men	-0.3	-0.2	-0.5	0.6	-0.3	-0.2	-0.7	0.0
16-24	0.0	-0.5	-1.5	-2.1	0.0	-0.5	-1.1	-1.7
25-29	0.3	0.1	0.6	-0.6	0.3	0.1	0.9	-0.1
30-39	0.5	0.7	0.7	1.1	0.5	0.7	0.8	0.9
40-49	0.7	0.6	1.0	0.6	0.7	0.6	1.1	1.2
50-59	-0.3	0.1	0.3	0.6	-0.3	0.1	0.2	0.4
60-69	0.2	0.2	0.3	0.5	0.2	0.2	0.0	0.1
70-79	-1.0	-0.9	-1.0	-0.5	-1.0	-0.9	-1.1	-0.8
All women	0.3	0.2	0.5	-0.6	0.3	0.2	0.7	0.0

Table 16
Representativeness of the net sample after four waves, by size of income/level of education/ type of tenure/social assistance and size of municipality.
Deviation from the gross sample

	Without reentries				With reentries			
	W1	W2	W3	W4	W1	W2	W3	W4
<i>Taxable gross income (1000 Nkr)</i>								
-75	-1.5	-1.7	-2.6	-3.4	-1.5	-1.7	-2.2	-2.6
75-99	-1.0	-2.4	-2.3	-2.0	-1.0	-2.4	-2.0	-2.1
100-149	0.1	-1.3	-2.1	-2.1	0.1	-1.3	-1.5	-1.5
150-199	0.7	0.5	0.3	-0.4	0.7	0.5	0.0	0.8
200-249	1.0	1.6	2.5	3.8	1.0	1.6	2.3	2.8
250-	0.7	3.3	4.3	4.1	0.7	3.3	3.5	2.6
<i>Level of education</i>								
Low	-2.6	-4.0	-4.0	-4.2	-2.6	-4.0	-3.9	-4.1
Medium	1.2	1.0	0.8	0.7	1.2	1.0	1.2	1.1
High	1.7	3.3	3.6	4.0	1.7	3.3	3.0	3.2
Unknown	-0.4	-0.3	-0.5	-0.5	-0.4	-0.3	-0.4	-0.3
<i>Housing tenure</i>								
Owner	1.7	3.7	6.6	8.6	1.7	3.7	4.7	6.1
<i>Social assistance</i>								
Recipient	-0.9	-3.1	-3.8	-3.8	-0.9	-3.1	-2.8	-3.0
<i>Size of municipality (1000 inhab.)</i>								
-9.9	0.8	1.3	1.5	0.7	0.8	1.3	1.8	-0.1
10-49.9	0.6	1.3	1.2	2.0	0.6	1.3	0.2	2.0
50-	-1.3	-2.6	-2.7	-2.7	-1.3	-2.6	-1.9	-1.8

A similar analysis is presented in table 17 in respect to marital status and whether or not there are any children in the family. The table confirms that the representativeness of the net sample clearly deteriorates over time. As was shown in the previous section both of these variables were strongly associated with non-response. Both married couples and families with children were found to be over-represented in the net sample, at the expense of persons that were unmarried and families without children. As can be seen from table 17, the difference between the gross and the net sample grows larger after several consecutive waves. After the fourth wave married couples are over-represented in the net sample with as much as 13 percentage points. Similarly, the number of families with children are over-estimated in the net sample, deviating from the gross sample with as much as 7 percentage points after wave four.

The representativeness of the net sample improves somewhat when reentries are included. However, the positive impact of the reentries cannot change the fact that in respect to these two classifications, i.e. the presence of children and marital status, the net sample increasingly becomes unrepresentative of the gross sample and the population of interest.

Table 17
Representativeness of the net sample after four waves, by marital status
and whether or not there are any children in the family.
Deviation from the gross sample

	Without reentries				With reentries			
	W1	W2	W3	W4	W1	W2	W3	W4
<i>Marital status</i>								
Never married	-2.3	-4.4	-6.5	-9.4	-2.3	-4.4	-5.8	-7.1
Married	3.5	6.7	8.9	12.6	3.5	6.7	7.7	9.5
Widowed	-0.4	-0.4	-0.3	-0.1	-0.4	-0.4	-0.6	-0.5
Divorced	-0.4	-1.8	-1.9	-2.1	-0.4	-1.8	-1.3	-1.2
Separated	-0.3	-0.1	-0.2	-1.0	-0.3	-0.1	-0.1	-0.6
<i>Children in the family</i>								
At least one child	3.6	3.9	5.2	6.8	3.6	3.9	4.5	6.3
No children	-3.6	-3.9	-5.2	-6.8	-3.6	-3.9	-4.5	-6.3

6. Summary and conclusions

In this report we have compared the distribution of the gross and the net sample of the income panel of the Norwegian Income Distribution Survey, in order to investigate the amount and nature of longitudinal non-response. The availability of administrative data made it possible to have information not just on households that dropped out of the survey after the first wave (attrition), but even on households that never participated in the household interview (initial non-response households). By comparing the distribution of the gross and the net sample the following conclusions can be made.

First, in respect to the number of longitudinal non-respondents, it can be concluded that there are very few households that turn out to be permanent non-respondents. During the four waves between 1990 and 1994 only 10 % of the households declined to participate in all the four household interviews. There where, on the other hand, a substantial number (48 %) of panel members that were non-respondents in at least one of the four waves. The majority of these were, however, only one-wave non-respondents. Four out of ten households turned out to be permanent respondents, i.e. they participated in all the four waves.

Second, it seems as if there is a clear difference in the characteristics of households that participate always, sometimes or never in the panel survey. Among the permanent respondents there is, for instance, an over-representation of married couples and families with children. It is, moreover, suggested that this can be explained by a higher probability of finding someone at home in these households and the possibility of obtaining (at least) a proxy interview. The permanent respondents are also characterised by having incomes well above the average and by having more years of education than the average. Among the short-term non-respondents, i.e. those that only missed one out of four waves, the main feature is a clear over-weight of younger individuals, while there among the permanent non-respondents, on the other hand, is an over-representation of older households and in particular old women. In addition both the permanent non-respondents as well as the longer-term non-respondents (i.e. those that participated in just one or two of the four waves) are characterised by having less income as well as less education than the average and also by having fewer home owners.

Third, the difference in the distribution between response and non-response households leads to a deterioration of the sample representativeness with the passage of time. It turns out that those households sharing the same characteristics as the initial/first-wave non-respondents were also those households that were more likely to drop out of the survey with the passage of time. In particular this can be seen in respect to characteristics such as marital status and the presence of children in the family.

Finally, the analysis confirmed the importance of the reentries. It was documented that a substantial number of former non-respondents reenter the panel at some later stage, and that the inclusion of these improves the representativeness of the sample. This finding could again have some implications for the data collection process. With so many former non-respondents returning to the panel already in the next wave, it might be considered if not an even greater effort should to be made during the fieldwork in keeping potentially temporary non-respondents in the panel, in order to avoid gaps in the time-series. One obvious target group here will be the young.

Appendix 1: Links to administrative registers

The Income Distribution survey of which the income panel is a sub-sample combines information collected from a household interview with data collected from administrative registers.

Each individual selected to participate in the survey will be linked to several administrative registers. A unique 11-digit Personal Identification Number assigned to every person residing in the country is the key that links individuals to all the different registers.

This analysis is based on data from the following registers:

1. The Population Statistics System

This register provides important background information on all persons residing in Norway. The variables extracted from this register to be linked to the sample are:

- Municipality
- Sex
- Age
- Marital status
- Family composition

2. The Tax Register for Personal Tax Payers

This register covers all individuals above the age of 12, irrespective of whether they have any taxable income or not. The extracted variable(s) are:

- Personal codes to identify head of family, spouse and children

3. The Tax Return Register

This is a comprehensive register comprising all available information on income and property from the personal tax return. The following variables have been linked to the sample:

- Taxable gross income
- Largest source of income (socio-economic status)
- Imputed rent of owner-occupied dwelling (to specify type of tenure)

4. The Social Assistance Register

This register gives information on:

- Social assistance payment received during the year

5. Statistics Norway's Educational Register

This register supplies information on the highest level of completed education for all individuals, as well as education that is still going on. The variable linked to the sample is:

- Highest level of completed education

Appendix 2: Results from the univariate and multivariate analysis (p-values)

Table A2.1
Level of significance (p-values) in the univariate analysis (Chi-Square)

	Permanent respondents	Temporary short-term non-respondents	Temporary longer-term non-respondents	Permanent non-respondents
Age	0.001	0.003	0.001	0.122
Age>69				0.005
Income	0.001	0.116	0.001	0.012
Education	0.001	0.315	0.001	0.001
Tenure	0.001	0.539	0.001	0.001
Social assistance	0.001	0.023	0.001	0.001
Size of municipality	0.069	0.861	0.101	0.145
Marital status	0.001	0.100	0.001	0.001
Children in the family	0.001	0.798	0.001	0.001
Change in marital status	0.196	0.392	0.519	0.072
Left parental home	0.001	0.010	0.055	0.300
Moved to an other municipality	0.001	0.065	0.457	0.124
N	907	535	517	222

Figures in bold = significant at 0.05 level of significance

Table A2.2
Level of significance (p-values) in the multivariate analysis (Chi-Square)

	Permanent respondents	Temporary short-term non-respondents	Temporary longer-term non-respondents	Permanent non-respondents
Age	0.672	0.028	0.516	0.017
Income	0.205	0.248	0.309	0.693
Education	0.002	0.179	0.036	0.005
Tenure	0.005	0.254	0.052	0.032
Social assistance	0.070	0.005	0.011	0.145
Size of municipality	0.067	0.746	0.107	0.106
Marital status	0.001	0.173	0.039	0.001
Children in the family	0.002	0.278	0.014	0.648
Change in marital status	0.166	0.937	0.194	0.871
Left parental home	0.132	0.173	0.917	0.976
Moved to an other municipality	0.317	0.325	0.440	0.244
N	907	535	517	222

Figures in bold = significant at 0.05 level of significance

Construction of explanatory variables

Age (in 1994) 20-24 = 1
25-29 = 2
30-39 = 3
40-49 = 4
50-59 = 5
60-69 = 6
70- = 7

Age > 69 -69 = 0
70- = 1

Income, taxable gross income (Nkr)

-49 999 = 1
50 000 - 74 999 = 2
75 000 - 99 999 = 3
100 000 - 149 999 = 4
150 000 - 199 999 = 5
200 000 - 299 999 = 6
300 000- = 7

Education, highest level of completed education

Low : primary school (1-6 years) = 1
Medium: second level (7-12 years) = 2
High: third level (13+ years) = 3

Type of tenure

Owner: positive taxable income owner-occupied dwelling or part of building's society = 1
Tenant: no housing income = 0

Social assistance

The household received social assistance in 1994 = 1
No social assistance = 0

Size of municipality

Less than 10 000 inhabitants = 1
10 000 - 49 999 inhabitants = 2
50 000 or more = 3

Marital status

Never married = 1
married = 2
widowed = 3
divorced = 4
separated = 5

Children in the family

One or more child 0-17 years old = 1
No children = 0

Change in marital status

Married in 1990, divorced/separated/widowed in 1994 = 1
others = 0

Left parental home

Change in personal code from tax register from '3' (child) in 1990
to '1' (head) or '2' (spouse) in 1994 = 1
others = 0

Moved to another municipality

A different municipality number in 1994 from that in 1990 = 1
No change = 0

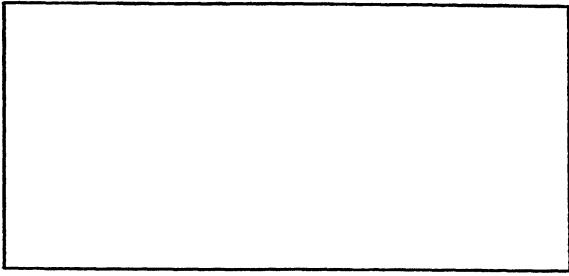
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