The effects of longitudial "drop-outs" and late respondents on the main EU-SILC indicators

Steinn Kári Steinsson & Bengt Oscar Lagerstrøm
steinn.steinsson@statice.is & bengt.oscar.lagerstrøm@ssb.no
Statistics Iceland & Statistics Norway
Surveys

Abstract: The EU-SILC longitudinal design and the order of responses collected were used to try to answer the questions whether the EU-SILC social indicators, Gini, S80/S20 and the at-risk-of-poverty rate are affected by non-response. The results show that longitudinal "drop-outs" and first wave non-respondents tend to have higher indicators than those who do not skip waves. When the indicators were calculated for the last 5% of responses and compared to the first 95% of responses a trend could be seen indicating that late respondents tend to have higher indicators than those who respond earlier. This might indicate that the EU-SILC social indicators could be biased by non-response and that increase in non-response could increase the bias.

1. Introduction

The research questions

Response rates have fallen over the past decades in both Norway and Iceland as in most countries in the western hemisphere. At the same time, survey costs have risen dramatically as efforts have been made to try to offset this trend (De Leeuw, E. and De Heer, W. 2002). Current best practices are to maximize response rates and to minimize risk of non-response error. However, these practices have been challenged lately through studies showing no strong relationship between non-response rates and non-response bias (Peytcheva and Groves 2009; Groves 2006).

The motivation for this paper is to find out if the main EU-SILC indicators are biased by non-response. And if so, would an increase in non-response lead to increased bias in these indicators? These are big questions that might be hard to answer conclusively but the aim of this paper is to look at longitudinal "drop outs", and late respondents, in order to try to shed some light on the issue. This could be analyzed with only looking at one country. When looking on both Norway and Iceland, where the indicators are almost similar, we can also shed some light on reasons for differences in response rates between these two countries. Figures for response rates and social indicators for Norway and Iceland can be seen in appendix (table 1).

2. Data

The EU-SILC measures income distribution:

EU-SILC is the reference source for comparative statistics on income distribution and social exclusion at European level. The sample units are persons aged 16 or more registered in the central population register (inhabitants). A rotational design ensures both cross-sectional and longitudinal data. This design rotate a part of the sample form one year to the next retaining the other part unchanged. In the Norwegian sample each year 1/8 of the sample are replaced. Iceland uses the regular EU-SILC four year rotational sample design. In both Norway and Iceland, a selected household respondent re-

ceives a personal questionnaire and household and income variables are collected either through register or through the selected respondent for all household members see Eurostat homepage for further information (http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/).

The longitudinal design is here used to help understand those who do not respond to the survey. Another approach would be to use register data for the same purposes but that is not within the scope of this research. Register data alone do not produce comparable social indicators to those retrieved from the EU-SILC since information on household compositions are inaccurate in registers but they are necessary for the EU-SILC approach.

2. Method

This research uses the longitudinal design of EU-SILC to try to understand those who do not respond to the survey through three approaches. (1) First we look at non-respondents in the first wave but answer in the second wave compared to respondents in both successive waves to shed some light on non-response. (2) Then we use respondents from wave t who turns out as non-respondents in wave t+1 compared to respondents in both year t and t+1 to better understand attrition. (3) Our third approach is to look at respondents that respond late in the data collection period.

Our hypothesis is that if sample persons that is reluctant or hard to reach, successfully is brought into the respondent pool through persuasive or other efforts, may introduce respondents with other characteristics then those who already is included. This can harm the quality of a statistics in our survey expressed by i.e. means or correlation coefficients.

Does the mean square error of a statistics increase when sample members who are less likely to be contacted or cooperate are included in our sample? An increase in mean square error could occur because our late responders offset our non-response bias in the final estimates, but are affected by measurement error. Or the other way around, non-response bias exist, but the measurement error introduced by our late respondent exceeds the non-response bias.

The main EU-SILC indicators are the Gini coefficient, the quintile share ratio and the at-risk-of-poverty rate. They are designed to measure income distribution, how evenly or unevenly income is distributed within the population of different nations or groups. These indicators have received increased attention among economists and policymakers as the economy has gone through great changes.

The Gini index: The Gini index shows how the total income of a society is distributed among the population. The Gini index would be 100 if all the income belonged to the same person and others had nothing. The index would be 0 if all members of the population had equal income.

The quintile share ratio, S80/S20 The quintile share ratio (S80/S20) compares the 20% of the population with the highest income to the 20% of the population with the lowest income.

The at-risk-of-poverty rate:

The at-risk-of-poverty rate measures the proportion of the population that falls below the at-risk-of-poverty threshold. The threshold is defined as 60% of the median equivalized disposable income, taking into account the economy of more than one person residing under the same roof. Those with income below 60% of the median are considered to be at-risk-of-being poor by the EU.

2. Results

EU-SILC social indicators: non-response and attrition

We find non-response in both cross-sectional surveys and panel surveys. However, non-response may be more devastating to a panel survey than a cross-sectional survey if non-response is selective in first wave since subsequent waves will suffer from this bias too. In addition, it is always a risk in panel surveys that former respondents drop out of the respondent sample in a way that might harm the statistics further.

Our first approach was to compare the social indicators for those who do not respond in the first wave of the survey but respond in the second wave to those who respond in both waves. Table 2 and 3 in the appendix show the indicators for each year of the survey and total weighted average for all years for both Iceland and Norway respectively. Confidence intervals and total count numbers apply to the column of mean indicators for all years of interest.

First wave non-respondents tend to have higher social indicators than first wave respondents.

It can be seen that for the total indicator column, all indicators are higher for the non-responding group (not responding in the first wave but responding in the second wave) than the responding group (responding both waves) for both countries. However the differences were not found to be statistically significant.

Those who drop out of the longitudinal survey tend to higher social indicators than those who continue.

A comparison was also made for those who have taken part in the survey in the first wave, but dropped out in the subsequent wave. There might be several reasons for this, but the data shows that all indicators are higher for the non-responding group (responding in wave t but not in wave t+1) than the responding group (responding both waves). Further, at-risk-of-poverty rate was found to be significantly higher for the total indicator for those who drop out than for those who respond both waves. The trend is strong for both the at-risk-of-poverty rate and the S80/S20 with all years higher for those two indicators among the “drop-out“ group as seen in table 4 and 5 in the appendix. For both comparisons, remarkable similarities in response pattern in Iceland and Norway were found.

The EU-SILC social indicators and late respondents

The data indicates that both non-response and attrition underestimates the income distribution in our two countries. One of the research questions asks whether those who respond late might differ from other respondents. If that is the case, increased non-response might increase bias. It is also interesting to find out whether those who respond late are similar to those who drop out of the survey between waves.

Longitudinal "drop-outs" tend to be late respondents.

Those who are non-respondents in the first wave (t) but do respond in the second wave (t+1) have a stronger tendency than others to respond late in the subsequent wave. Those who are among the 5% of the last respondents to take part in the survey are significantly more likely to drop out in the subsequent wave (t+1) than the first 95% who respond as shown in figure 1. This is true for both countries.

Figure 1. Non-response rate in wave t for respondents in wave t+1 by order of interview in wave t+1. IS (average 2005-2009) and NO (average 2005-2008)

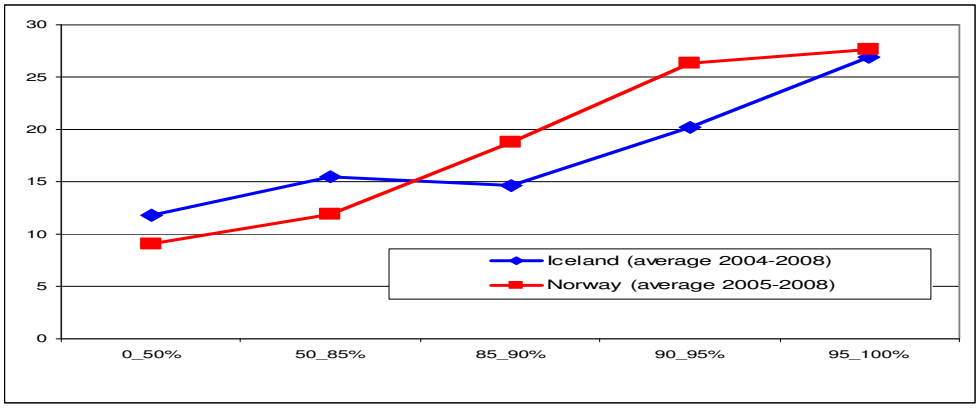


Figure 2. Non-response rate in wave t+1 for respondents in wave t by order of interview in wave t. IS (average 2004-2008) and NO (average 2004-2007)

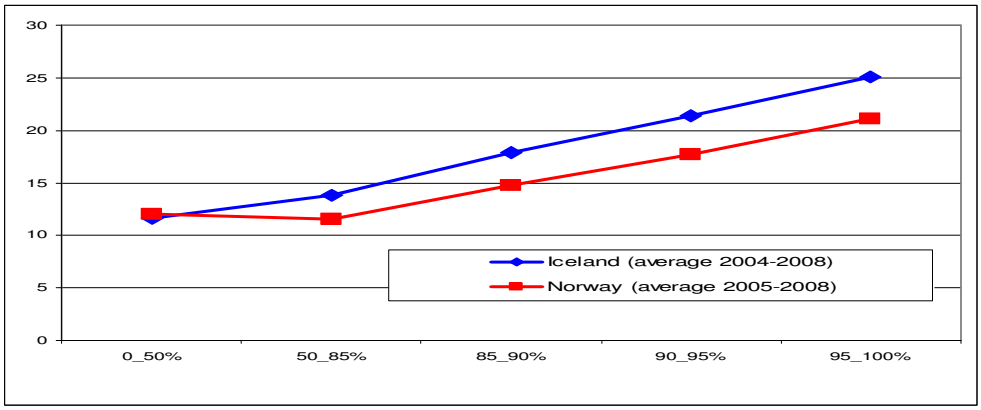


Figure 2 shows non-response rates in wave t+1 by different percentage of the data collection for both Iceland and Norway. We see a clear and steady tendency to higher and higher non-response in t+1 if the respondents were interviewed late in wave t. In Iceland one out of four respondents from the last five percentages of the date collection in wave t will drop out in the subsequent wave (t+1). Respectively, we find that this is true for one out of five in Norway.

Late respondents tend to have higher social indicators than those who respond earlier.

From figures 3 to 8 it can be seen that when the total numbers are compared to the last 5% responders for the three social indicators, we find for almost every year produces a significant difference between the first 95% responders and the last 5% responders. For all indicators, both the dropouts and late respondents tend to have significant higher social indicators than others.

Figure 3. Gini-indexs for late respondents (last 5 %) and first 95% respondents. 2004-2009. IS

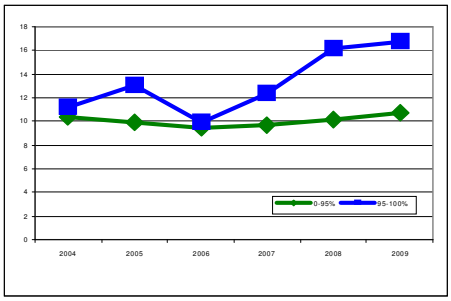


Figure 4. Gini-indexs for late respondents (last 5 %), first 95% respondents and mean. 2004-2008. NO

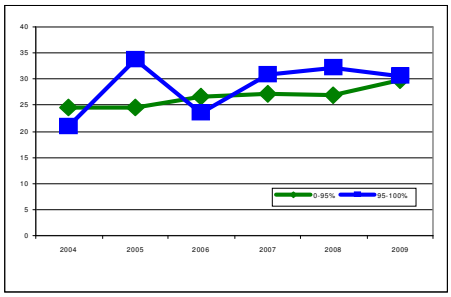


Figure 5. S80/S20 for late respondents (last 5 %), first 95% respondents and mean. 2004-2009. IS

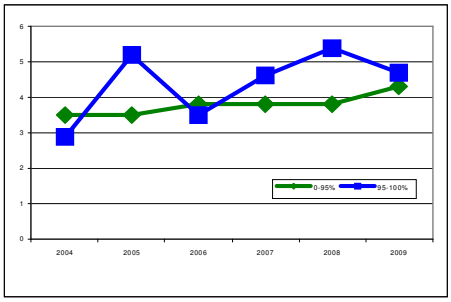


Figure 6. S80/S20 for late respondents (last 5 %), first 95% respondents and mean. 2004-2008. NO

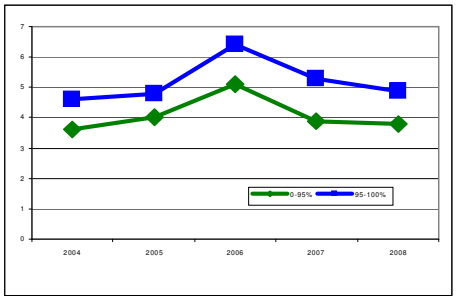


Figure 7. ARPR for late respondents (last 5 %), first 95% respondents and mean. 2004-2009. IS

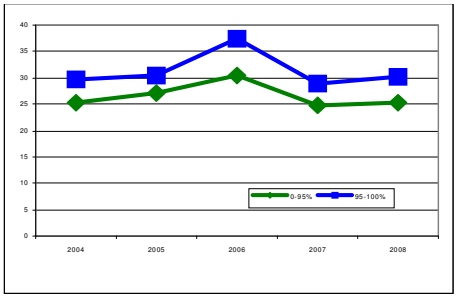
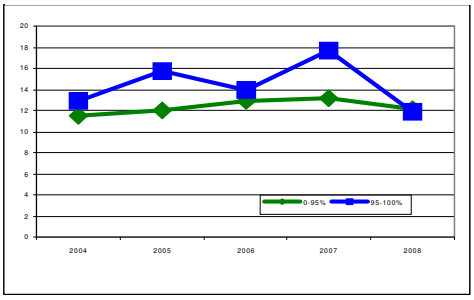


Figure 8. ARPR for late respondents (last 5 %), first 95% respondents and mean. 2004-2008. NO



3. Discussion and Conclusion

These analyses have six main findings. (1) Non-respondents in the first wave of EU-SILC tend to underestimate social indicators. (2) Attrition in subsequent waves (drop outs) tends to have higher social indicators than those who respond in two subsequent waves, thus also underestimate social indicators. (3) For those who respond late, the difference in income is higher than for respondents in general. (5) We also showed that those who respond late are similar to those who drop out of the panel after wave t in the way that both groups have higher difference in income than there is to be found among respondents in general. This indicates that because of non-response, EU-SILC underestimates income distribution, and if response rates were lower the bias might be even higher. (6) Both non-response in first wave and “drop outs” in the subsequent wave follow the same pattern in Iceland and Norway. The reason for different response rates in our two countries should therefore have its origin in some other features with the national EU-SILC. One explanation could be differences in non-response level in the

first wave. Another explanation could be differences in the lifespan of the panel between Norway and Iceland, knowing that Norway have eight waves and Iceland only four waves.

There are many different methods for studying non-response bias (Groves 2006). This analysis focuses on variation within an existing survey. The strength of this method is that it can be used regardless of mode, population and topics if you have access to process data from the data collection. However, the weakness, as explained by Groves (2006), is that it offers no direct information about the non-respondents. In further analysis we will expand our analysis to also include response rate comparisons across subgroups. Furthermore, it is possible to use process information to adjust our estimates in order to reduce the non-response bias (Bartholomew 1961; Thomsen et. al 2006). Another approach would be to use register data for the same purposes but that is not within the scope of this research. Register data alone do not produce comparable social indicators to those retrieved from the EU-SILC, since information on household compositions are inaccurate in registers but they are necessary for the EU-SILC approach.

In addition to adjustment procedures, the information obtained through this analysis also shade some light on non-response reduction procedures. Since late responders differ from early responders and that late responders seems to reinforce their negative impact on the survey estimates from wave to wave, typical late responders should be forced to respond earlier in the survey the subsequent wave. How to do this is out of the scope for this paper but it seems to be valuable to try to convert late responders in wave t to early responders in wave t+1 to offset the negative spiral introduced by late respondents. Some strategies could be to arrange the information and incentive strategy to meet this challenge or rearrange the data collection strategy and start the data collection with the late respondents in wave t, give interviewers arguments for this specific group and so on.

4. References

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5. Appendix

Table 1. Response rate and social indicators from EU SILC. IS and NO. 2004-2009.

		2004	2005	2006	2007	2008	2009
Response rate	IS	74	75	73	74	73	73
	NO	73	72	69	70	64	61
Gini	IS	24	25	26	28	29	
	NO	25	28	30	24		
S80/S20	IS	4	4	4	4	4	
	NO				1,0		
ARPR	IS	10	10	10	10	10	
	NO	11	11	11	11		

Tabele 2. Non-respondents in the first wave (t) and respondents in the subsequent wave (t+1) compared to respondents in both first and subsequent wave for main social indicators of EU-SILC. 2005-2009. IS

		2005	2006	2007	2008	2009	Total	Total	Total
							indic.	CI	count
Gini	Both	24.9	24.2	28.9	26.8	28.2	26.6	1.6	3 050
	Not first	22.9	30.2	28.2	27.2	29.0	27.4	2.8	513
	All resp.	24.6	25.1	28.8	26.9	28.4	26.8	1.4	3 563
S80/S20	Both	3.5	3.4	4.05	3.8	4.05	3.7	0.3	3 050
	Not first	3.4	4.3	4.09	4.2	4.08	4.0	0.7	513
	All resp.	3.4	3.5	4.1	3.8	4.1	3.8	0.3	3 563
ARPR	Both	9.87	10.4	10.7	10.2	13.3	11.0	1.4	3 050
	Not first	9.91	10.0	12.6	13.5	12.4	11.7	3.4	513
	All resp.	10.2	10.4	10.9	10.6	13.7	11.2	1.3	3 563

Tabele 3. Non-respondents in the first wave (t) and respondents in the subsequent wave (t+1) compared to respondents in both first and subsequent wave for main social indicators of EU-SILC. 2005-2009. NO

		2005	2006	2007	2008	2009	Total	Total	Total
							indic.	CI	count
Gini	Both	28.3	30.6	23.9	26.6	n.a.	27.6	3.1	2 708
	Not first	25.8	27.4	35.1	23.9	n.a.	28.6	5.8	381
	All resp.	28.2	30.4	26.1	26.5	n.a.	27.9	2.8	3 089
S80/S20	Both	4.1	5.1	3.7	4.2	n.a.	4.3	0.7	2 708
	Not first	3.9	4.3	6.3	3.5	n.a.	4.7	1.2	381
	All resp.	4.1	5.1	4.2	4.1	n.a.	4.4	0.7	3 089
ARPR	Both	11.5	14.2	11.8	12.5	n.a.	12.5	1.2	2 708
	Not first	12.5	11.9	17.1	14.9	n.a.	14.4	3.2	381
	All resp.	11.5	14.1	12.7	13.2	n.a.	12.9	1.1	3 089

Table 4. Respondent in the firs wave (t) and non-respondents in the subsequent wave (t+1) (drop out) compard to respondent in both first and subsequent wave for main social indicators of EU-SILC. 2005-2009. IS

		2005	2006	2007	2008	2009	Total	Total	Total
							indic.	CI	count
Gini	Both	25.0	24.0	25.7	27.5	27.2	25.9	0.9	9 173
	Not x+1	24.5	31.4	27.9	27.0	26.5	27.5*	2.4	1 475
	All resp.	25.0	25.1	26.0	27.5	27.1	26.1	0.8	10 648
S80/S20	Both	3.5	3.4	3.6	3.8	3.8	3.6	0.2	9 173
	Not x+1	3.5	4.6	4.1	4.0	4.1	4.1*	0.5	1 475
	All resp.	3.5	3.5	3.7	3.8	3.8	3.7	0.2	10 648
ARPR	Both	9.4	9.7	9.3	9.8	9.9	9.6	0.8	9 173
	Not x+1	14.0	11.8	12.9	12.1	14.8	13.2*	2.2	1 475
	All resp.	10.1	10.4	9.5	10.0	10.6	10.1	0.7	10 648

* $p < .05$

Table 5. Respondent in the firs wave (t) and non-respondents in the subsequent wave (t+1) (drop out) compard to respondent in both first and subsequent wave for main social indicators of EU-SILC. 2005-2009. NO

		2005	2006	2007	2008	2009	Total	Total	Total
							indic.	CI	count
Gini	Both	25.2	27.9	29.2	25.0	n.a.	26.8	1.0	18 261
	Not first	27.8	25.6	32.5	27.8	n.a.	28.4*	1.9	2 655
	All resp.	25.5	27.8	29.7	25.5	n.a.	27.1	0.9	20 916
S80/S20	Both	3.6	4.1	4.8	3.9	n.a.	4.1	0.2	18 261
	Not first	4.1	3.8	5.4	4.8	n.a.	4.6*	0.4	2 655
	All resp.	3.7	4.1	4.9	4.0	n.a.	4.2	0.2	20 916
ARPR	Both	11.5	11.9	12.5	13.0	n.a.	12.2	0.4	18 261
	Not first	12.9	13.4	15.6	15.8	n.a.	14.5*	1.2	2 655
	All resp.	11.9	12.0	13.0	13.5	n.a.	12.6	0.4	20 916

* $p < .05$