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Comparability of EU-SILC survey and register data: The relationship among employment, earnings, and poverty

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Comparability of EU-SILC survey and register data: The relationship among employment, earnings, and poverty

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Abstract

The Statistics on Income and Living Conditions (EU-SILC) provide an up-to-date data source for the comparative analysis of income, material deprivation, and poverty. At the EU level, these data have become a standard source for social reporting. Yet the specific approaches to data collection in EU-SILC vary widely from one country to the next. One of the major differences is that some countries rely entirely on household surveys, while others also use administrative or "register" data for a wide range of variables. This paper addresses the question of how the relationship among employment, earnings, and poverty changes when different approaches to data collection are used. The paper shows the impact on substantial results: here, the share of working and non-working poor. Since crucial questions of EU social policy rest on these data, it is an important finding that some results are most likely driven by different approaches to data collection.

Keywords: poverty, employment, EU-SILC, data comparability

1. Introduction

In social policy research there is a longstanding discussion on how to measure welfare state characteristics and outcomes (see Atkinson et al. 2002, Clasen/Siegel 2007). Substantial results often differ due to the use of different basic concepts, indicators, or types of data. In recent years, efforts have been made at the EU level to produce internationally comparable databases. An early example is the European Community Household Panel Study (ECHP), which termed out in 2001. With the launch of its replacement, the Statistics on Income and Living Conditions (EU-SILC), an up-to-date data source has become available for the comparative analysis of income, material deprivation, and poverty. EU-SILC is now a standard source for social reporting, and forms the basis for the calculation of many Laeken indicators (see European Commission 2008, Marlier et al. 2007). Although EU-SILC is used widely in comparative research, there is still little evidence on the comparability of EU-SILC across countries. Data collection methods vary widely among European countries. One crucial difference is that some countries rely entirely on survey data while others also use administrative or "register" data (Eurostat 2008). This article addresses the potential effects of these two approaches on substantial results.

The specific question addressed in this article is how the relationship among employment, earnings, and poverty changes when different data collection approaches are used, as is the case in EU-SILC (register vs. survey data with personal and proxy interviews). The main question is whether sufficient overlap exists between the income and employment information from different sources. The likely consequence of limited overlap is an attenuated relationship between work and poverty. This affects substantial questions. The relationship among employment, earnings, and poverty is a key component of the Lisbon process, which aims at achieving full employment while increasing the quality of work and reducing social exclusion

(see, e.g., Council of the European Union 2005). Some of the Laeken indicators focus on the interplay between employment and poverty (e.g., poverty risk by main activity status, in-work poverty risk, poverty risk by work intensity). Such indicators are crucial for determining social policy and provide the basis for the evaluation of best practice approaches at the EU level. Such evaluations are, however, prone to misinterpretation if results differ systematically from one country to the next due to different data collection approaches.

The paper is organised as follows. Section 2 gives a brief overview of the previous research. Section 3 describes the dataset and the general approach of the paper. Section 4 presents results on the overlap between employment and earnings information at the individual level. Section 5 addresses differences in the poverty risk of the working and the non-working population depending on the method of data collection. Section 6 investigates how much these differences influence the results of multivariate models on the structure of the poor population. The analysis is intended to provide more evidence on the extent to which substantial results are affected by the method of data collection. Section 7 summarises the results and provides conclusions, focusing on the comparability of EU-SILC data for analyses of employment, earnings, and poverty.

2. Survey, proxy, and register data: evidence from earlier studies

A large number of studies address the impact of the use of register or survey data on the overall distribution of earnings, income, or the extent of poverty (see Duncan/Hill 1985, Bound et al. 2001, Epland/Kirkeberg 2002, Rendtel et al. 2004, Kapteyn/Ypma 2007, Kristensen/ Westergaard-Nielsen 2007). Many of these studies regard register data as more accurate and therefore use such data to validate survey data (see, e.g., Rendtel et al. 2004). These studies show that the accuracy of earnings and income information in surveys differs depending on

factors such as the level of earnings or the characteristics of employment. There is evidence that respondents at the lower end of the income distribution tend to overreport their earnings or income, and that the opposite is true of respondents at the upper end of the distribution. There is also evidence that part-time employees are more likely to report their earnings inaccurately. The results on the influence of gender are inconclusive: while some studies report a higher accuracy of women's survey earnings, others find the opposite effect (Kristensen/Westergaard-Nielsen 2007).

A different view on register data is not to treat it simply as more accurate but as a measure based on a different concept (Kapteyn/Ypma 2007). Earnings information, for instance, usually stems from tax registers, which exclude information on non-taxed earnings. Some of the differences between survey and register data are probably due to tax evasion, but also to the different points in time at which income and tax data are collected. Such problems are most likely to occur for temporary workers or the self-employed, both of which are therefore often excluded from validation studies. There is also evidence of differences between survey and register data on employment or unemployment (see Duncan/Hill 1985, Mathiowetz/Duncan 1988). These studies show that the unemployment information in survey and register data differs significantly at the individual level. At the population level, the differences are less pronounced, since overreporting and underreporting of unemployment level each other out. But this is less true when two characteristics are combined—for example, in the measurement of hourly wages, which combines information on weekly or monthly earnings and hours of work. Similar problems can be expected for the measurement of poverty by activity status.

The literature on differences between proxy and personal interviews is more ambiguous. Most studies stress the differences in the respondent's process of information retrieval and processing, but many also report similar levels of accuracy from the two sources (see Moore 1988,

Blair et al. 1991, Highton 2005). In general, proxy interviews are used in two categories of cases. First, they are conducted if respondents are unwilling or unable to give an interview. In such cases, the proxy respondents differ in crucial characteristics from the rest of the survey population. The "proxy effect" is confounded by other characteristics of the respondents, such as being too old or too infirm to answer. As a consequence, inaccuracies due to proxy interviewing are not distributed at random over the total population but affect selected groups, which impacts univariate distributions as well as bivariate relationships. Second, proxy interviews are used to lower survey costs. In these cases, respondent rules are used to guarantee the random selection of proxy respondents over the sample population, making the proxy effect less likely to be confounded by other characteristics.

EU-SILC combines personal survey and proxy interviews as well as register data. Some countries use proxy interviews to reduce the data collection workload, others only to reduce nonresponse (see Eurostat 2008). However, differences between the information from proxy and personal interviews in EU-SILC have not been addressed in detail to date (Epland 2006 discusses the use of register and survey data in the Norwegian case). However, there are a number of studies that analysed the consequences of different data collection approaches in EU-SILC's predecessor, ECHP (see Epland/Kirkeberg 2002, Nordberg 2003, Rendtel et al. 2004). These studies took into account that under the ex-ante harmonised design of the ECHP, countries that traditionally rely on register data (e.g., Norway, Finland) were obliged to collect survey data that paralleled the already existing data. These studies showed differences in the results produced with the two approaches. For instance, Rendtel et al. (2004: 39) stated in their conclusion on measurement errors in survey and register data: "With respect to the percentage poor, a key measure for cross-country comparisons, the deviation amounts to a relative error of about 50 percent! […] Such large deviations have an impact on the ranking of the

European countries according to ECHP results and will have it for the forthcoming EU-SILC too."

3. Data and methods

The aim of this paper is not to compare EU-SILC data with external data derived from registers or other surveys. Rather, it is to examine the impact of differences in the EU-SILC income and employment data between register countries, which use different data sources (income information from registers and detailed employment information from interviews), and survey countries (interviews only). The basic approach taken here addresses how "working" is defined: whether as "receiving earnings" or as "being employed." The most important difference between the two is that the former does not require the use of employment information: the definition of "working" via earnings uses the same source as the other income information, whereas the definition of "working" via employment uses the standard employment variable. Thus, in the register countries, if there is a mismatch between the employment information and the earnings information, the identification of the working population will differ depending on the approach used to define "working." This does not occur in the survey countries, where both types of information come from the same source. It should be noted that this approach does not allow for an evaluation of the accuracy of the data. Therefore, even if this paper shows that there is a problem of overlap between register and survey data, it cannot show whether this is due to the inaccuracy of which of the two data sources. Furthermore, the paper cannot provide a general evaluation of EU-SILC data (see the discussion in Hauser 2008, Nolan et al. 2009 or Frick/Krell 2010).

The analysis uses data from all EU-SILC countries for the years 2004 to 2007 (cross-sections only).[i] Data collection started in 15 countries in 2004. In 2007, EU-SILC covered individuals

and households in 24 EU member states plus Norway and Iceland. All EU-SILC income information refers to the "income reference period." With two exceptions, the income reference period covers the 12 months of the calendar year prior to the survey year (Eurostat 2009: 17f). In Ireland, the income reference period is the 12 months prior to the date of the interview. In the United Kingdom, current income (weekly, monthly) is annualised and refers to the year of the survey (Eurostat 2008: 25). Information on employment is available for the month of the interview and for the income reference period. Since the aim of this paper is to analyse the match between the employment and income information, only the employment information for the income reference period is used. The respective variables record the main activity status for each month of the income reference period. With regard to "working," the main activity status differentiates between full-time and part-time work. However, some respondents who are working short hours may be classified as inactive or unemployed. The majority of the analyses only include persons of core working age (age 25 to 54 years): with this group it is more likely that the main activity concept used in EU-SILC accurately distinguishes between working and non-working persons (which is more difficult in the case of working students or retirees). As a standard, income information is recorded as gross income and supplemented by net indicators such as net equivalised household income. Some countries collect net income, which is transformed into gross values. Prior to 2007, some of the countries were allowed to provide net information only (Italy, Greece, Spain, Latvia). Data from these countries are not used in years where only net information is available. Therefore, the analysis uses the full country sample of 26 countries in 2007 only (2004: 11 countries, 2005: 21 countries, 2006: 22 countries). In total, the data contain 80 country/year observations. The sample size differs between countries and ranges from 8,566 (Iceland 2006) to 52,456 (Italy 2007). In the following, I use measures of total disposable household income and use personal earnings for employees only ("employee cash or near cash income") since the validity of earnings data from self-employment tends to be low. In addition, in analyses focusing on total disposable

income, I exclude individuals with earnings from self-employment (see also notes in the tables). Individuals living in households with zero or negative yearly disposable household income have been excluded from all of the analyses.

As already mentioned, the data collection approach differs from country to country. The majority of countries rely entirely on surveys and are therefore called "survey countries." Seven countries make broad use of register data. These "register countries" include the Nordic countries (Denmark, Finland, Iceland, Norway, Sweden), which have longstanding traditions in the use of register data, as well as the Netherlands and Slovenia. But these countries do not derive all their information from administrative records: data producers often combine register data with survey data. According to Eurostat (2009: 11f), income information is taken from registers and other administrative records, while detailed labour information, the activity history, and the calendar of activities is collected through surveys. An exception is Slovenia, where both income and employment data on the year before the survey are obtained from registers. However, even in Slovenia, the two types of data stem from different sources: the tax register and the health insurance register. Ireland and Latvia use register data to a very limited extent.[ii] In Ireland, information on social welfare payments is obtained from register data if the respondent has given prior consent for their use in EU-SILC. In Latvia in 2007, all variables were collected in a survey but the data were then matched with register data. Based on the comparison, the Latvian data producers decided to use some income components from the register data and some from the survey data. In this paper, the focus is on the overlap between employment and earnings. The Latvian register data in EU-SILC cover taxes on employee cash or near-cash income. Hence, a considerable portion of the earnings information that is central to the following analyses stems from registers, and I therefore classify Latvia as a register country. In Ireland, however, the register information does not include any kind of earnings, and Ireland is therefore classified as survey country.[iii]

Countries differ not just in their general approach but also in their use of proxy interviews. In Denmark and Finland, usually only one person per household answers for all household members. Therefore, about half of the interviews are proxy interviews. Looking at the register countries, the share of proxy interviews is also high on average in the Netherlands, Norway, and Ireland, but low in Iceland, Latvia, Slovenia, and Sweden. Thus, the basic data collection approach varies even among the register countries, which will be taken into account in the empirical analyses. Variation also exists among the survey countries, where the share of proxy interviews ranges from 6.0 to 41.5 percent. On average, the share of proxy interviews is lower here than in the register countries. It should be kept in mind, however, that in survey countries, proxy interviews do not supplement register data but constitute the sole source of information on a given person. Major changes have occurred in only two countries: one is Latvia (see above), and the other is the Netherlands, where the share of proxy interviews has decreased substantially over time. While 40 percent were proxy interviews in 2005 and 2006, just 5 percent were proxy interviews in 2007. This stands in contrast to most other countries, where the share of proxy interviews has increased—at least slightly—over time.

In the following, I differentiate four basic approaches to data collection:[iv]

1. Survey: income and employment information from the same source: personal interview
2. Survey/proxy: income and employment information from the same source: proxy interview
3. Register: income and employment information from two different sources: register data and personal interview (or second register in the case of Slovenia)
4. Register/proxy: income and employment information from two different sources: register data and proxy interview

With regard to the consistency of income and employment information, we can expect that it is highest when the information comes from the same source and is not based on a proxy interview. The following analyses will show to what extent the potential inconsistencies have an impact on the measurement of concepts such as poverty by activity status. Most relevant for these analyses is the definition of "working" or "not working." A standard approach is to treat individuals as working if they have worked at least seven months of the income reference period. An alternative approach is to treat individuals as "working" if they had at least one euro cash income from employment ("earnings criterion") during that period. In contrast to the first approach, the second is based on income information. In register countries, workers are identified on the basis of register data (and not on the basis of survey data). This approach will therefore be used to identify the consequences of inconsistencies between survey (employment) data and register (income) data. However, since the one-euro criterion is much stricter than "at least seven months working," I use a third approach: I consider a person as "working" if he or she has worked at least one month during the income reference period ("employment criterion").

The empirical analysis starts by looking at the share of non-working persons with income from work. Since data on income from self-employment tend to be less accurate, all persons with income from self-employment are excluded from the analysis. The second part of the empirical analysis deals with poverty, with a specific focus on the division between working and non-working poor. The at-risk-of-poverty threshold is defined as 60 percent of the median disposable equivalised household income in a given country in a given year (using the modified OECD equivalence scale). Sample weights are used in the analyses focusing on a representative share of the population, while none are used in analyses dealing with non-representative sub-samples such as "proxy interviews only" (see Eurostat 2009: 27ff for de-

tails on weights in EU-SILC). Additional analyses (not documented) show that the use of weights does not alter the main results in any significant way.[v]

4. The overlap between employment and income from employment

The first step of the analysis is to examine the overlap between employment and income information. If a relevant share of the non-working population erroneously reports earnings, poverty analyses by activity status will yield inaccurate results due to a blurred dividing line between the working and non-working population. The basic assumption is that income from employment of the non-working population (according to the employment criterion) is close to zero. Since the EU-SILC records only the main activity status for the months of the income reference period, there exist individuals who worked several hours of a given month but not as their main activity. In the following, "not working" and "working" always refers to the main activity. It is therefore expected that we will identify some income from employment for at least some of the non-working population.

<Table 1>

Table 1 shows the share of non-working persons for whom income from employment is reported in EU-SILC. With few exceptions, the share is higher in the 17 to 64 age group, which probably includes a larger share of working persons with a different main activity (students, retirees). Therefore, the sample is restricted to the group of core working age (25 to 54 years). However, the main result of Table 1 is not that there is a share of non-working persons with income from employment, but that this share differs strongly depending on the data collection approach. While the respective share is 6.2 percent for the group of non-working persons based on survey information, it is 33.6 percent for non-working persons for whom register

and proxy information is available. Table 1 conceals variation between countries. I will not discuss details and only refer to one extreme outlier. There appears to be a specific problem in the UK proxy data. According to these data, more than 80 percent of the non-working population has income from employment, which also explains the increase in the average in the survey/proxy group from 2004 to 2005 (in 2004 the UK did not participate in EU-SILC).

The general result that the share is higher for persons with proxy information may not only be due to problems of data quality but also due to the composition of the proxy population, which shares certain characteristics that confound the "proxy effect" (see Section 2). Further analyses will show whether the proxy effect is also found when controlling for potentially confounding factors. However, it is rather unlikely that this is also the reason for the higher share in the register/no proxy data.

<Figure 1>

As discussed in Section 2, register data provides more detailed income information, including small amounts of income that may not be identified in a survey interview. However, the respective amounts are not so small in all cases. Figure 1 displays the distribution of the income of non-working persons by data collection approach. To have a comparable standard for all countries, the figure uses relative income positions instead of income (i.e., the income of a person divided by the median of the total population). It shows the share of the non-working population with earnings within different income brackets. While less than one percent of non-working respondents in the survey population report earnings larger than a quarter of the median, this group is much larger when register data is used. A visible share (about three percent) reports earnings higher than 50 percent of median earnings. Such earnings are far too high to originate exclusively from side jobs. The survey/register respondents deviate from the

general pattern, since the group with the lowest earnings is not larger than the groups with other earnings. However, this result is completely driven by the UK proxy data. Taking the UK out of the analysis, the distribution of earnings of the survey/proxy population does not deviate significantly from the survey population.

5. Differences in at-risk-of-poverty rates of the working and non-working population

Section 4 has shown that the overlap between income and employment data differs depending on data collection approach. If this does not alter the substantive results, it might just indicate a purely technical characteristic of the individual approaches to data collection. Therefore, the analysis will now examine the question of whether group-specific poverty rates are affected by the type of data collection. As argued above, if a relevant share of the non-working population reports erroneous earnings, analyses by activity status are likely to be flawed. Table 2 provides an overview of the poverty risk by activity status for the working-age population (25 to 54 years) of the European countries.[vi]

<Table 2>

The columns of Table 2 are numbered (1) to (14) to facilitate the interpretation of the results. It is not surprising that in all countries, there are rather large differences between the working and the non-working population. Therefore, I primarily discuss the differences between the poverty rates, which are based on the different criteria for how "working" is defined ("earnings" vs. "employed", see Section 3). In order to identify the impact of the different measures used to evaluate country differences, a rank order is provided for each indicator. Let us take as an example the poverty rates in Belgium. According to the employment criterion (column 10), the difference in the poverty risk of the non-working and the working population is 33.0 per-

centage points (37.1 vs. 4.2 percent, columns 2 and 6). The difference is slightly larger when the earnings criterion is used to distinguish between the working and non-working population (37.5 vs. 3.9 percent=33.6 percentage points, column 12). Given the absolute size of the gap between poverty risks, the difference between the two is small (0.6 percentage points, column 14). A substantial portion of the analyses that follow focus on this latter difference, which is less likely to be affected by the overall level of poverty than the difference between poverty rates is. This difference is not substantially higher or even lower in the majority of the countries. However, it is much higher in the countries at the bottom of the table. The at-risk-of-poverty rate of the non-working population in the UK is 34.2 percent based on the employment criterion (column 2) but 45.1 percent based on the earnings criterion (column 6). It is quite likely that this has to do with the high share of non-working persons with income from employment in the UK (see Section 4). Using the employment criterion, these are counted as part of the non-working population, which probably reduces the poverty risk within this group. At the same time, persons without income from employment are counted as working, which results in a higher in-work poverty risk. It should be noted that among the six countries with the highest differences between the two measures, there are five register countries and the UK, where the overlap between the income and employment information in the proxy interviews appears to be rather limited. Therefore, these results can be taken as initial descriptive support for the hypothesis that the data collection method affects the relationship among employment, earnings, and poverty.

Table 2 shows that this also impacts the ranking of countries. In research dealing with the question of how much working lowers the poverty risk, some countries are therefore likely to be evaluated in a very different manner depending on which of the two criteria were used. In four countries, the difference in ranks is greater than four (column 13). In Sweden, the gap between the working and non-working population is small using the employment criterion

(rank 7, column 9), but much larger using the earnings criterion (rank 20, column 11). Large differences can also be observed in other countries (Slovenia: rank 12/17, United Kingdom: rank 15/26, Denmark: 22/12). While four out of 26 is not an overwhelming share, it is a sufficient number for concern if the rank differences are as large as in some of the cases. The impact of the differences is also reflected in the rank correlations reported at the bottom of the table.

While Table 2 contains only results for 2007, the following figures provide information on the relationship between the poverty risks using the two different definitions of "working" for all available observations. Furthermore, to be able to distinguish between country effects and data collection effects, all analyses on the poverty risk of working and non-working persons have been repeated, also taking into account the type of data collection. To give an example: in the UK, the majority of the data come from personal interviews, and a smaller portion from proxy interviews. To be able to distinguish potential problems in the proxy population, all poverty measures have been calculated on the basis of the sample with personal interviews and on the basis of the sample with proxy interviews (always using the poverty threshold of the full sample). Hence, we can distinguish poverty rates by country, year, and data collection method (n=156). As before, it is most interesting to look at the differences between the non-working/working poverty risk using the employment or earnings approach (Figure 2). Using survey data (no proxy) only results in a fairly high correlation between the measures resulting from the two approaches. The correlation for the subsample of proxy interviews is much lower, which is apparently due to a number of outliers (UK, Slovakia). The graph for the register sample (no proxy) is more scattered than the one for the survey population. The result for the subsample of persons with proxy interviews (register countries) shows a similarly weak correlation but not such extreme outliers as in the case of the survey countries.

<Figure 2>

How can we sum up the results so far? We find some support for the basic hypothesis that a limited overlap between employment and income information affects poverty measures of the working and non-working population when register or proxy information is used. However, it is not unlikely that other factors that have nothing to do with data collection methods influence the differences between poverty measures using different definitions of "working." Part of the observed differences may not be caused by the use of a certain approach but simply by the fact that respondent's characteristics differ according to type of data collection. First and foremost, proxy respondents most often are not sampled randomly but differ systematically from the rest of the population. As the sample is restricted to persons of core working age (25 to 54 years), the differences in mean age (and in indicators highly correlated with age) between the personal and proxy respondents are comparably small. However, in most countries women are more likely to participate in a personal interview, with the consequence that the share of men among the proxy respondents is fairly high. As discussed in Section 2, the accuracy of women's income data may differ from men's: therefore, the share of women is a potentially confounding factor in many countries. There are also factors that can be expected to differ between the personal and proxy respondents but even more between countries and therefore between survey and register data. On the one hand, persons who are working but not as their main activity are not counted as workers according to the employment criterion, but are counted using the earnings criterion. This will primarily apply to part-time workers (in particular those who work short hours) or persons who do not work on a regular basis. On the other hand, persons who do work but do not receive an income (mainly unpaid family workers) are counted as workers on the basis of the employment measure but not on the basis of the earnings criterion. For both groups, we can assume that there is a limited match between employment and income information. Since the size of these groups differs from country to

country, such differences in the composition of the working population can confound the observed results for the different data collection approaches.

<Table 3>

I therefore regressed the absolute differences, which are displayed in Figure 2, on the type of data collection controlling for the share of women, unpaid family workers, part-time workers and of workers who were not employed for 12 months of the year.[vii] The main question here is whether the results of the descriptive analysis hold when controlling for aggregated respondent characteristics that may differ according to data collection approach. The results in Table 3 show that the differences are higher on average for the sample of persons with proxy interviews or with register data. With the exception of the survey/proxy effect, the size of the coefficients is fairly stable when the year of data collection or the characteristics discussed above are controlled for. Since the UK has proven to be a specific case (different income reference period, large deviations within the proxy population) the respective observations have been left out of the last model (M4). There are no substantive changes in the main results, but, as could be expected, the "proxy effect" almost diminishes to zero. In contrast, the "register effect" is robust. In general, the results of the models show that the employment-specific poverty risks differ significantly depending on data collection approach, also when controlling for other characteristics of the samples.

6. Individual and household-related poverty risks

Social policy research is not only interested in the incidence of phenomena at an aggregate level but also in the structure of groups like the poor to allow for conclusions about specific risk factors at the micro level. The question of whether poverty profiles differ substantially

depending on data collection method will be addressed in the following. As an example, I estimate the in-work poverty risk for all years and countries using standard logit regression models, which contain the following predictors: gender, age and age squared, migration background, education, and household type (see Section 3 for the definition of poverty). As the analysis focuses on in-work poverty, the samples are restricted to the working population, using the "employment criterion" in one set of models and the "earnings criterion" in a second set of models.[viii] In analogy to the analyses above, the basic assumption is that the results differ when the two criteria identify two differently structured samples of employed persons. Given the number of 26 countries, up to four years of observation, and two approaches, 160 models have been estimated. I discuss in detail only a few selected results but provide summary information on all the models.

<Table 4>

Table 4 contains the results of models for four countries (year 2007). These are selected just as examples to show that there are cases with smaller and larger deviations. As examples I picked two survey and two register countries. These are cases with low (Luxembourg), medium (Austria, Norway), and high (Denmark) differences between the poverty rates using the two different criteria for "working" (as shown in Table 2). After the discussion of the examples, I will provide an overview of the relevant results for all countries and years. These results will also show whether the examples discussed represent typical cases.

In substantive terms, the models confirm results from previous studies (see, e.g., Lohmann 2009). There is no significant influence of gender on the in-work poverty risk. The influence of age is U-shaped. Migrants face a higher in-work poverty risk. Higher education lowers the poverty risk. The in-work poverty risk of couples without children or with only one child is

low, while it is high for single parents. The results for couples with two or more children differ by country. Do the results differ depending on which definition of the working population is used? To evaluate the difference, we can look at the absolute difference in the size of the coefficients, at the number of coefficients that are significant in the first model but not in the second, and at coefficients that have different signs in each of the models. Regarding the sum of the absolute differences between the coefficients, the results are most similar for Austria (0.708) and least similar for Denmark (11.114, Luxembourg: 1.042, Norway: 1.499). In the Austrian case, three coefficients are weakly significant in one model while they are insignificant in the other. There are no such differences in the models for Luxembourg. In Norway, the highly significant age effects in the "earnings criterion" model are not significant in the "employment criterion" model. However, the sign of the coefficients is unchanged. In the Danish case, ten of the coefficients are significant in one model while they are insignificant in the other. Of these, three are highly significant. In addition, the gender effect and the single parent effect change their signs. The reversed effects, however, are not significant. While in the other three examples the predicted profile of poverty risks—at least when applying loose standards—is the same, this conclusion cannot be drawn on the basis of the Danish results.

<Figure 3>

Looking at Figure 3, which contains the results of this exercise for all countries and years, it becomes clear that such large differences between the two models are more the exception than the rule. The figure contains the sum of the absolute differences discussed in the case of the four examples. The left panel shows the results for the register countries; the right panel the results for the survey countries. On average the differences are larger in the register countries, but the overall mean is strongly driven by the Danish results. Apart from the four observations from Denmark, only one other observation contains differences well above the mean (Slove-

nia 2005). But also the median of the register country results is higher than the mean in the survey countries. The results for the survey countries are less clear-cut. As in some of the previous analyses, the results for the UK stand out but there are many other countries with values above the average that have not been observed as outliers in the analyses in earlier sections. However, in interpreting these results, one has to keep in mind that the level of deviations in general is quite low. A sum of differences of 2 over 12 coefficients means that the average difference per coefficient is 0.17. Hence, in the large majority of cases, both approaches come to similar results. This means that despite the problems of overlap in the register countries and some other countries (proxy interviews) described above, in most cases the general structure of poverty risk is not altered by the different data collection approaches.

7. Conclusion

The starting point of this article was the fact that substantial results—such as indicators used in social reporting or social policy research—may differ due to differences in data collection approaches across countries. Also the EU Statistics on Income and Living Conditions (EU-SILC) are characterised by a variety of data collection approaches. One of the main differences is that some countries use only survey data while others combine register data with survey data. Furthermore, the use of proxy interviews differs widely. It is safe to assume that this variation results in substantial differences.

The main question of the article was how the relationship among employment, earnings, and poverty changes when different data collection approaches are used. The analyses show that the degree of overlap of earnings and employment information is on average lower in register countries (and in UK proxy data). In some of these countries, this also has an impact on poverty rates by activity status and—as a consequence—on the difference in the poverty risk of

the non-working and working population. The analyses provide evidence that the question of the extent to which working lowers the poverty risk depends on the data collection approach used. For a relevant minority of countries, we would draw different substantive conclusions regarding the impact of work on the reduction of the poverty risk with the different data collection methods. Depending on the relevance of such cases for a given research question, the impact on broader conclusions could be profound.

Some additional issues are worth mentioning. For technical reasons I have used a dividing line between the working and the non-working population that is slightly different from the standard approach. Using a more common dividing line between the working and the non-working population would have resulted in slightly less pronounced results in terms of differences between the different data collection approaches, but without changing the general result of the analyses. Furthermore, the analyses look at only one potential research question: namely, the impact of working on the poverty risk. It is likely that the data collection approach also has an impact on other—but probably not all—areas of research. In addition, it should be kept in mind that the differing use of individual survey, proxy, and register data is only one aspect of data collection. There are more variations in country-specific approaches (e.g., interview mode, collection of income information) that are not addressed in this article. More research is needed to evaluate the impact of the variety of data collection approaches in EU-SILC on different substantial research questions. In order to be able to draw sound conclusions from comparative analyses, it is essential to raise the awareness that some results are most likely driven by the different data collection approaches used.

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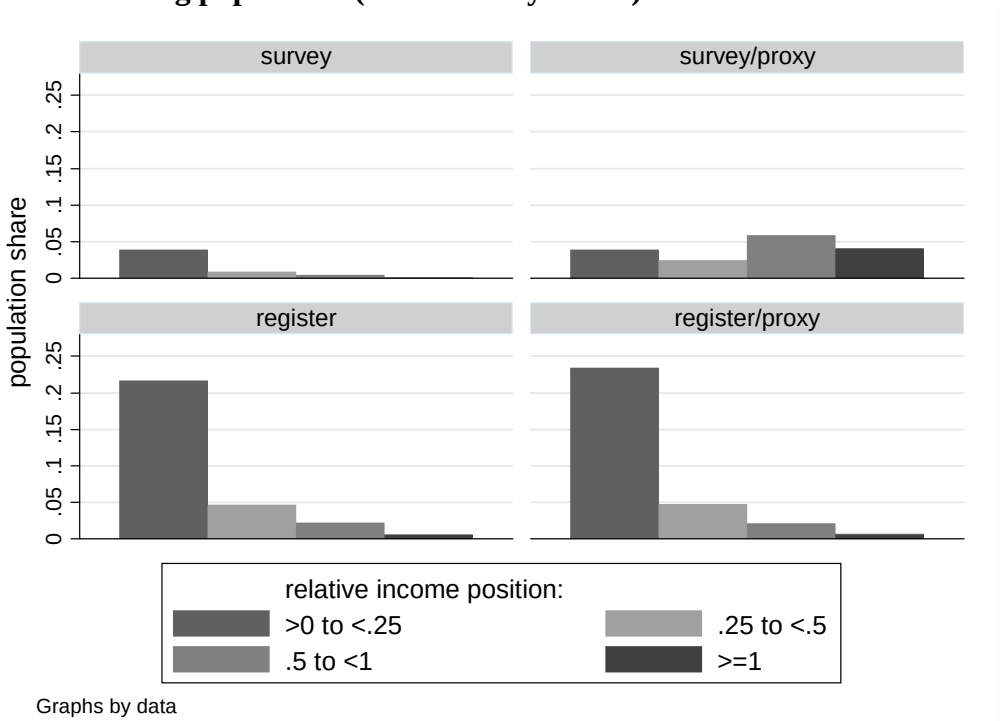
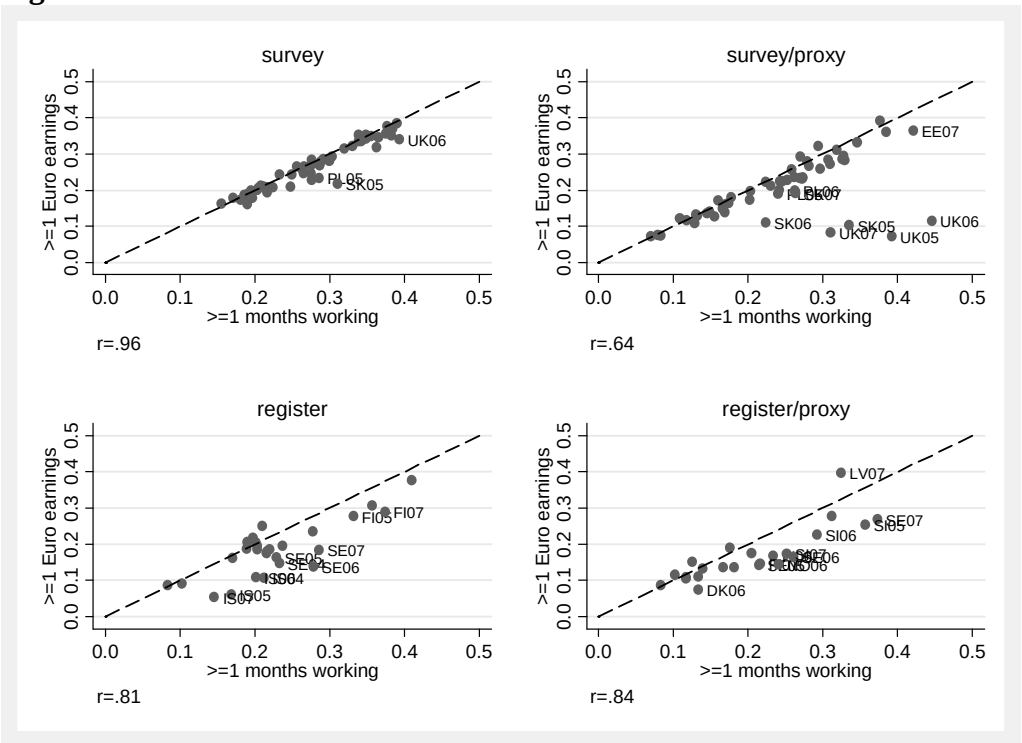
Figure 1: Distribution of employee cash or near cash income: Relative income position of non-working population (main activity status)



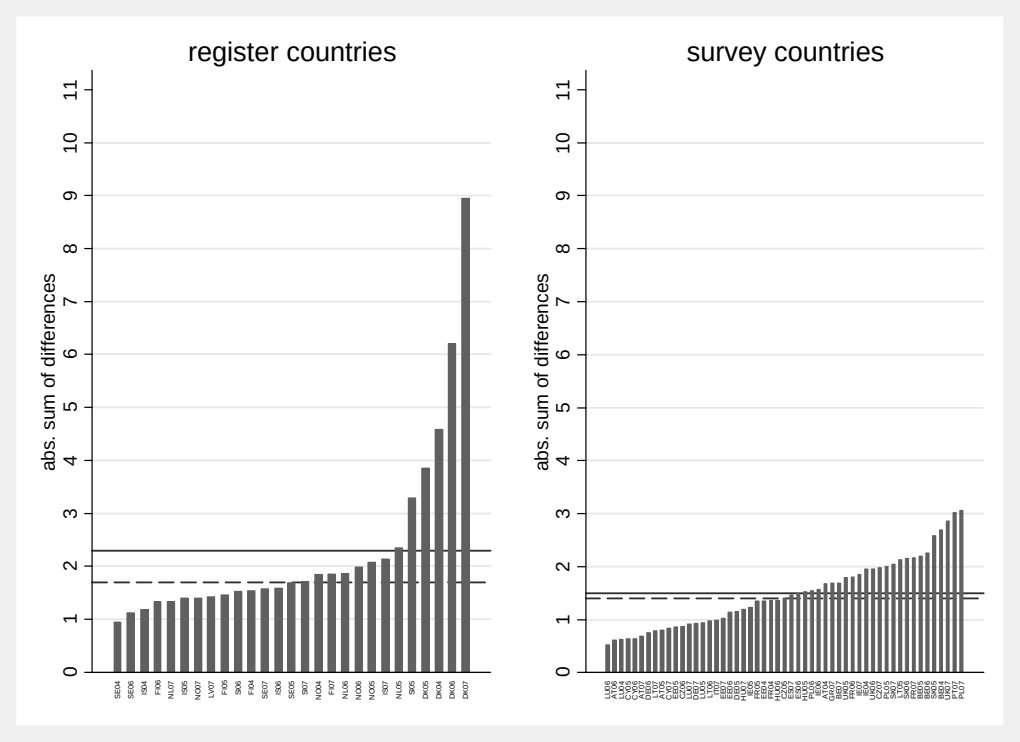
Source: EU-SILC 2004-2007 (unweighted), persons with earnings from self-employment excluded.
Note: The shares do not add up to 1 because the non-working population without any employee cash or near cash income is not displayed (relative income position=0).

Figure 2: Absolute difference between at-risk-of-poverty rates of non-working/working population by country, data collection approach, year, and different criteria of "working"



Source: EU-SILC 2004-2007 (unweighted), data aggregated by country, year and data collection approach (see text for additional information), persons with earnings from self-employment excluded.

Figure 3: Absolute difference between logit coefficients based on different criteria of working



Source: EU-SILC 2004-2007 (weighted), see also Table 4.
Notes: solid line=mean, dashed line=median.

Table 1: Share of non-working population (%) with employee cash or near cash income

	2004	2005	2006	2007
17-64 years				
survey	5.0	4.7	4.9	6.1
survey/proxy	9.9	15.4	11.4	10.9
register	41.5	37.0	36.0	36.0
register/proxy	49.7	44.6	43.9	47.0
25-54 years				
survey	4.1	5.1	4.8	6.2
survey/proxy	5.2	23.1	15.1	14.6
register	39.3	27.7	29.1	26.5
register/proxy	35.8	28.4	28.0	33.6

Source: EU-SILC 2004-2007 (unweighted), persons with earnings from self-employment excluded.

Table 2: At-risk-of-poverty rates and differences between rates by country, activity status and different criteria of "working"

	not working				working				difference "not working-working"				absolute diff. in diff.		
	not employed		no earnings		employed		earnings		(2)-(6)		(4)-(8)		(9)-(11)	(10)-(12)	Data collection
	rank	%	rank	%	rank	%	rank	%	rank	%	rank	%	ranks	%	(Survey, Register)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
GR	8	27.9	6	28.0	21	9.1	23	9.2	5	18.8	5	18.8	0	0.0	S
LT	25	43.9	23	43.2	20	9.1	20	8.4	25	34.8	24	34.9	1	0.0	S
DE	20	34.8	18	35.5	13	6.9	18	7.7	19	27.9	16	27.8	3	0.1	S
FR	17	33.8	15	34.0	12	6.3	13	6.6	16	27.6	15	27.4	1	0.2	S
CY	3	24.1	3	23.9	17	7.5	16	7.5	3	16.6	3	16.4	0	0.3	S
LUX	5	25.5	5	25.1	24	10.0	24	10.0	2	15.5	2	15.1	0	0.3	S
IT	21	35.2	19	36.4	22	9.2	25	10.1	14	25.9	13	26.3	1	0.4	S
CZ	10	29.3	7	28.9	3	4.1	3	4.1	13	25.3	10	24.9	3	0.4	S
IRL	16	33.5	14	33.9	7	5.1	6	5.0	20	28.3	18	28.9	2	0.6	S
BE	23	37.1	21	37.5	4	4.2	2	3.9	23	33.0	21	33.6	2	0.6	S
SK	15	33.2	11	32.3	9	5.5	9	5.3	17	27.7	14	27.0	3	0.7	S
HU	11	29.4	9	30.5	16	7.4	17	7.6	10	22.0	7	22.8	3	0.8	S
LV	26	44.7	26	46.6	25	10.7	26	11.8	24	33.9	22	34.8	2	0.8	R
EE	24	43.9	24	44.5	19	8.6	19	8.1	26	35.3	25	36.5	1	1.2	S
NO	4	24.8	4	24.6	6	4.8	12	6.0	6	19.9	4	18.6	2	1.3	R
PT	22	35.9	20	36.5	18	8.1	15	7.1	18	27.8	19	29.4	-1	1.6	S
AU	7	27.5	8	29.2	11	6.2	11	6.0	9	21.3	8	23.2	1	1.8	S
NL	2	20.8	2	23.2	2	3.7	1	3.6	4	17.1	6	19.6	-2	2.5	R
ES	13	32.3	16	34.2	23	9.5	21	8.6	11	22.8	11	25.6	0	2.9	S
PL	12	32.3	13	33.8	26	11.2	22	9.2	8	21.1	9	24.6	-1	3.5	S
SI	9	28.2	12	32.6	5	4.2	4	4.4	12	24.0	17	28.2	-5	4.1	R
DK	14	33.2	10	31.5	1	2.4	8	5.2	22	30.8	12	26.3	10	4.5	R
FIN	19	34.4	22	39.9	8	5.2	7	5.0	21	29.2	23	34.9	-2	5.7	R
IS	1	13.1	1	19.5	15	7.2	14	6.9	1	5.9	1	12.6	0	6.7	R
SW	6	26.1	17	34.8	10	5.7	5	4.9	7	20.4	20	29.8	-13	9.4	R
UK	18	34.2	25	45.1	14	7.1	10	5.4	15	27.1	26	39.7	-11	12.7	S
corr:		0.785				0.791				0.698					

Source: EU-SILC 2007 (weighted), persons with earnings from self-employment excluded.
Notes: Activity status=working vs. not working, Criteria of "working"=earnings vs. employment. Columns numbered from (1) to (14).

Table 3: Linear regression—Absolute difference between at-risk-of-poverty rates of non-working/working population

	M1	M2	M3	M4
data collection (ref.: survey):				
survey/proxy	0.028 +	0.028 +	0.005	-0.005
	0.014	*0.015*	*0.017*	*0.013*
register	0.034 *	0.035 *	0.028 +	0.032 *
	0.014	*0.014*	*0.015*	*0.014*
register/proxy	0.034 **	0.035 **	0.021	0.027 *
	0.010	*0.010*	*0.012*	*0.011*
year (ref.: 2007):				
2004		-0.009	-0.01	-0.006
		0.005	*0.007*	*0.006*
2005		0.011	0.01	0.009
		0.008	*0.008*	*0.008*
2006		0.008	0.008	0.005
		0.006	*0.005*	*0.004*
% women			-0.081	-0.068
			0.062	*0.058*
% unpaid family workers			-0.937	-0.33
			0.791	*0.477*
% part-time workers			-0.071	-0.081
			0.053	*0.049*
% non full-year workers			0.054	0.174 +
			0.148	*0.098*
intercept	0.015 ***	0.011 ***	0.065 +	0.042
	0.003	0.003	0.037	0.029
R^2	0.090	0.108	0.152	0.297
N	156	156	156	150

Source: EU-SILC 2004-2007 (unweighted), data aggregated by country, year and data collection approach (see text for additional information), persons with earnings from self-employment excluded.
Notes: M4: United Kingdom excluded. Significance levels: ***) <0.001, **) <0.01, *) <0.05, +) <0.1. Robust standard errors in italics (clustering at country level).

Table 4: Logit regressions—Probability of risk of in-work poverty by country and different criteria of working

	Austria		Luxembourg		Norway		Denmark	
	earnings	employ.	earnings	employ.	earnings	employ.	earnings	employ.
gender (ref.: male):								
female	-0.116	-0.068	-0.176	-0.225	0.273	0.182	0.256	-0.742 **
age:								
in years	-0.185 *	-0.149	-0.053	-0.081	-0.380 ***	-0.148	-0.672 ***	-0.270
in sq. years	0.002 *	0.002	0.000	0.001	0.004 ***	0.001	0.007 **	0.003
migrant (ref.: no)								
yes	0.834 ***	0.745 ***	1.546 ***	1.283 ***	0.770 **	0.917 ***	0.762	0.795 *
education (ref.: ISECD 0-2):								
ISCED 3	-0.624 ***	-0.576 ***	-0.998 ***	-0.980 ***	-0.576 **	-0.384	-0.343	-0.389
ISCED 4-5	-1.177 ***	-1.225 ***	-2.724 ***	-2.424 ***	-0.573 **	-0.724 ***	-0.281	-0.768 *
hh type (ref.: single):								
couple	-0.881 ***	-0.810 ***	-1.627 ***	-1.516 ***	-1.459 ***	-1.484 ***	-2.743 ***	-1.050 *
couple 1 child	-0.593 *	-0.563 *	-1.244 ***	-1.221 ***	-2.252 ***	-2.031 ***	-2.316 ***	-0.987
couple 2 children	-0.226	-0.205	-0.477	-0.466	-1.239 ***	-1.008 ***	-1.945 ***	-0.549
couple 3+ children	0.399	0.578 **	-0.016	0.097	-0.779 **	-0.709 **	0.084	1.115 **
single parent	1.115 ***	0.988 ***	1.642 ***	1.636 ***	0.958 ***	1.009 ***	-0.265	1.275 *
others	-1.184 ***	-1.194 ***	-1.414 ***	-1.295 ***	-0.881 **	-0.795 *	-3.178 **	-1.022
intercept	1.892	1.225	-0.175	0.454	6.351 ***	1.501	12.321 ***	3.036
Pseudo-R2	0.082	0.077	0.242	0.211	0.163	0.121	0.245	0.100
N	5197	5755	3749	3936	5387	5346	5344	5337

Source: EU-SILC 2007 (weighted), persons with earnings from self-employment excluded.
Notes: Criteria of "working"= earnings vs. employment. Significance levels: ***) <0.001, **) <0.01, *) <0.05, +) <0.1.

Table A1: At-risk-of-poverty rates by country, age and activity status

	total population	25-54 years		
		all	not working	working
			employed <7 months	employed>=7 months
Greece	20.2	17.7	28.0	7.7
Lithuania	19.1	14.7	43.2	7.4
Germany	14.8	12.8	34.3	5.9
France	13.0	10.6	30.1	5.5
Cyprus	15.5	9.7	24.1	6.7
Luxembourg	13.5	12.8	25.3	9.4
Italy	19.5	16.7	35.2	8.2
Czech Republic	9.5	8.7	28.3	3.0
Ireland	17.5	11.6	31.1	4.2
Belgium	15.0	11.2	34.9	3.3
Slovak Republic	10.5	9.5	31.9	4.9
Hungary	12.3	11.9	29.1	5.8
Latvia	20.9	16.1	42.9	9.7
Estonia	19.2	14.5	40.0	7.7
Norway	12.1	8.1	25.4	4.0
Portugal	18.1	14.2	35.3	6.9
Austria	12.0	10.0	25.6	5.6
Netherlands	9.8	7.4	20.4	2.8
Spain	19.5	15.6	31.0	8.2
Poland	17.2	17.6	31.7	9.6
Slovenia	10.9	9.0	27.0	3.5
Denmark	11.2	8.2	33.3	1.2
Finland	13.0	9.3	30.2	3.4
Iceland	9.9	8.3	18.5	6.2
Sweden	10.6	8.3	24.5	5.0
United Kingdom	19.0	13.2	33.0	6.6

Source: EU-SILC 2007 (weighted), persons with earnings from self-employment excluded from analysis by activity status.

[i] Versions of the cross-sectional User Data Bases: 2004-3, 2005-4, 2006-2, 2007-1 (all issued on March 1, 2009).
[ii] Additional details on data collection obtained in personal communication with Statistical Office of the Republic of Slovenia and the Central Statistical Bureau of Latvia. For Ireland, see also Central Statistics Office (2009: 10).
[iii] As a sensitivity check I dropped Latvia and Ireland, which does not alter the results in a substantial manner.
[iv] There is also variation in the interview mode using four different approaches: computer-assisted telephone interview (CATI), computer-assisted personal interview (CAPI), paper-and-pencil interview (PAPI) and in the case of Germany, self-administered questionnaires via mail (see Eurostat 2008: 18ff). It is not unlikely that substantial results also differ by mode and not only by the basic approach (survey/register). However, without an experimental design it is not possible to investigate this question in the specific case of EU-SILC.
[v] The computation of the poverty threshold requires the use of weights for all current household members. To be consistent in the use of weights, I also use these weights in the analyses of the subpopulation of 25- to 54-year-olds. An alternative choice would be the use of the weights for all current household members aged 16 and over. However, in almost all countries there is a perfect or almost perfect correlation between the two types of weights (exception: Germany, see Frick/Krell 2010: 21ff). Thus, no or only minimal differences in the results can be expected.
[vi] Refer to Table A1 in the appendix, which contains poverty rates for the total population. These are (rounded) the same as the rates provided by the EU in various reports and databases (see, e.g., European Commission 2009). In all countries but Poland, the poverty rate of the population of core working age (25 to 54 years) is lower than the national average.
[vii] OLS regression using panel data faces two problems. First, standard errors are downwardly biased because the assumption of the independence of observations is violated. Second, if constant unobserved factors are correlated with any of the independent variables, the point estimates are biased. To cope with the first problem, robust standard errors are calculated that correct for the nested data structure. In addition, I estimate models that explicitly take autocorrelation into account (random effects models with AR(1) disturbance and OLS models with a lagged dependent variable). The substantive results do not change (not reported). In the AR(1) models the coefficients of the data collection variables are slightly larger than in the OLS models. In the lagged dependent variable models, the respective coefficients are slightly smaller but still significantly positive. The autocorrelation coefficient *rho* is small (0.085). However, also these models will yield—like OLS—biased point estimates if constant unobservables are correlated with any of the independent variables. Fixed effects models are robust against the violation of this assumption. Fixed effects use only variation within units over time. Unfortunately, the data collection approach in EU-SILC did not change over time. Therefore, the fixed effects approach is not feasible for the question to be answered. To minimize the likelihood that unobserved factors correlate with the independent variables, control variables are included. I interpret the robustness of the estimates as an indication that the estimates are not strongly biased. This is of course not a formal test that all relevant factors are observed. But without variation over time in the data collection approach or an experimental setting, this problem cannot be solved.
[viii] The same analysis could be done for the non-working population. However, in particular in countries with high employment rates, the sample sizes are fairly small and the results are less robust than those based on working population samples.