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E. Data quality: Quality issues on measurement of variables, issues and opportunities for standardisation between surveys or Internationally

E1 – Quality issues regarding the number of hours actually worked in the German LFS

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Quality issues regarding the number of hours actually worked in the German LFS¹ (topic B 1)

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Preliminary draft, ask for permission before quoting

1. Introduction

Measures on working time rank among the most prominent variables of the Labour Force Survey. The two main working time concepts covered by the LFS – the hours actually worked and the hours usually worked – are widely used for statistical purposes and in public debate. For example, the working time estimation in the National Accounts, in many countries (but except, e.g., for Germany and France), is based on LFS estimates. The wide use of LFS data on working time might be surprising, given that the concepts are complex and difficult to operationalise. One explanation is that there are few alternatives, which have drawbacks either. For example, administrative data and business surveys are often deviating from the concepts agreed internationally and only partially cover the target population (e.g. due to cut-off thresholds that exclude workers in small enterprises from the data).

The difficulties in the measurement of working time regularly become visible in results that appear implausible compared to other sources or legal working time provisions. Sometimes such (apparent or real) inconsistencies lead to debate, for instance when data are compared internationally. The results for France and Germany are a recent case in point. In the press coverage of a study based on Eurostat tabulations, it was remarked that the hours actually worked were much lower in France compared to Germany. In the following, a lively debate ensued particularly on the French side of the border (engaged in the campaign for the presidential elections) doubting the reliability of the LFS figures. The French journal *Libération* incredulously scrutinised whether the French really worked six weeks less per year compared to the Germans.²

Table 1: Number of annual hours actually worked per person in France and Germany

		Germany	France
Employed persons	LFS (main job only)	1685	
	National Accounts	1408	1439
Employees	LFS (main job only)	1631	1548
	National Accounts	1323	1363
Full-time employees	LFS (main job only)	1903	1679
	National Accounts	1654	
Part-time employees	LFS (main job only)	874	978
	National Accounts	640	

Although the criticism of the figures was only partly justified (as the figures were not always properly used and the concepts misunderstood), it was clear that the LFS figures on working time were not plausible to journalists. The criticism was aggravated even further due to the fact the working time estimates of the National Accounts did not show the same differences then those of the LFS. In both countries, the number of hours actually worked was significantly higher

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² “Les Français travaillent-ils vraiment six semaines de moins, chaque année, que les Allemands?” (*Libération*, 13 January 2012) see also the German online journal *Spiegel Online*, 16 January 2012.

according to the LFS (+23% in Germany and +14% in France). This immediately led to questions as to potential biases in the measurement in both sources.

The data got even more confusing when comparing the working hours between the two countries: German employees are working 47 hours longer (or 3%) annually according to the LFS, while French employees are working 40 hours longer (equally 3%) according to the National Accounts. These figures clearly raise questions regarding the reliability of either source.

Besides the specificities of the measurement process, it should be noted that, first, some conceptual issues need to be taken into account:

- The results of National Accounts comprise full-time and part-time workers. Thus differences regarding the hours worked can in part be due to differences in the part-time rate in each country. This information is also important to understand the deviations between the LFS and the NA in Germany: In the National Accounts, the share of persons with small part-time employment is much higher compared to the LFS (see Körner/Puch 2011), which translates into smaller average working time in NA estimates.
- The working time of employees and self-employed persons in many countries differs a lot (the self-employed usually indicating much longer working hours). The share of self-employed persons thus will also have a considerable impact upon the overall average.
- While the LFS results usually refer to the main job only, the NA include working hours spent in secondary jobs in their calculation.
- Sometimes, e.g. in Eurostat publications, the average hours actually worked are calculated without taking into account employed persons who worked zero hours in the reference week. In contrast, the National Accounts normally take into account all employed persons. If one does not take into account employed persons with zero working hours in the reference week, annual hours worked for all employees are again higher in France (1941 hours compared to 1851 in Germany). This indicates that there are obviously large differences regarding the number of employees that have been absent during the reference week.

In order to be able to focus on the measurement of working time in the LFS, in the following, we focus on results for full-time employees. Whenever appropriate, this group will be subdivided into those who have been working in the reference week and those who have not been working in the reference week.

The structure of this paper is as follows: Following this introduction, the second chapter will briefly discuss the concept of hours actually worked and its operationalisation in the LFS. Against the background of the conceptual requirements, we will identify challenges of the measurement of the number of hours actually worked in the LFS (and other household surveys). In the third chapter we will try to show whether there is empirical evidence for an impact of these challenges upon the measurement of working time in the LFS. In this context, we will discuss the impact of questionnaire design, mode effects, proxy interviews, and effects due to the seasonality of working time.

2. Concept and operationalisation of hours actually worked

The operationalisation of the hours actually worked seems paradox: On the one hand, the concept (endorsed by the 18th International Conference of Labour Statisticians; ILO 2008) is highly complex. It includes no less than 10 working time components to be included and four components to be excluded for determining the hours actually worked. On the other hand, the operationalisation in the questionnaire is very simple and reduced to one question in order to limit cost and burden (see Eurostat 2011b).

Still, according to the Explanatory Notes (Eurostat 2011a), there are quite a number of aspects to be taken into consideration when answering on the number of hours actually worked during the reference week. The components have to be included or excluded as shown in table 2.³

Table 2 Components to be considered for the measurement of hours actually worked (adapted from Eurostat 2011a)

Hours actually worked ...	
... include	... exclude
- activities directly engaged in the production of good or services	- travel time between home and the place of work
- ancillary activities (such as travel between places of work, personnel management)	- absences from work within the working period for personal reasons (e.g. paid leave, bank holidays, illness)
- short pauses	- the main meal breaks
- education and training necessary to carry out production or ancillary activities	- education and training not necessary to carry out production or ancillary activities
- Travel time on business trips	
- Overtime hours	
- Work at home	
- On-call time	

Looking at the number of issues to be taken into consideration, it is obvious that the measurement of hours actually worked is cognitively extremely demanding for the respondents. Even though there might be some parallels with the everyday life's perception of working time and the operationalisation (e.g., in the case of Germany, regarding the differential treatment of small pauses in lunch breaks),⁴ the respondent has to deal with a whole bunch of considerations to come up with an appropriate answer:

- The respondent, theoretically, has to recall the working time for each day of the reference week and to calculate the sum of all days. As this might be a complicated calculation or overburden the recall capacity of the respondents, it seems likely that the number of working hours will be rounded or given according to the usual or contractual hours of work.
- In case the respondent tries to answer the question as intended, he has to take in to considerations, in particular:
 - o to consider time not worked during usual working time, e.g. due to illness, bank holidays or paid leave.
 - o to consider time spent at work in addition to his or her normal working time, e.g. overtime and extra hours of work.

In the following chapter, we will try to shed light on the question, whether these issues lead to effects upon the measurement that could contribute to an understanding of the differences in the results outlined in chapter 1.

³ The reference of the Explanatory Notes (Eurostat 2011a), in the case of the working time variables, is still the former ICLS resolution dating from 1962. However, the basic problems remain the same (or are even aggravated) under the new resolution.

⁴ For other components, the situation is much less clear, e.g. the treatment of travel time on business trips that is handled differently by the enterprises even inside Germany.

3. Measurement issues

3.1 Impacts of the data collection mode

Before entering into the analysis of the challenges mentioned above, it is important to note that the data collection mode seems to have some impact upon the average number of hours actually worked. Such effects are well-known from earlier studies: In a randomised experiment, carried out in Germany in 2009, the data collection modes CAPI, CATI, CAWI and self-administered PAPI were compared. One of the results was that the number of working hours in the data collected via self-administered PAPI was significantly higher compared to the interviewer-administered modes (see Statistisches Bundesamt 2010: 37-38). Despite the fact that the modes are not randomly assigned in the German LFS, similar effects can also be found in the regular LFS data.

In 2009, the average number of hours actually worked of full-time workers was 35.7 for CAPI, but 37.5 for self-administered PAPI. In 2010, this difference was reduced from 1.8 hours to 0.6 hours (see table 3). It seems likely that this reduction in the difference is due a change in the question wording of the PAPI questionnaire, which was introduced in response to the results of the experiment: The question on hours actually worked in the reference week was supplemented by an instruction saying “Please take into account extra hours as well as reduced working hours due to paid leave, bank holidays, or sick leave”. It seems likely that the change in the results are affected by this change as the number of hours actually worked is reduced for the self-administered PAPI respondents despite an overall trend towards increased working hours in 2010.⁵

Table 3: Hours actually worked per week by data collection mode, 2009 and 2010 (full-time employees)

	2009	2010
Total	36.1	36.6
CAPI	35.7	36.5
Self-administered PAPI	37.5	37.1
Passive telephone interview	36.5	36.6
Difference self-administered PAPI-CAPI	1.8	0.6

Analyses of the randomised experiment suggested that the mode effects were not equally important for the different situations above. They seemed to be particularly important for bank holidays, so that also in this section a disaggregation by data collection mode could be useful.⁶

3.2 Effects due to the seasonality of hours actually worked

More than most other LFS variables, the hours actually worked are a variable with a very strong seasonal and calendar-specific variation. Bank holidays, the typical periods of paid leave, but also the winter season will directly translate into a reduction of hours worked. For this reason, an unequal distribution of the sampling units over the calendar weeks can lead to biased results. For example, smaller sample sizes in typical holiday weeks could contribute to an overestimation

⁵ The increase of the number of hours actually worked is +2.5% according to the National Accounts, but only +1.4% according to the LFS (but +2.2% for the respondents interviewed via CAPI). Thus, part of the slower increase of working time might be explained with the effect of this wording change of the PAPI questionnaire. The interpretation is also backed up by the results of a cognitive laboratory test comparing the old and the new question (Banz/Schiel/Schröder 2009: 23-25)

⁶ The mechanism underlying the mode effect is not fully clear. It also be caused by missing precision of the identification of the reference week to which the interview refers (the reference week is coded according to the entry in the state statistical office, while an experiment has shown that they de facto often refer to earlier weeks.

of the annual averages of hours actually worked (if not corrected for by the weighting scheme). As frequently noted (see, e.g., Körner/Puch 2011), the German LFS is characterised by a large variation of the monthly sample sizes, which is even stronger when focussing on calendar weeks. In 2010, the number of persons interviewed per reference week varied between 7,700 and 17,800. Due to a selection bias, particularly few persons are interviewed in the last weeks of most quarters. Nevertheless, no significant correlation can be observed between the weekly sample size and the average number of hours actually worked observed for each week. Effects of the variation of the weekly sample size upon the number of hours actually worked can therefore be considered negligible (a rough estimation shows an effect of below 0.1 hours).

Besides the weekly sample sizes, there is another element of the German system of allocating the households to the reference weeks that might have an effect. The German LFS currently applies the concept of sliding reference weeks, i.e. the reference week is by definition the week before the interview. Thus if a household cannot be reached at the beginning of the respective fieldwork period (e.g. due to holidays), the interview will be postponed until the interviewer succeeds in establishing a contact with the household. One might speculate that it is relatively less likely that an interview takes place in the first week following an absence. This could contribute to an underestimation of the number of employed persons who have been absent from their job during the reference week. Unfortunately, on the basis of the data available, there is no possibility to get empirical evidence on the size of such effects. However, compared to the French data, it is obvious that the share of employed persons that were absent from their job in the reference week was clearly smaller in Germany (9.6% compared to 15% in France). Still, this difference might also be due to other effects, e.g. the impact of a (hard) plausibility check correcting the response of employed persons indicating zero hours actually worked in the reference week if WSTATOR is coded "2".

Another side effect of the concept of the sliding reference week is that the reference week is quite unspecifically referred to as "the last week" in the questionnaire. Hence, in all questions referring to the reference week, no concrete date is mentioned (e.g. "in the week from Monday, ..., to Sunday, ..."). This could lead to a higher proportion of respondents answering the hours usually worked instead of the hours actually worked.

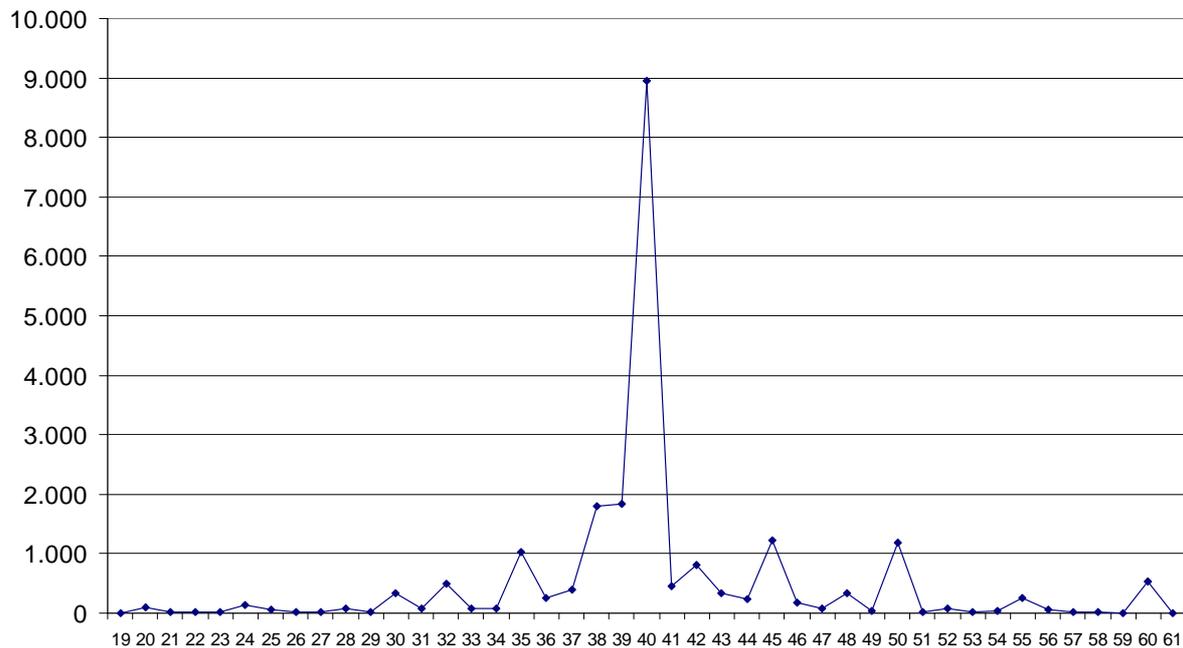
3.3 Biases due to rounding effects

Given the cognitive complexity of the task, it seems unlikely that respondents will calculate on a day-by-day basis the number of hours they actually worked in the reference week to respond to the question. They would rather choose a pragmatic approach and make a rough assessment whether they worked more or less hours than usual. In doing so, one might suspect that "round" numbers will be preferred when the answer is reported. The distribution of the number of hours actually worked in the year 2010 indicates that numbers divisible by 10 or 5 are the most popular choice of the respondents. In the distribution, there are conspicuous peaks for 30, 35, 40, 45, 50, 55, and 60 hours actually worked (see figure 1). This effect occurs in a uniform way across the data collection modes.

No less than 40 percent of the full-time employees indicated that they worked exactly 40 hours during the reference week. Given the information available from other data sources (like the data base on collective bargaining agreements) such a concentration does not seem very plausible. However, it is not easy to tell whether rounding will create a significant bias when focusing on the average hours actually worked. Given the fact that the vast majority of working hours laid down in collective bargaining agreements is lower than 40 hours (except for agriculture and construction where it equals 40 hours; see WSI 2012), there might be a tendency towards an overestimation of hours actually worked. Similarly, some collective bargaining agreements stipulate weekly a working time like 37.5 or 38.5 hours. In such cases, the respondents would probably frequently round up the value to the next whole number (as instructed in the questionnaire) or right away round it up to 40 hours, which than always leads to overestimating the number of hours actually worked. At the same time, one can also imagine persons who worked 41 hours and who bring

down the answer to 40 hours. However, in the German context, the latter case seems to be less likely.

Figure 1: Distribution of hours actually worked (full-time employees; in 1000 persons; 2010)



Another form of rounding would be to reproduce the number of hours usually worked (perhaps with slight adjustments). In 2010, for 70% of the full-time employees working in the reference week there was no difference between the usual and the actual working hours. Given the result that nearly 60% of the employees do have practically no flexibility regarding their working time, this result might at first sight not seem excessively high. However, considering that also persons with inflexible working time arrangements sometimes go on holidays, fall ill or are not at work during bank holidays, an orientation according to the hours usually worked seems likely. Whether this will contribute to an overestimation of the hours actually is difficult to prove.⁷

3.4 Proxy effects

One can easily guess that the answers received in proxy interviews might deviate from those given by the respondents personally: Other household members are often not as familiar with the working hours as the target person him or herself (Porst/Prüfer 2011). For example the share of persons answering 40 hours to the question on the hours actually worked is higher for proxy answers, which indicates (plausible) rounding effects. This is in line with the result that, in proxy interviews the hours actually worked are more often equal to the hours usually worked (direct interviews: 68%; proxy interviews: 79%).

One can also observe a slightly higher average number of actual working hours in proxy interviews (37.6 hours compared to 36.2 hours for direct interviews referring to full-time employees). This is mainly due to a lower share of absences during the reference week observed for proxy answers (7% compared to 10% for direct interviews). Absences for the entire reference week are apparently reported much more often in direct interviews compared to proxy interviews.

⁷ The experimental study Q-MED/LFS found signs of mode effects in this respect: In self-administered PAPI, respondents rather indicated hours actually worked that were deviating from the hours usually worked compared to CAPI. At the same time CAPI respondents with different hours actually worked more frequently stated that they worked less than usual, while self-administered PAPI respondents said more frequently that they worked more than usual. Similar effects can however not be found in the regular LFS data.

Table 4: Differences between hours usually and hours actually worked for proxy interviews and direct interviews (share of full-time employees not absent for the full reference week, 2010)

	Total	Actual working time equal to usual hours	Actual working time smaller than usual hours	Actual working time higher than usual hours
Total	100%	71%	11%	18%
Direct interview	100%	68%	12%	20%
Proxy interview	100%	79%	8%	12%
No answer	100%	73%	11%	16%

3.5 Absences due to paid leave

For a correct measurement of the hours actually worked it is essential that absences due to paid leave are taken into consideration as completely as possible. Qualitative pretests have suggested (Porst/Prüfer 2011, Banz/Schiel/Schröder 2009) that the deduction of absences due to paid leave by the respondents is a challenging task. At the same time, for the number of days of paid leave, other reliable data sources are available to verify the results obtained by the LFS. According to the Structure of Earnings Survey (SES) 2006, each full-time employee is entitled to 28 days of paid leave per year. The National Accounts' estimation here also takes into account other types of leave and arrives at an estimation of 30.7 days of annual leave actually used by the employees.

From the LFS, one can roughly estimate the number of days of paid leave used by each employee with information on the share of employees who did not work in the reference week for the reason of vacation plus part of the share of employees who worked less than usual in the reference week due to paid leave. As shown in table 4, according to the LFS, each full time employee is absent due to paid leave for 3.2 weeks. With a usual working week of five work days, this would be the equivalent of 16 days of paid leave, which is only little more than half of the estimations carried out for the National Accounts' estimation.

Table 5: Estimation of holiday weeks used in 2010 per full-time employee

	Full-time employees	Full-time employees with no work in reference week due to paid leave	Full-time employees with less working hours than usual in the reference week due to paid leave
Persons (in 1000)	24,974	1,243	512
Average hours actually worked	36.6	0	20.1
Estimated sum of holiday weeks (in 1000) per year⁸	79,239	64,615	14,624
Estimated weeks of absence due to paid leave per full-time employee	3.2	2.6	0.6

Although the estimation of the sum of holiday weeks is very rough, one can easily see that obviously absence due to vacation is not recorded appropriately in the LFS. The mechanisms

⁸ The yearly sum of holiday weeks was estimated by multiplying the average number of employees absent per week by 52 weeks (1,243*52=64,615). For the persons partially absent, the sum of weeks was weighted according to the average number of hours actually worked.

leading to this result are however difficult to determine. There are some indications that there are some proxy as well as mode effects, which can nevertheless only explain a small part of the difference: 4.7% percent of the full-time employees answering via CAPI were absent during the entire reference week for holidays compared to 5.7% for the self-administered PAPI interviews (reduced hours: 2.4% for CAPI, 1.3% for PAPI). Referring to the proxy answers, 3.9% were on holiday for the full reference week, compared to 5.3% of the direct interviews (reduced hours: 1.7% for proxy and 2.3% for direct interviews). While the effect of the data collection mode is not even in the same direction for those absent for the entire week and those absent for part of the reference week, it seems clear that fewer absences are recorded for those covered by proxy interviews. However, also these effects can only explain a small part of the differences compared to other data sources. Probably effects due to the sliding and reference week and the plausibility check correcting for contradictions between HWACTUAL and WSTATOR (see 3.2) have a larger impact in comparison.

3.6 Absences due to illness

A similar analysis can be carried out for the absences due to illness. According the volume of labour accounts of the Institute for Employment Research (IAB), the basis of the working time estimation of the National Accounts in Germany (which are in line with the data from the statutory health insurance), each full-time employee was on average on sick leave for 9.2 days in 2010.

Table 5: Estimation of sick leave of full-time employee (2010)

	Full-time employees	Full-time employees on sick leave for the full reference week	Full-time employees on sick leave for part of the reference week
Persons (in 1000)	24,974	575	206
Average hours actually worked	36.6	0	18.3
Estimated sum of weeks on sick leave (in 1000)	79,239	29,879	5,356
Estimated weeks of absence due to paid leave per full-time employee	1.4	1.2	0.2
Estimated days of absence due to paid leave per full-time employee	7	6	1

Compared to the absences due to vacation, the deviation from the estimation of the IAB is less important for the days of sick leave. However, it seems that the number of employed persons who indicated that they were absent for only part of the week is surprisingly small. This could indicate that particularly persons with short-term sick leave did not deduct the absence when reporting the number of the hours actually worked.

3.7 Absences due to bank holidays

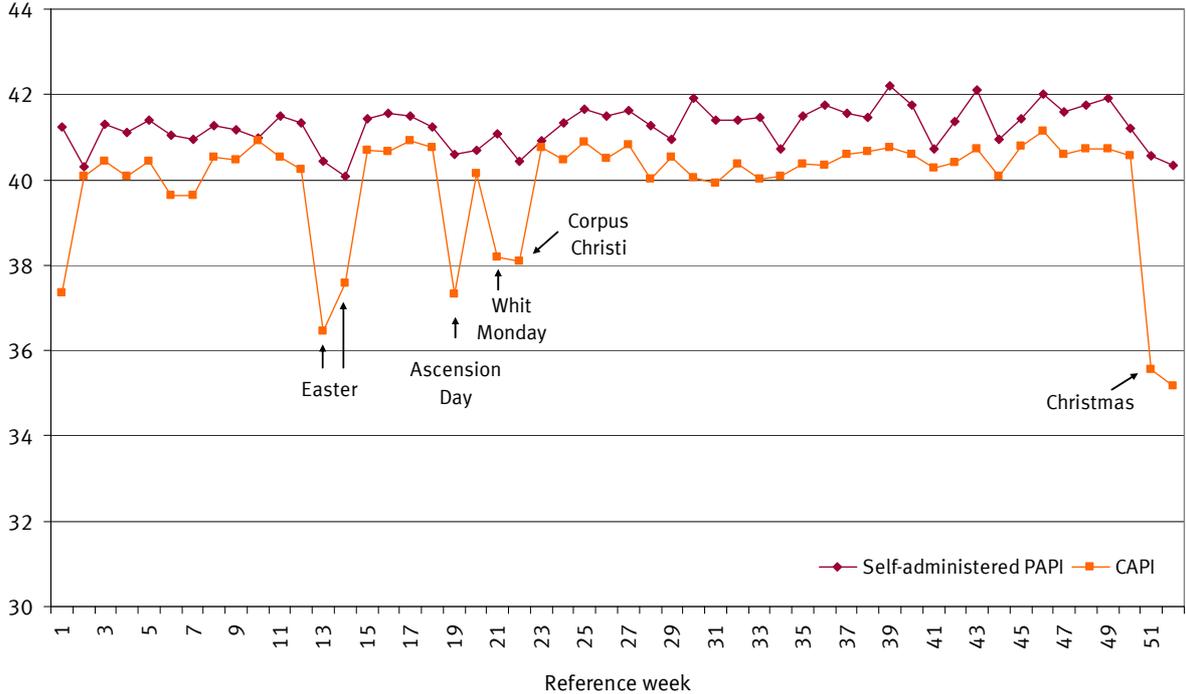
Also bank holidays need to be taken into consideration when reporting on the number of hours actually worked in the reference week. As the sample of the LFS is spread across all calendar weeks, the hours actually worked in weeks with bank holidays can easily be compared with other

weeks. In the year 2010, there were four national-wide bank holidays that did not at the same time coincide with the weekend: Good Friday, Easter Monday, Ascension Day, and Whit Monday.

In reference weeks that include a national bank holiday, the average hours actually worked in 2010 amounted to 38.3 hours (full-time employees not absent during the full reference week), compared to 40.7 hours for reference weeks without neither national nor regional or de facto bank holidays (Christmas Eve, Carnival Monday, New Year’s Eve). Even assuming that a part of the employees is also working on bank holidays, the difference seems to be fairly small. According to the reasons for having worked less during the reference week, only around 17% of the full-time employees stated to have worked less than usual due to a bank holiday (and 8% for other reasons). Even if one adds those employees absent for the entire week the share of employees (at least partly) absent does still not exceed 30% in weeks with national bank holidays.

The average hours actually worked strongly differ by data collection mode: Full-time employees not absent for the entire reference week, who participate in the LFS via the self-administered PAPI questionnaire indicate to work on average 40.5 hours in weeks with nation-wide bank holidays (and 41.4 in weeks without any bank holiday), while CAPI respondents state to work only 36.7 hours (40.5 in weeks without bank holiday). As figure 2 shows, weeks with bank holidays hardly differ from other weeks for self-administered PAPI respondents, while some difference can be detected in CAPI mode.⁹ However, even for the CAPI cases, the share of full-time employees indicating reduced hours due to bank holidays attains only 23% (other reasons: 7%; absent during entire week: 10%).

Figure 2: Average hours actually worked of full-time employees not absent for the entire reference week, 2010



These results quite clearly show that a large part of the respondents does not consider days not worked due to bank holidays when reporting the answer on hours actually worked. The situation is precarious for the self-administered PAPI interviews, but also highly problematic for the data collected via CAPI. Nevertheless, the missing consideration of bank holidays, as such, has only limited influence upon the average hours actually work. Even under the (unrealistic) assumption that no employee answered not to work on bank holidays, the actual working hours would only

⁹ No similar differences can be observed between proxy answers and answer obtained in direct interviews.

reduce by 0.4 hours on an annual average. The bigger problem is that the problem to account for bank holidays indicates that other irregularities in the working time patterns are not taken into consideration either, which could have a much more significant impact upon the hours actually worked.

3.8 Consideration of overtime hours

Another potential explanation of the higher number of hours actually worked in the LFS compared to other sources could be that respondents tend to overestimate the number of extra and overtime hours. As a proper measurement of overtime hours has been introduced only very recently in the German LFS, in this field evidence is more difficult to find than for the deductions made to the working time. For an assessment of the measurement of the hours actually worked, the basic problem is that only a rough estimation is possible regarding the number of overtime hours worked. For such estimation we focus on the employed persons who worked over time in the reference week. In order to estimate the number of overtime hours worked, the sum of the hours worked in excess of the usual working time is calculated. The problem is that the hours usually worked already include regular overtime hours and are therefore higher than the contractual working hours (40.6 hours compared to a contractual working time which is probably well below 39 hours).¹⁰ In 2010, 1.7 million full-time employees worked overtime hours in the reference week. The sum of hours exceeding the usual working time was 15.5 million hours. Thus the number of overtime hours per non-marginal employee would roughly amount to 0.5, which is much below the estimation of the IAB (for the National Accounts) that arrives at about one hour. Despite the considerable uncertainties of this very rough estimation, it seems unlikely that an overestimation of the overtime hours in the LFS contributes as a major factor to the differences in the results on hours actually worked.

4. Conclusions

This paper has outlined only some of the obstacles of the measurement of the hours actually worked in the German LFS. As usual numerous sources of error interact, so that an exact quantification of errors is very difficult to obtain. However, taken all the results together, it is obvious that the average number of hours actually worked is largely overstated. This is both due to an underestimation of the number of persons absent from their job in the reference week and of the persons who had reduced working hours in the reference week. This result is evident for all reason of absence respectively reduced working hours under consideration in this paper (paid leave, sick leave, and bank holidays). Based on the absolute figures presented here, it is quite obvious that the underestimation of the number of employees absent in the reference week has the largest impact. Hence, improvement actions should first of all try focus upon this group.

The mechanisms behind the measurement problems are manifold and difficult to analyse in their interaction. At least the findings lead to some general conclusions: Improvement measures should not be restricted to questionnaire design. The question and explanations clearly need further testing and improvements, but other aspects need to be considered as well and might, at least in the case presented here, be of larger impact. Other points to be further studied include the effects due to plausibility checks, the data collection mode and proxy interviews. All these aspects have proven to have effects upon the measurement of working time. A further issue is that the concept of the sliding reference weeks, again, can be suspected to be highly problematic as it can lead to biased distributions of the interviews across the calendar weeks. A variable subject to strong seasonal variation will be highly vulnerable to such bias.

¹⁰ Data on contractual hours are difficult to obtain. According to the SES 2006, the number of hours paid for (including paid overtime) was 38.6 for full-time employees. According to the collective bargaining agreements (covering 63% of the employee), the contractual working hours were 37.7 hours in 2010 (WSI 2012).

It should be noted that similar studies should be carried for the estimation of the hours actually worked in the context of the National Accounts, as the fact that problems are made transparent in the LFS should not lead to the overhasty conclusion that other sources are not facing similar problems.

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