European Data Watch

This section will offer descriptions as well as discussions of data sources that may be of interest to social scientists engaged in empirical research or teaching courses that include empirical investigations performed by students. The purpose is to describe the information in the data source, to give examples of questions tackled with the data and to tell how to access the data for research and teaching. We will start with data from German speaking countries that allow international comparative research. While most of the data will be at the micro level (individuals, households, or firms), more aggregate data and meta data (for regions, industries, or nations) will be included, too. Suggestions for data sources to be described in future columns (or comments on past columns) should be send to: Joachim Wagner, University of Lueneburg, Institute of Economics, Campus 4.210, 21332 Lueneburg, Germany, or e-mailed to ⟨wagner@leuphana.de⟩.

The German Structure of Earnings Survey:
Methodology, Data Access and
Research Potential

By Hans-Peter Hafner and Rainer Lenz

1. Introduction

Linked employer employee datasets (LEED) enable labour market researchers to split observed effects into one fraction caused by the employer and one fraction dependent on the employee. Since the middle of the 1990s the number of analyses in this field has escalated. Abowd / Kramarz (1999) provide an overview on projects executed during the 1990s and on datasets from 17 countries that were available at that time.

LEED for Germany that are currently available to the science community are the Linked Employer Employee Data of the Institute for Employment Research (LIAB) and the Structure of Earnings Survey of the Federal Statistical Office and the statistical offices of the Länder (federal states). A description of the LIAB and selected studies conducted with it can be found in Alda /

Bender / Gartner (2005). Stephan (2001) describes the possibilities of access to the Lower Saxonian Salary and Wage Structure Survey and some selected topics of research conducted with this data set.

In this paper we present the structure of earnings survey (SES). In chapter 2 we describe the methodology and the variables contained in the survey. In chapter 3 we discuss the various ways of data access with main focus on the recently published scientific use file of the survey 2001. The anonymisation of LEEDs poses a specific challenge to the data producers, since balancing the two main objectives "minimisation of the information loss" and "minimisation of the re-identification risk" associated with the data turns out to be more difficult for data containing information on both employers and employees. In order to provide an insight into the analytical validity of the data we summarise in chapter 4 the results of some interesting analysis conducted with the SES so far. Finally, we give a short outlook on the new perspectives arising by the planned integration of the SES with other business surveys.

2. Survey Methodology and Variables

The SES has been conducted by the statistical offices of the Federation and the Länder since 1951. In the past, the survey was held at irregular intervals, with a long gap between 1978 and 1990, but it will be conducted every four years in the future. Based on an EC regulation of 1999, the survey is held in all EU countries, so that the data produced are comparable all over Europe. As most countries conducted the latest survey for 2002, the next one will be performed for 2006. The data entry forms were distributed in the beginning of 2007, the data preparation is expected to be completed in the second half of 2008.

Information on hours worked and earnings always refer to the reference month October. For the year 2001, the German data contain about 22,000 local units and more than 846,000 employees. The group of reporting units comprises local units of the industry and selected parts of the service sector. Besides retail and financial intermediation there is information on hotels and restaurants, transport, storage and communication, real estate, renting and business activities. The employees queried include apprentices, minimal employed (a specific form of part-time employed in Germany) and partially retired employees.

The SES is a two-stage sample survey. In the first sampling stage, a stratified random sample is drawn from the local units. Stratification is done by 17 regions (Länder, Berlin separately by west and east), 64 groups of economic activity and 7 employee size classes. At the second stage, the employees to be included from the selected local units are determined through the personal identification number shown on the staff lists. For that purpose, the statistical offices provide a starting number and a sampling interval. The distribution of the sample size over the Länder is done in a way ensuring that the results for

any region have a comparable standard error. This means that the sampling fraction for the small Länder is higher than for the large Länder. Representative information cannot be produced for regional breakdowns that are more detailed than the Länder level. Since the data file also contains the municipality identifier of the place of the local unit, it is possible to add information at the district level as for instance the types of settlement structure of the Federal Office for Building and Regional Planning or regional rates of unemployment.

There are separate questionnaires for data on the local unit and one each (or several for larger local units) for salaried employees and wage earners. For the local units or for the enterprise to which the local units belong the following information is available.

- the economic activity according to WZ93 (German classification derived from NACE Rev. 1)
- the influence of the public sector on the business management (no influence, limited influence of up to 50 percent, controlling influence of over 50 percent)
- the number of active persons of the enterprise
- the number of employees of the local unit, broken down by salaried employees and wage earners and by sex
- the code of collective agreements applicable to the local unit (which indicates if the local unit has a collective or enterprise agreement or applies individual agreements)
- Expansion factors: These factors are used to project the sample to the population of all local units and the employees, respectively. Regarding the local units, for each stratum the factors are calculated as the ratio of the number of local units in the population and the number of utilisable responses in the strata. Regarding the employees, the ratio of the number of employees of the local unit and the number of employees of the local unit are included in the survey.

Among the data covered for the employees are:

- agreed salary or wage group, if there is a collective or enterprise agreement
- Performance group: If payments are based on a collective / enterprise agreement, the various salary classes are allocated to the performance groups. If payments are based on individual agreement, the local unit must take a decision as to which performance group the employee belongs to, based on the actual job. For salaried employees, a breakdown by 6 groups is applied, for wage earners a breakdown by 4 groups
- socio-demographic variables like sex and month and year of birth
- data on job and qualification including the five-digit code from the social insurance confirmation document (the first three digits indicate the job per-

formed, while the fourth digit refers to the status in employment and the last
one to the qualification)

• information on working hours (collectively agreed weekly working hours,
  overtime)

• information on earnings: gross monthly and annual earnings, annual extra
  payments Shift differential for night, sundays and holiday

• holiday entitlement in days

Some additional variables are covered on the basis of a national law only for
the industry, wholesale and retail trade and financial intermediation. Those
include wage tax and social security contributions, net earnings as well as tax
class and number of allowances for children.

Further information on the methodology and variables of the 2001 SES is
contained in Frank-Bosch 2003 and in the metadata provided on the web site
of the research data centres of the statistical offices of the Federation and the
Länder, see http://dok.fdz-metadaten.de/6/62/621/621110/erheb/200100/.

3. Ways of Data Access

The micro data of the SES 2001 and SES 1995 are available at the re-
search data centres of the Federal Statistical Office and the statistical offices
of the Länder. There are various ways of data access; namely on-site (using
so called safe scientific workstations), remote data access and off-site (the
scientist can work at his own office) using the so called scientific use file for
2001 (described in more detail below) and the recently published campus file
for 2001 (data generated for teaching purposes). For some more detailed de-
scription of the different approaches to use German official data see Zühlke
et al. (2004).

Since the beginning of 2007, a scientific-use-file of the SES 2001 is avail-
able, which has been generated in a cooperation project conducted by the re-
search data centres of the Federal Statistical Office and the statistical offices
of the Länder. Scientists participated in an advisory capacity in the conception
of the anonymised dataset to ensure that the result will be of interest to a broad
circle of users.

At first, the key question was which regional units should be displayed. Two
alternatives with five and eight regions consisting of adjacent federal states
were tested. Depending on the model used, some 30 to 40 economic sectors
were displayed. Furthermore, the number of employees of a company was mi-
croaggregated if a company had at least a thousand employees or if it was
among the three largest companies of the economic sector in the region. Each
group for microaggregation consisted of at least three companies.

The key variables which the employer dataset had in common with commercial databases were the region, the economic sector, the number of employees of the enterprise and the influence of the public sector. The last-mentioned attribute can be compared with partner- agency, state, administration in the Markus database. The risk of reidentification can now be determined by means of matching experiments between the target file and the additional knowledge. The aim of the data intruder is to decide whether or not a pair of records belongs to the same employer. In a non-technical way, the concept of matching may be introduced as a way of bringing together pieces of information in pairs from two records taken from different data sources. For this purpose, a reasonable concept of similarity is necessary. Roughly spoken, the greatest possible similarity between two records turns into identity if the considered records correspond with regard to all key variables. In the case of small deviations of the key variables, two objects are felt to be strongly related, so that the matching result essentially depends on the concept of similarity. For technical details see Lenz (2006). It transpired that the risks for some economic sectors were too high when eight regions were displayed. Thus we opted for five regions and we lowered the threshold from which the number of employees was microaggregated to 500. It turned out that the attribute participation of the public sector was not critical with respect to reidentification; hence we could display the original value.

The risk of reidentification for the employees is negligible since there is no systematic additional knowledge. Furthermore a data intruder has no participation knowledge about a person. Thus the information about the employees is sufficiently anonymised when taken alone. However, it might be possible to draw conclusions from it about the enterprises so that the anonymisation made for the employer data can be reversed in parts by a data intruder.

We are going to explain a data intruder's possible strategy by taking as an example the strongly correlated variables "branch of economic activity" and "actual job". A technical discussion is contained in Hafner / Lenz (2006).

(1) For every aggregated group of economic activity contained in the anonymised file, the data intruder knows the individual branches of economic activity it consists of.

(2) For each of the individual economic branches, the data intruder can obtain the distribution of the actual jobs, e.g. from a publication of the statistical offices or by remote data access.

(3) For every local unit, the data intruder compares the distribution of the actual jobs in the survey with the distributions of the potentially possible economic branches and allocates the local unit to the economic branch for which the deviations are smallest.

If the data intruder is able to properly assign many local units by using that strategy, there is a high risk of reidentification for the local units of the eco-

nomic branches concerned. The consequence for the data provider in such a case is that, before data provision, he has to group some occupations with others s.t. an assignment to the corresponding economic branches is hindered.

The scientific use file of the SES shows about 60 occupational groups. For the individual groups of economic activity and occupational groups as well as further anonymisation methods applied to the data see Hafner / Lenz / Mischler (2007). The scientific use file (and also information on the requirements to the applying institution) can be requested at the research data centres of the statistical offices of the Federation and the Länder. Application forms are available at the web site: http://www.forschungsdatenzentren.de.

4. Analyses Using the German Structure of Earnings Survey

Most of the SES-based analyses performed so far can be allocated to the two focuses "sex-specific differences in earnings" and "level of earnings in relation to coverage by collective / enterprise agreement". They were performed, first, as part of a co-operation project of the university of Hanover, the Lower Saxonian Statistical Office and the Lower Saxon Ministry of Economics, Technology and Transport and, second, as part of a pilot project of the Federal Statistical Office on improving the informational infrastructure between the scientific community and official statistics. In addition, in 2004 a joint analysis was performed by the Statistical Office of Baden-Württemberg and the Institute for Applied Economic Research, Tübingen. First results of projects carried through within the scope of the research data centre of the statistical offices of the Länder are also available now.

4.1 Sex-specific Differences in Earnings

Using the Lower Saxon data of the 1990 SES, Stephan (1997) examines in how far the wage differential between men and women is due to the fact that, on the one hand, the sexes have different access to performance groups, local units and job fields and, on the other hand, the income decreases along with an increasing share of women in a local unit or in a performance group. She uses a decomposition model developed in Groshen (1991). That model first of all uses the least squares method to estimate an income function for which – in addition to a dummy variable for the sex – the women's shares in the performance group of the employee, in the local unit and in the job field are used as explanatory variables. The difference in the estimated average income between men and women is then decomposed into a part depending only on the sex, and three components depending on the share of women in the areas.

It turns out that income always decreases along with a rising share of women in the individual areas. As women more frequently than men choose work areas with high women's shares, this can explain the wage differential. Above one third of the wage differential is due to the women's share in the performance group, and about one fifth to the share in the working environment, while the share in the local unit (5 %) plays a minor role. The remaining share (above one third) cannot be explained by the model.

Von Kulmiz (2001) examines sex-specific wage differences, also using data of the 1990 SES, however for the entire former territory of the Federal Republic. She determines income functions by means of a stepwise regression performed separately for women and men. Explanatory variables used by her include age, age squared, length of affiliation in the enterprise (linear and squared), performance group, qualification, 33 occupational classes, 25 economic branches, working hours, marital status derived from the tax class, and interaction terms of, first, age and length of affiliation in the enterprise and, second, qualification and performance group. The difference in average estimated income between women and men is then decomposed into a share explained by qualification characteristics and a discrimination share, using the method according to Oaxaca and Blinder (Oaxaca, 1973; Blinder, 1973). For wage earners, 41 % of the difference can be explained after decomposition, just under 23 % of which by the performance group, 13 % by the economic branch, and 7 % by the qualification. For salaried employees, even 64 % can be explained by qualification of the employees or the local unit variables used. Here, also the largest part (over 35 %) is due to the performance group, while age and economic branch can explain 8 % each.

4.2 The Impact of Collective / Enterprise Agreements on Earnings Differences

Stephan / Gerlach (2005) use the 1990, 1995 and 2001 surveys for Lower Saxony to examine earnings differences in manufacturing and, more precisely, in enterprises paying according to collective agreements, enterprise agreements, and individual agreement. They use a multi-level model that includes for the employees the length of affiliation in the enterprise and the potential job experience calculated on the basis of qualification and age; what is covered at the enterprise level, in addition to the data on collective / enterprise agreements, is the share of women, the enterprise size, and the average school education. Analysed are the factors on which the basic wage (received by the average employee in the enterprise) depends. The basic wage is higher in enterprises applying a collective / enterprise agreement; in 1990, it was by 3 % to 4 % higher, in 2001 even by 11 % to 12 %. The difference is slightly larger for enterprises applying a collective agreement than for those with enterprise agreements. However, from 1990 to 2001, the differences caused by qualifica-

tion and length of affiliation in the enterprise decreased. According to the scientists, this is due to the fact that at times of general difficult economic situation, as was the case in 2001 compared with 1990, less is paid for additional qualifications. Other results are that the basic wage decreases along with an increasing share of women and that it increases along with a higher average level of education. The latter is probably connected with the fact that enterprises offering good wage are especially attractive to highly qualified people. The wage gap between women and men is by about 5 % smaller in enterprises with a collective / enterprise agreement; from 1990 to 2001 it decreased from 21 % to 17 % in enterprises basing their payments on individual agreements. In Gerlach / Stephan (2006), the authors examine the wage dispersion for wage earners for the same enterprise groups. As expected, it is largest for enterprises applying individual agreements because trade unions try to achieve a highly compact earnings structure when bargaining collective agreements. In companies applying collective / enterprise agreements, the average wage dispersion was 19 % in 1990 and 20 % in 1995 and 2001, while in those using individual agreements it was 22 % in 1990, 25 % in 1995 and 24 % in 2001. Decomposing the variance of wages into enterprise effects and into shares depending on individual characteristics of wage earners shows that the shares of enterprise effects have a stronger impact where collective agreements are used, while individual performance variables are most important where payment is based in individual agreements.

Bechtel / Heinbach / Strotmann (2006) examine the same issue, using the SES 2001 data for Baden-Württemberg, and obtain similar results. Heinbach (2005) further distinguishes collective agreements by whether they include opening clauses, allowing e.g. deviations regarding wage, working hours or extra payments. For that purpose he first of all evaluates collective agreements provided by the Ministry of Labour and Social Affairs and by the *WSI-Tarifarchiv* (collective agreements archives of the Institute of Economic and Social Sciences of *Hans-Böckler-Stiftung*). The information compiled from those sources was linked with the SES data, using the main record of collective agreements supplied by the Federal Statistical Office and containing the collective agreement codes underlying the SES and the relevant designations of the agreements. An uncertainty of the study is that there is no information on what companies make use of the opening clauses. Descriptive analyses show that average earnings are lower where opening clauses are included in the collective agreement. Analyses of variance and regression models, however, confirm a significant influence of opening clauses on the pay distribution only for wage earners, whereas the coefficients for salaried employees are not significant. It is now planned to extend the study to the whole of Germany and to include the 1995 data.

The two papers by Fitzenberger / Kohn / Lembcke (2007) as well as Kohn / Lembcke (2006) also deal with the impact of various agreement systems on

the pay distributions. In the paper of 2006, they treat the distributions and regression models at the individual and enterprise levels. They separately examine male and female full-time employees and female part-time employees. In every case, they distinguish between wage earners and salaried employees and by western and eastern Germany. The results expected on the basis of earlier studies are generally confirmed. However, there are groups of employees showing remarkable deviations. For male full-time salaried employees, the average salary is highest with individual agreements, whereas this is the case with enterprise agreements for all other groups of employees. That effect is explained by the fact that salaried employees exempt from collectively agreed terms have a major impact on the salary level. For west-German salaried employees, the salary dispersion is larger with enterprise agreements than with collective agreements, whereas the opposite is true for eastern Germany. In general, however, the relevant differences between western and eastern Germany are small. The regression models show that the basic wage with enterprise-level agreements is remarkably higher than with collective or individual agreements. This suggests that unions are more successful where they bargain direct with employers. Also, trade unions have more influence in eastern Germany. This is shown by the fact that the decrease of wage dispersion in the case of applying a collective / enterprise agreement is much larger there than in western Germany. In their paper of 2007, the authors also examine the influence of the net union density (NUD) for western Germany, which is defined as the share of employed union members in all employees of a specific labour market. As the SES does not contain information on whether an employee is a union member, they impute that variable by applying an estimation method developed by Fitzenberger, Kohn / Wang (2006) using data of the Socio-Economic Panel (SOEP). Quantile regression of the conditional distribution of the logarithmised hourly wage, using individual characteristics of employees, local unit variables and collective agreement / trade union variables as covariates, shows that the NUD has a negative effect on the wage level. While for the 10th percentile only a non-significant effect of –0.7 % is observed for a 10 % increase in union density, the same effect in the 90th percentile is a significant –2.4 %.

4.3 Further Research

Fitzenberger / Reize (2002) examine wage differentials and growth from 1990 to 1995 for western Germany, distinguishing various qualification groups. Those groups are defined by the dimensions of vocational qualification (without vocational qualification; with vocational qualification, but without academic degree; with academic degree) and type of employment (men working full time, women working full time, women working part time).

All wage distributions are unimodal. As expected, the distribution for men working full time is farthest to the right and for women working part time it is

farthest to the left. The structure of the distributions hardly changed from 1990 to 1995. The earnings differences within the groups increase along with an increasing qualification level. Those differences are particularly strong for women working part time, while there is hardly any difference between men and women working full time.

Jirjahn / Stephan (1999) use the data for Lower Saxony 1990 and 1995 for male employees to analyse what the factors are on which the level of annual extra payments depends. Analysis of variance is used to show what shares of the differences in extra payments are due to the employee, the local unit, the branch and the working environment. The individual characteristics of the employees, such as qualification and age, explain just about 10 % of the variance, while especially the length of affiliation in the enterprise plays a major role. The local unit explains 70 % to 90 % of the variance for wage earners and 50 % to 60 % for salaried employees; sector and enterprise size, however, do not contribute much to the explanation.

Boss / Christensen / Schrader (2005) take the SES 2001 as a basis for calculating average earnings by age groups and qualification levels, applying distinctions by sex, western / eastern Germany as well as secondary and tertiary sector. The values – extrapolated to 2005 by means of the results from the continuous earnings calculations and estimation factors on the basis of other data sources – are used by the authors for a comparison with the level of the unemployment pay II (ALG II) to examine the question of whether the incentive to take up a job is sufficient. Especially for recipients of ALG II with low qualification, children and an economically inactive partner, the incentive is considered insufficient, whereas for highly qualified persons and people with a partner in employment the opposite is true. Another critical point mentioned by the researchers is the fact that more and more employees are squeezed out of the first labour market by "1-euro jobs" and marginal part-time work. One of the measures proposed to render the low-wage sector more attractive is a negative income tax, meaning that, up to a specific gross wage, a wage tax credit is paid, which is offset against the tax due.

5. Outlook

Access to the data of the 2006 SES survey is expected for the first half of 2009. Afterwards, it will be checked whether the SESs of 2001 and 2006 can be linked to each other.

Panel data are more and more often demanded by the scientific community. As the SES is a sample survey, there is permanent change among the local units questioned, especially among the smaller local units. For this reason, there is uncertainty about the number of common units in both surveys. While the linkage of information about the local units is technically possible using

the identifier of the German business register, the linkage of the employee information poses on the one hand a technical and on the other hand a legal problem. There are no direct identifiers, s.t. linkage could only be done using similarities between the information on persons (statistical matching). Moreover, presently the legislator, according to § 21 of the Law on Statistics for Federal Purposes, does not permit linkage of personal data.

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