Data Observer

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New Survey Data on the Role of Universities in the German Regional Innovation System

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1 Introduction

Universities¹ are essential players in the Regional Innovation System. Their tasks include the generation, collection, and transfer of knowledge (see Fritsch et al. 2007: 20). Through a variety of transfer channels (spin-offs, collaborations), universities transfer the knowledge they generate to players within and outside the region. Two types of higher education institutions are predominant in the German higher education system – on the one hand, the scientifically-oriented *Universities*, and on the other hand, the practically-oriented *Universities of Applied Sciences (UAS)*. *Universities* and *UAS* should play a different role in the Regional Innovation System, because of the well-known differences. The author of this essay has confirmed this assumption in the context of his dissertation (see Warnecke 2016), for which the here presented data set was created. This data set addresses in particular the aspects of intensity and range of transfer channels used from the perspective of the professors. The data situation in previous studies was insufficient. As a rule, these studies included only one to three universities, and the return was too low to allow the derivation of generally valid statements and the realization of complex mathematical and statistical models. The new data collection includes the answers of 7,500 teachers at *Universities* and *UAS*. All in all, the data set presented here makes an essential contribution to improving the data situation.

¹ Universities in general are being referred to when the word ‘university’ appears in standard text, rather than italic. The term ‘university’ in this general meaning includes ‘Fachhochschulen’ or *Universities of Applied Sciences*, as well as ‘Universitäten’ or *Universities*.

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2 Data source

The data is based on two surveys that were carried out between 6 March 2013 and 30 September 2013 and were merged into one overall data set (see Warnecke 2016: 89, 2017a: 138). This allowed the formation of a general view of the opinion of academic teachers on knowledge transfer from higher education institutions in Germany. The first survey covered only twelve case study institutions and scored a total return of 500 respondents (see Warnecke 2016: 96). In the course of the second poll, 44,347 other university teachers were contacted by e-mail (see Warnecke 2016: 89), resulting in the acquisition of a further 7,000 participants in the survey. A detailed description of the survey process and the data can be found in Warnecke (2016: 89 ff.) and Warnecke (2017a: 138 f.). Overall, the record therefore includes 7,500 cases.

3 Sample

The data set consists of retired and active university teachers, both with and without the title of professor. Emeritus teachers comprise 26.3 % of cases. 8.4 % of the scholars included in the data set do not hold the title of professor. These include those who have qualified as *University* professors (“Habilitation”) and private lecturers, who are also listed in Hochschulelehrerverzeichnis Band 1 (Directory of Professors volume 1) (see Deutscher Hochschulverband 2012: VII). The included academic teachers come from both *Universities* and *UAS*. 76.2% of the scholars are affiliated to *Universities* and 23.8 % to *UAS*. Table 1 shows the

Table 1: Breakdown of academic teacher by institution type.

Type of institution	Absolute value	Percent share (%)
University (private)	88	1.2
University (owned by the federal state)	5,192	69.2
Medical university	46	0.6
University (owned by the federal government)	55	0.7
College of education	106	1.4
College of theology	46	0.6
Universities of applied sciences (private)	141	1.9
Universities of applied sciences (owned by the federal state)	1,556	20.8
Administrative college (owned by the federal state)	29	0.4
Administrative college (owned by the federal government)	2	0.03
Not specified	239	3.2

institutional affiliation of the university teachers surveyed. The overwhelming majority of respondents are from *Universities* and *Universities of Applied Sciences* owned by the federal states. Table 2 illustrates the origin of academic teachers by federal state. The proportion of respondents from the three most populous federal states (North Rhine-Westphalia, Bavaria, Baden-Wuerttemberg) was 49.2%.

Table 2: Breakdown of academic teacher by federal state.

Federal state	Absolute value	Percent share (%)
Baden-Wuerttemberg	1,094	15.1
Bavaria	916	12.6
Berlin	520	7.2
Brandenburg	115	1.6
Bremen	121	1.7
Hamburg	259	3.6
Hesse	548	7.5
Lower Saxony	690	9.5
Mecklenburg-Western Pomerania	137	1.9
North Rhine-Westphalia	1,559	21.5
Rhineland-Palatinate	323	4.4
Saarland	69	1.0
Saxony	324	4.5
Saxony-Anhalt	196	2.7
Schleswig-Holstein	206	2.8
Thuringia	185	2.5

4 Variables

The data set contains, on the one hand, variables at the individual level (Level 1). These variables resulted from interviews with academic teachers. In addition, the data set was expanded to include secondary statistical data. Therefore, the data set contains variables related to the higher education institution (Level 2) and variables related to the federal state (Level 3). The most important variables of all three levels are listed below.

With regard to the individual level, the data set contains the following variables: title of professor (yes/no), membership of the core group (yes/no), emeritus/retired (yes/no), number of years since retirement, scientific discipline, time budget for teaching or research or administrative tasks, applicability of teaching or research, number of supervised theses, various selection options (yes/no) for integrating practice actors in teaching, number of publications in scientific or grey or other literature, spatial scope of the publication, membership

of the supervisory board of a plc (AG) (yes/no) or a limited-liability company (GmbH) (yes/no) or other organisation (yes/no), involvement in other commissions, committees and working groups outside the university (yes/no), spatial scope of activities outside the university, frequency of cooperation with small or medium-sized business or corporations or interest groups, associations and foundations or scientific institutions or other state institutions, geographical scope of cooperation between the respective universities and the aforementioned cooperation partners (e. g. small business), various selection options (yes/no) for the forging of contacts with practice partners, foundations with high research intensity (yes/no), foundations with low research intensity (yes/no), number of foundations with high research intensity, number of foundations with low research intensity, spatial scope of foundation activities, assessment of the alignment of the curriculum or the research activity with the region, estimates of the effect of the university based on the quality of the location or range of regional leisure and cultural activities or stabilisation of the economy or the quality of life.

In addition, the data set contains the following Level 2 variables. These are variables that refer to the university.

Year of establishment, age of the university, classification of the type of institution, financed by the federal state (yes/no), membership of the group of technical universities (yes/no), federal state of university, affiliation to the group of East German universities (yes/no), third-party funding per university, number of professors per university, number of academic staff per university, number of students per university, number of universities within a radius of 60 minutes' travel, number of ICE railway stations within a radius of 15 minutes' travel, number of airports within 60 minutes' travel.

In addition, the data set contains the following Level 3 variables. These are variables that refer to the federal state in which the respective university is located: number of companies with up to 49 employees, number of companies with 50–249 employees, number of companies with 250 or more employees, gross domestic product, area in sq km, research and development workers in the economy, expenditure on higher education, number of *University* professors, number of professors at *UAS*, total number of professors, population, number of persons in employment, number of students.

5 Data quality

The two surveys were conducted in the form of an online survey using standardised self-completers. With just under 50,000 respondents and several reminder letters, this form of survey was chosen for reasons of cost and practicality.

The answers provided by the survey participants were exported directly from the survey software as a CSV file. This had the advantage of not causing transfer errors, as can be expected in paper surveys, especially on this scale. Respondents were given access to the survey utilizing an individual link, which led them to the online questionnaire and could only be used once. This ensured that the respondents could not participate in the survey several times. The uniform contact data base used to send e-mails to the survey participants also contributes to the high quality of the data. The e-mail addresses used for contacting teachers for expansion are taken from Hochschulehrerverzeichnis Band 1 and Band 2 (see Deutscher Hochschulverband 2011; Deutscher Hochschulverband 2012). The e-mail addresses used for the surveying of professors at the twelve case study institutions were researched with the aid of the online edition of the Hochschulehrerverzeichnis (see Warnecke 2017a: 138). During the preparation of the address data set for the expansion of the survey, it was explicitly ensured that contact persons were not included multiple times in the contact data set. The contacting of all academic teachers listed in the Hochschulehrerverzeichnis provided a representative picture of opinion. In 239 cases the respondents gave no or no clear indication of their institution. This means that, in these cases, no Level 2 and Level 3 variables, or university type, could be assigned to them. Although these 239 cases are included in the data set, they are not usable for many analyses.

6 Descriptive statistics

Table 3 presents some selected descriptive statistics for the Level 1 variables.

7 Publications using the new data

The two most important publications based on the data set presented here are briefly described below.

„Universitäten und Fachhochschulen im regionalen Innovationssystem – Eine deutschlandweite Betrachtung“ (see Warnecke 2016): This is the dissertation of the author of this essay, for which the data set presented here was initially gathered. The subject of research is the role that *Universities* and *UAS* play in the Regional Innovation System, with particular emphasis on the scope and intensity of the respective knowledge transfer channels. Based on the results of use of the respective transfer channels, it could be shown that *Universities* are

Table 3: Selective descriptive statistics.

Transfer channel	N	Indicator	Expl.
<i>Frequency of usage of several knowledge transfer channels</i>			
number of scientific publications	5,281	6–10	(I)
number of supervised Ph.D. theses	4,910	2.01	(II)
cooperation with small companies	6,419	16.8 %	(III)
cooperation with medium-sized companies	6,104	14.9 %	
cooperation with large companies	6,402	23.6 %	
cooperation with interest groups	6,502	23.9 %	
cooperation with other academic institutions	7,071	63.0 %	
cooperation with public institutions	6,469	29.2 %	
spin-offs with a high research orientation	5,531	8.3 %	(IV)
spin-offs with a low research orientation	5,530	10.6 %	
<i>Spatial dimension of various knowledge transfer channels</i>			
publications	4,835	11.4 %	(V)
degree theses	5,278	30.8 %	
cooperation with small companies	3,829	49.1 %	
cooperation with medium-sized companies	3,289	29.5 %	
cooperation with large companies	3,981	16.5 %	
cooperation with interest groups	4,736	18.9 %	
cooperation with other academic institutions	6,615	8.3 %	
cooperation with public institutions	4,929	17.4 %	
spin-offs	5,531	12.4 %	

Explanation: (I) Median, seven-point likert scale: 0 = “0 publications”, 1 = “1–2 publ.”, 2 = “3–5 publ.”, 3 = “6–10 publ.”, 4 = “11–15 publ.”, 5 = “16–20 publ.”, 6 = “Over 20 publ.”, (II) Mean, (III) Relative frequency of class 4 and 5, five-point likert scale: from 1 = never to 5 = very often, (IV) Relative frequency, dichotomous variable, (V) Regional share of the respective knowledge transfer channels.

more oriented towards basic research, *UAS* are more application-oriented. Concerning the geographic scope of the knowledge transfer channels, it was shown that these vary depending on the type of institution, the respective transfer partner and the type of knowledge transferred. The results make clear that *UAS* are much more regionally oriented. In summary, a functional differentiation was found between both types of higher education institutions. The role of *Universities* and *UAS* in the Regional Innovation System is therefore comparative.

“Cooperation between Higher Education Institutions and Companies from a Spatial Perspective – An Empirical Analysis of Germany Using Bayesian Logistic Multilevel Models”: In this essay, Warnecke and Weller (2017) investigate the individual, institutional, and regional factors that influence the spatial focus on the cooperation of professors and company representatives. The analytic

evaluation was realized using Bayesian logistic multilevel models via Markov Chain Monte Carlo simulation (MCMC). The study distinguishes between small, medium and large enterprises. In particular, the results of the research show that research disciplines are far more important for professors at *Universities* than for their counterparts at *UAS*. Also, about the *UAS*, a high relevance of the time budget for research activities could be proven. The impact on the time budget is negative for professors at *UAS* as well as for *University* professors.

8 Data access

As a supplement, this publication is attached to a test data set containing 10 % of the total data set (random selection). However, for privacy reasons, this test data set does not provide any information regarding the affiliation of a scholar to a specific university. For the same reason, the test data set does not include Level 2 and Level 3 variables.

The complete data set (DOI: 10.4232/1.12885) is available from GESIS (see Warnecke 2017b). For data protection reasons, however, it is subject to special access restrictions. The data set is available via on-site access at the GESIS Secure Data Center. This means that, after consultation and signing a contractual agreement, the data can be evaluated at a guest workplace in the GESIS Safe Room in Cologne (see GESIS 2017).

9 Outlook

The data set offers much potential for further analysis. This is due to its size in terms of case numbers and content covered, as well as the fact that it is institution- and subject-specific. The affiliation surveyed also allows the data set to be expanded to include higher education and regional secondary statistics.

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References

- Deutscher Hochschulverband (2011), Fachhochschulen Deutschland. München: De Gruyter Saur.
Deutscher Hochschulverband (2012), Universitäten Deutschland. München: De Gruyter Saur.
Fritsch, M., T. Henning, V. Slavtchev, N. Steigenberger (2007), Hochschulen, Innovation, Region. Wissenstransfer Im Räumlichen Kontext. Berlin: Edition Sigma.

- GESIS (2017), The Secure Data Center (SDC). Retrieved on 2017-10-18: <https://www.gesis.org/en/services/data-analysis/more-data-to-analyze/secure-data-center-sdc/>.
- Warnecke, C. (2016), Universitäten und Fachhochschulen im regionalen Innovationssystem. Eine deutschlandweite Betrachtung. Bochum: Universitätsverlag Brockmeyer.
- Warnecke, C. (2017a), Wissenstransfer aus Hochschulen Methodik und Ergebnisse einer bundesweiten Professorenbefragung. *die hochschule* 26 (1): 135–147.
- Warnecke, C. (2017b), Universitäten und Fachhochschulen im regionalen Innovationssystem: Eine deutschlandweite Betrachtung. GESIS Data Archive. Cologne Germany. ZA5249 Data file. Version 1.0.0, doi:10.4232/1.12885
- Warnecke, C., D. Weller (2017), Cooperation between Higher Education Institutions and Companies from a Spatial Perspective – An Empirical Analysis of Germany Using Bayesian Logistic Multilevel Models. *Ruhr Economic Papers* #701, Essen: RWI.