The Completion Shift of German Universities of Applied Sciences

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Abstract

In research on higher education, the evaluation of completion and drop-out rates has generated a steady stream of interest for decades. While most studies only calculate quotes using student and graduate numbers for both phenomena, we propose to also consider the budget available to universities. We transfer the idea of the excellence shift from the research (Bornmann et al., 2017) to the teaching area, and particularly to the completion rate of educational entities. The completion shift shows institutions' ability to produce graduates as measured against their basic academic teaching efficiency, thereby avoiding the well-known heterogeneity problem in efficiency measurement. Their politically determined focus on education makes German universities of applied science the perfect sample for evaluating this novel method. Using a comprehensive dataset covering the years 2008 to 2013, we show that the shift produces results, which correlate considerably with the results of the standard Data Envelopment Approach (DEA). Thus, we recommend the completion shift as an alternative method of efficiency measurement in the teaching area. Compared to DEA, the computation of the shift is easy and the results are understandable to non-economists.

JEL Classification: A23, H52, I21, I23, D61

Keywords: Efficiency, Completion Shift, DEA, Students, Universities of Applied Sciences

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Introduction

Bornmann et al. (2017) introduced the excellence shift as a variant for assessing the efficiency of (higher) education institutions to do (successful) research. The method makes it possible to avoid the well-known heterogeneity problem in efficiency research, with either the data or the institutions being too varied to compare (De Witte and López-Torres, 2017 and Johnes and Johnes, 2009). Institutions vary for many reasons, primarily the location and the (potential) different focus across entities: institutions are located in different countries and operate under conditions, which are not comparable. One university emphasizes research whereas another is more teaching oriented. An advantage of the excellence shift is that institutions are compared based on their own basic efficiency, which avoids comparing disparateness. To calculate the shift, two output variables depicting the research side of the institutions are used, whereby one is the subset of the other. Bornmann et al. (2017) employ the total number of publications and as a subset the number of highly cited papers. Based on these data sources, the shift shows the institutions' ability to produce highly-cited papers as measured against their basic academic research efficiency (using institutions' total budget as input indicator).

This paper makes two contributions to the literature on this topic:

Firstly, we transfer the idea of the excellence shift from the research area (Bornmann et al., 2017) to the teaching area, and particularly to the completion rate of educational entities. Completion and drop-out are topics of consistently high interest in research on higher education (see Tinto, 1975 and Aulck et al., 2016), especially in Germany (Heublein, 2014). We call the transferred approach *completion shift*. It is based on two output variables: the number of students at a university, which signals how attractive a university is and the number of graduates, indicating how successful the graduation process works. The number of graduates is a subset of the number of students who have been enrolled at that university. The main input variable is the expenses of the institution. The completion shift therefore shows the institution's ability to produce graduates as measured against their basic academic teaching efficiency. These output and input numbers are established data for efficiency studies; they have been used, for example, by Agasisti and Dal Bianco (2009). In this study, we use the numbers to compare our new efficiency approach with the standard method, the Data Envelopment Approach (DEA).

Secondly, in contrast to the previous literature looking at conventional universities, we deliberately use teaching data for universities of applied sciences (in German: *Fachhochschulen*). The institutions complement the existing German conventional universities by having a politically predefined focus on education (and not research or research training)[1]. Hence, our teaching oriented efficiency approach is perfectly suited to assess their efficiency. Despite their growing status within the German higher education sector, with half of all existing institutions being universities of applied sciences, they have only rarely been subject to efficiency studies to date (to the best of our knowledge).

This paper begins with a short overview of the literature on this topic, as well as a description of our data set and continues by illustrating the completion shift approach. We discuss our results both across time and across entities and compare them with the DEA approach.

Related Literature

De Witte and López-Torres (2017) and Rhaiem (2017) provide excellent summaries of efficiency literature in the education sector. The efficiency of educational entities has been a topic of early interest, with first studies recommending relevant input, as well as output variables (see Carter, 1972) and discussing limitations, especially regarding the comparability of universities (see Sadlak, 1978). While the productivity of conventional universities has been frequently analyzed in the past[2], only two studies to date have examined the efficiency of universities of applied sciences (Olivares and Wetzel, 2011 and Başkaya and Klumpp, 2014). Both studies classified the universities as just one component of the higher education sector and therefore examined them as part of a bigger sample.[3] Olivares and Wetzel (2011) focus in particular on the economies of institutional scale and scope. The authors applied a recent specification of the Stochastic Frontier Analysis (SFA) to an unbalanced panel by covering 72 conventional universities and 80 applied institutions in the time range from 2001 to 2008. Their results show that all entities work on a similar high level of efficiency and exhibit increasing

[1] Universities of applied science emerged in the 1960s, in response to the need for skilled labor and the growing demand for student places. Graduates receive the same formal title, but differ from leavers of conventional universities through their place of study. Most of the institutions are multidisciplinary, vocationally oriented and suit the regional economy in their subject range (see Kyvik, 2004).

[2] For the German higher education sector, see Kempkes and Pohl (2010), Johnes and Schwarzenberger (2011) and Gralka (2016). For a comparison of efficiency between countries see Agasisti and Gralka (2017).

[3] Valuable exceptions are the publications by the German Council of Science and Humanities [*Wissenschaftsrat*], which give a thorough view of the universities of applied science landscape (see, for example, Wissenschaftsrat, 2010). Although the council separately evaluated input and output variables of the universities, it missed the opportunity to evaluate their efficiency.

returns to scale. With a similar mixed, but much smaller sample, Başkaya and Klumpp (2014) used the DEA in a cross-section of 33 institutions. Their evaluation of universities in the year 2011 reveals that the universities exhibit quite heterogeneous efficiency values on an average low level. The differences between the results of the studies by Olivares and Wetzel (2011) and Başkaya and Klumpp (2014) are primarily caused by their different efficiency approaches and considered variables. In line with most of the literature on universities' efficiency, Olivares and Wetzel (2011) included the number of students at each institution in their study, carefully arguing why this measure is preferable to the number of graduates.[4] By contrast, Başkaya and Klumpp (2014) used the number of graduates as an output, without further discussion.

Data and Methods

The initial sample consists of 262 German public universities of applied science (classified by the Federal Statistical Office of Germany) including 163 private and/or specialized institutions (primarily in the subject group's theology, art and pedagogy). These private and specialized institutions have not been evaluated in this study, mainly due to their different funding arrangements. Due to mergers and missing data, 18 further institutions had to be dropped. The final sample thus comprises 81 of the 99 German public universities of applied science. To gain insights into the productivity of the institutions we evaluated their primary activity, namely teaching, with respect to their main input, i.e. expenses. The output variable "teaching" is

Table 1 - Descriptive statistics for 2013

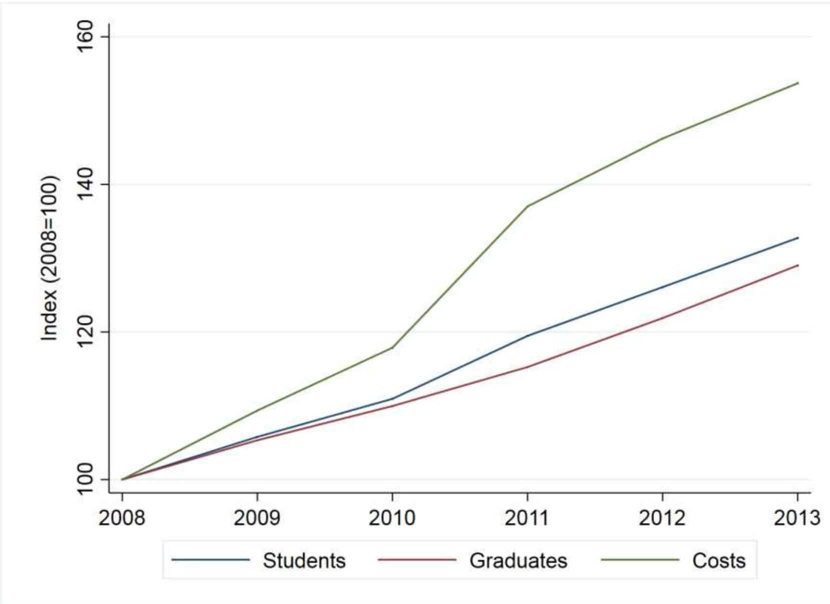
	Universities of applied science (n=81)			
	Mean	Std. dev.	Min	Max
Students	6,791	3,936	1,440	22,322
First semester student [a]	1,736	962	487	5,330
Graduates	1,135	603	263	3,277
Expenditures [b]	41	23	10	142

[a] First semester students are defined as students within their first subject related semester (in German: *Fachsemester*).
[b] In € million, 2013 prices.

[4] Agasisti and Haelermans (2016) illustrate how sensitive the efficiency values are to the variable representing the teaching output (students or graduates). The study evaluated the efficiency of the Italian and Netherlands higher education system.

represented by the total number of first semester students[5] alongside the graduates from bachelors and master courses (or equivalent). Student numbers refer to the academic years 2008/2009 through 2013/14, and financial variables are from 2008 to 2013. The data were provided by the Federal Statistical Office of Germany. Expenditure data are deflated to the year 2013. Table 1 reports descriptive statistics for the year 2013. The values are similar to those reported by Olivares and Wetzel (2011). The student numbers amount to approximately 6,800 on average, with around 1,700 students in the first semester and 1,100 graduating in that year. The largest university is the FH Cologne with respect to both students and expenditure. Average expenditure is 41 million euros per institution. Figure 1 shows the change in average students, graduates and expenses over the considered timeframe. While the first two variables show a moderate and similar increase, the expenditures grew to a larger extend.

Figure 1 – Development over time for inputs and outputs



A crucial point is the definition of the time point when a student graduates. This is surely not the same for students from different universities.[6] Therefore, given our data framework, we have to make some assumptions, based on the standard and actual duration of study. While bachelor (master) students in Germany have a standard period of study with 6 (4) semester, the

[5] The Federal Statistical Office of Germany distinguishes between students in their first subject related semester (in German: *Fachsemester*) and their first university semester (in German: *Hochschulsemester*). We deliberately selected the first classification, since it comprises the second classification by additionally enveloping students who changed their field of study.

[6] For a discussion of the problems in measuring time to degree in the German higher education sector see Theune (2015).

actual period of study is listed as 7.3 (4.2) by the Federal Statistical Office of Germany (see Destatis, 2016). Since we have a mixed sample, containing both courses, we assume an average study duration of 6 semesters. Hence, we split the overall sample (with a period from 2008 to 2013) according to the contained student cohorts and obtain three groups. Based on our assumption of six semesters, the first semester students from 2008 (2009 / 2010 respectively) have been related to the graduates of 2011 (2012 / 2013 respectively). For each cohort, the average expenditure over the corresponding three years has been calculated.

The Completion Shift

We have one input and two output variables. On the output side, our approach is based on two indicators: (1) total number of first semester students (S) and (2) total number of graduates (G). The input is defined as the total expenditure (E).

Given our dataset, the completion shift is formally calculated as follows (Bornmann et al., 2017):

1. The relative shares $p_{1i} = S_i / \sum S_i$; $p_{2i} = G_i / \sum G_i$ and $ex_i = E_i / \sum E_i$ are calculated. These represent the share of each university given the sum of input and outputs. The percentages standardize the absolute numbers and make them comparable across indicators.
2. The university efficiency scores for the two outputs given by $e_{1i} = p_{1i} / ex_i$ and $e_{2i} = p_{2i} / ex_i$ are calculated. These are simple productivity measures relating the outputs to the input.
3. The difference of the two efficiency scores $e_2 - e_1$ defines the completion shift. The score has only a relative interpretation.

Comparison to DEA

To relate the results from the completion shift to the results of an established method, we additionally performed an efficiency analysis as a benchmark. Two main methods for estimating efficiency coexist for the education sector. In both cases, inefficiency is measured by the distance of each institution to a calculated efficiency frontier. Since the frontier is determined by the sample, efficiency is a relative measure: the efficiency of a particular institution is calculated relative to the performance of the other institutions in the sample. We choose the non-parametric DEA introduced by Charnes, Cooper and Rhodes (1978) as a benchmark for this study, because it is the most frequently used method and it can be implemented straight forwardly. Using linear programming, the frontier and the position of each entity is calculated by the ratio of (weighted) outputs over (weighted) inputs. Detailed overviews of advantages and variations of the DEA can be found in Bogetoft and Otto (2010), as well as Wilson and Clemson (2013). To achieve the best possible benchmark, we performed the DEA with the same dataset as used for the completion shift, considering first semester students and expenditure as inputs and graduates as output. We allow for variable returns to scale (VRS) and choose the output-oriented approach, assuming that universities maximise their output with the given input.

Results

In the first step, we calculated the completion shift for each year from 2008 to 2010. Figure 2 plots the corresponding kernel estimate of all 81 scores for every cohort year considered. It shows that the distribution is constant across time. Both mean and median are negative. There are more negative than positive scores on average over the three years. However, a visual inspection of the results showed that the relative positions of universities are volatile with respect to both the level and the ranking position. This impression was confirmed by corresponding correlation coefficients (see Spearman Rank and Pearson coefficients in Table 2), which are all below 0.7. The results indicate that interpretations and policy conclusions might differ slightly depending on the year one picks.

Figure 2 - Kernel estimates of the completion shift (2008-2010)

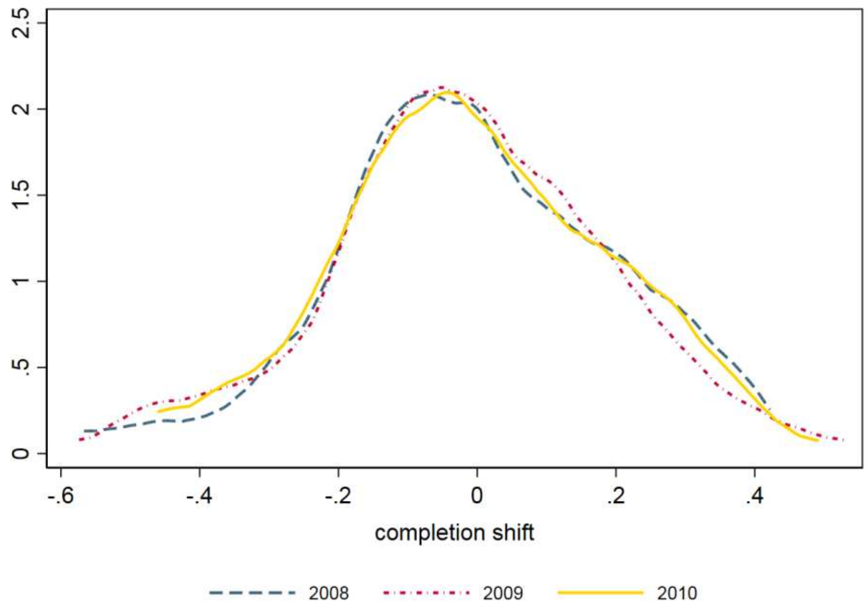


Table 2 - Spearman rank and Pearson correlations across time for the completion shift

	Spearman rank correlation				Pearson correlation		
	2008	**2009**	**2010**		**2008**	**2009**	**2010**
2008	1.000			**2008**	1.000		
2009	0.658	1.000		**2009**	0.698	1.000	
2010	0.476	0.674	1.000	**2010**	0.530	0.670	1.000

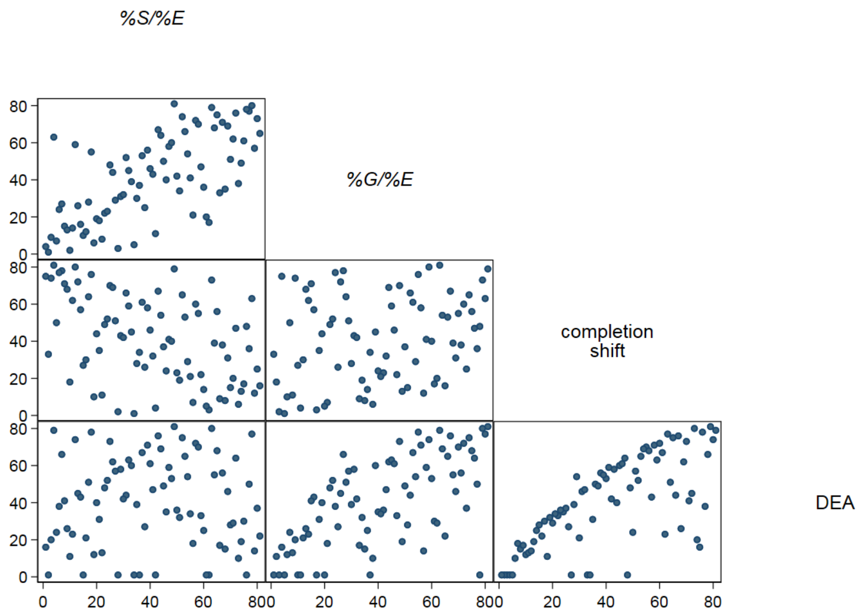
There are two options to aggregate the results: either one averages the input and outputs across time or takes the average of the computed efficiency scores. We opted for the first approach, which is preferable for illustrating the completion shift.[7] The second approach (averaging the efficiency scores) yields very similar results.

Table A.1 (in the appendix) documents the results of the efficiency analyses for the individual universities of applied sciences. The table is sorted in descending order by the completion shift. The table shows average expenditure, the number of first semester students and graduates – including its relative shares. The completion shift is the difference between the two relative efficiency measures $\%S/\%E$ and $\%G/\%E$. In the last column, DEA scores are listed. With an average of 0.82 the institutions exhibit a fairly high efficiency level. The University of Applied Sciences in Nürtingen has the highest completion shift compared to the other universities. In other words, the university exhibits the best relative graduation process of students based on the given expenses. While this university is only ranked 34th in respect to the relative student efficiency (column 8, $\%S/\%E$), it reaches fifth position when it comes to completion efficiency (column 9, $\%G/\%E$). This results in a very good relative performance with respect to the completion shift. A DEA score of 1.00 confirms the high completion efficiency. At the lower end of the ranking we find the FH Brandenburg, which performs quite well with respect to student efficiency (Rank 4), but drops to the 63rd ranking position in the graduation ranking. In addition, the university features a very small DEA score.

Figure 3 shows the scatterplot of the ranking positions, which resulted from the different approaches. The scatterplot points out that the ranking positions of the universities are dispersed across the approaches. Table 3 provides the Spearman ranking correlations for the different comparisons. The correlation between DEA and completion shift is fairly high ($r = 0.71$). Thus

[7] We preferred the first approach due to its higher transparency and resulting better comprehensibility in Table A.1.

Figure 3 - Ranking comparison across approaches



both approaches seem to measure similar concepts. However, since the correlation is not perfect, a high DEA score is not necessarily associated with a high completion shift. For example, Table A.1 shows that the Technical University of Applied Sciences in Wildau has a high DEA score with 0.95 (Rank 16), but is lowly ranked in respect to the completion shift (Rank 75). In Table 3, the completion shift is negatively correlated with the student efficiency ($\%S/\%E$) and marginally correlated with the graduation efficiency ($\%G/\%E$). This means that universities successfully attracting first semester students are not necessarily efficiently guiding students to completion – whereby efficiency is measured with respect to the overall expenditure.

Table 3 - Spearman rank correlation between efficiency measures

	Spearman Rank Correlations			
	$\boldsymbol{\%S/\%E}$	$\boldsymbol{\%G/\%E}$	**Completion Shift**	**DEA**
$\boldsymbol{\%S/\%E}$	1.000			
$\boldsymbol{\%G/\%E}$	0.675	1.000		
Completion Shift	-0.467	0.252	1.000	
DEA	0.009	0.644	0.710	1.000

Discussion

In research on higher education, comparing numbers of first semester students and graduates has attracted a steady stream of interest for decades. The negative side of graduation is usually drop-out, which should be as low as possible for universities. To minimize drop-out rates at universities, governments and university administrations are interested in the most important causes of student drop-out and their later career developments. For example, the German Centre for Higher Education Research and Science Studies (DZHW GmbH; formerly HIS GmbH) has published several studies on causes and motives of drop-out, as well as the calculation of attrition and drop-out rates. In most of the studies on completion and drop-out, only quotes of both phenomenon have been calculated (an overview of the literature can be found in European Commission, 2015). In this study, we propose to further consider the available budget of the universities as an input variable and to calculate the ability of universities to graduate their students – under consideration of the available budget.

Using a comprehensive sample of 81 institutions within the period of 2008 to 2013, we show that some German universities are more able to guide students to graduation than others, given budget constraints. We introduced the completion shift in this study, which can be used to assess the efficiency of the completion success for a set of universities. We found that the completion shift leads to similar results as the DEA. Since the DEA is an established instrument in efficiency measurement, the relatively high correlation might be interpreted as a validation of our new approach. However, the correlation coefficient is not perfect, which can be interpreted differently: either the completion shift does not measure efficiency in the same way as DEA do, or the completion shift might be interpreted as an alternative method of efficiency measurement.

It is an advantage of the shift that the differences between institutions are controlled with respect to institutional data and orientation heterogeneity. This control is not considered in the DEA approach. Compared to DEA, the computation of the completion shift is easy and the results are understandable to non-economists.

In this study, we used a dataset with universities of applied sciences to exemplify the calculation of the completion shift. Future studies should compute the shift not only for universities in Germany, but also for universities in other countries. The topics completion and drop-out concern most nations with higher education systems. The results of efficiency analyses interest a widespread audience, including students, university administrations, policy makers and researchers.

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Appendix

Table A.1 - Input and output indicators for 81 universities of applied sciences and the resulting completion shift (sorted in decreasing order by completion shift)

	E	$\%E$	S	$\%S$	G	$\%G$	$\%S/\%E$	$\%G/\%E$	**Completion Shift**	**DEA**
FH Nürtingen	20,174	0.73	883	0.79	918	1.06	1.08	1.45	0.37	1.00
FH Neu-Ulm	10,514	0.38	486	0.43	483	0.56	1.14	1.47	0.32	1.00
FH Albstadt-Sigmaringen	16,132	0.58	570	0.51	602	0.69	0.88	1.19	0.32	1.00
FH für Technik und Wirtschaft Berlin	58,657	2.11	2,379	2.12	2,393	2.75	1.01	1.30	0.30	1.00
FH für Technik und Wirtschaft, Reutlingen	31,827	1.15	1,130	1.01	1,171	1.35	0.88	1.17	0.29	1.00
FH Konstanze	27,525	0.99	886	0.79	913	1.05	0.80	1.06	0.26	0.99
FH Ravensburg-Weingarten	15,999	0.58	588	0.52	585	0.67	0.91	1.17	0.26	0.95
FH Pforzheim	30,019	1.08	999	0.89	1,002	1.15	0.82	1.07	0.24	0.97
FH für Technik Stuttgart	21,760	0.78	733	0.65	729	0.84	0.83	1.07	0.23	0.95
FH Augsburg	23,884	0.86	1,179	1.05	1,069	1.23	1.22	1.43	0.21	0.99
FH Kiel	27,019	0.97	1,300	1.16	1,179	1.36	1.19	1.39	0.20	0.98
FH Münster	70,177	2.53	2,120	1.89	2,085	2.40	0.75	0.95	0.20	0.97
FH Hildesheim-Holzminden-Göttingen	40,766	1.47	1,311	1.17	1,258	1.45	0.80	0.99	0.19	0.93
FH Koblenz	40,412	1.46	1,438	1.28	1,345	1.55	0.88	1.06	0.18	0.91
FH Furtwangen	31,722	1.14	1,041	0.93	965	1.11	0.81	0.97	0.16	0.89
FH Hannover	53,184	1.92	1,547	1.38	1,449	1.67	0.72	0.87	0.15	0.92
FH Neubrandenburg	18,743	0.68	592	0.53	546	0.63	0.78	0.93	0.15	0.87

FH Schmalkalden	14,564	0.52	815	0.73	699	0.80	1.39	1.53	0.14	0.99
FH Aalen	27,485	0.99	1,041	0.93	920	1.06	0.94	1.07	0.13	0.85
Technische FH Berlin	67,140	2.42	2,195	1.96	1,956	2.25	0.81	0.93	0.12	0.88
FH Ulm	23,149	0.83	856	0.76	744	0.86	0.92	1.03	0.11	0.83
FH Heilbronn	36,114	1.30	1,299	1.16	1,123	1.29	0.89	0.99	0.10	0.84
FH Karlsruhe	40,606	1.46	1,539	1.37	1,295	1.49	0.94	1.02	0.08	0.82
FH Braunschweig-Wolfenbüttel	53,124	1.91	2,095	1.87	1,753	2.02	0.98	1.05	0.08	0.83
FH Zittau/Görlitz	31,202	1.12	931	0.83	793	0.91	0.74	0.81	0.07	0.82
FH Osnabrück	63,207	2.28	2,709	2.42	2,218	2.55	1.06	1.12	0.06	0.90
FH Nürnberg	46,884	1.69	2,430	2.17	1,956	2.25	1.28	1.33	0.05	1.00
FH Bonn-Rhein-Sieg	30,070	1.08	1,299	1.16	1,032	1.19	1.07	1.10	0.02	0.79
FH Potsdam	18,585	0.67	700	0.62	556	0.64	0.93	0.95	0.02	0.76
FH Regensburg	35,609	1.28	1,792	1.60	1,415	1.63	1.25	1.27	0.02	0.92
FH Anhalt	51,525	1.86	1,693	1.51	1,346	1.55	0.81	0.83	0.02	0.78
Technische Hochschule Mittelhessen, FH (THM)	58,837	2.12	2,400	2.14	1,872	2.15	1.01	1.02	0.00	0.78
FH Landshut	15,184	0.55	1,002	0.89	778	0.89	1.64	1.63	0.00	1.00
FH Munich	81,084	2.92	3,488	3.11	2,697	3.10	1.07	1.06	0.00	1.00
FH für Technik, Wirtschaft und Kultur Leipzig	37,289	1.34	1,796	1.60	1,389	1.60	1.19	1.19	-0.01	0.87
FH Aachen	67,207	2.42	2,046	1.83	1,574	1.81	0.75	0.75	-0.01	0.76
FH Frankfurt a.M.	51,636	1.86	2,037	1.82	1,571	1.81	0.98	0.97	-0.01	0.76
FH Dortmund	51,656	1.86	1,730	1.54	1,321	1.52	0.83	0.82	-0.01	0.75
FH RheinMain	60,052	2.16	2,085	1.86	1,586	1.82	0.86	0.84	-0.02	0.75

FH Niederrhein	62,218	2.24	2,388	2.13	1,817	2.09	0.95	0.93	-0.02	0.76
FH Bielefeld	42,423	1.53	1,644	1.47	1,250	1.44	0.96	0.94	-0.02	0.75
FH Magdeburg-Stendal	33,479	1.21	1,498	1.34	1,139	1.31	1.11	1.09	-0.02	0.79
FH Ansbach	12,125	0.44	551	0.49	415	0.48	1.13	1.09	-0.03	0.75
FH Ingolstadt	17,591	0.63	865	0.77	653	0.75	1.22	1.18	-0.03	0.79
FH Lübeck	23,045	0.83	1,013	0.90	761	0.87	1.09	1.05	-0.04	0.74
FH Weihenstephan-Triesdorf	30,246	1.09	1,259	1.12	944	1.08	1.03	1.00	-0.04	0.73
FH Bochum	34,320	1.24	1,114	0.99	824	0.95	0.80	0.77	-0.04	0.71
FH Cologne	118,704	4.28	3,705	3.31	2,735	3.14	0.77	0.74	-0.04	1.00
FH Coburg	21,146	0.76	1,008	0.90	757	0.87	1.18	1.14	-0.04	0.78
FH Deggendorf	19,054	0.69	1,116	1.00	841	0.97	1.45	1.41	-0.04	0.91
FH Harz	16,908	0.61	785	0.70	585	0.67	1.15	1.10	-0.05	0.75
FH Flensburg	17,644	0.64	837	0.75	623	0.72	1.18	1.13	-0.05	0.76
FH Düsseldorf	47,425	1.71	1,786	1.59	1,291	1.48	0.93	0.87	-0.06	0.71
FH Stralsund	17,991	0.65	711	0.63	515	0.59	0.98	0.91	-0.07	0.69
FH Merseburg	22,837	0.82	828	0.74	592	0.68	0.90	0.83	-0.07	0.68
Westsächsische H Zwickau	38,103	1.37	1,315	1.17	934	1.07	0.86	0.78	-0.07	0.69
FH Hof	13,440	0.48	699	0.62	504	0.58	1.29	1.20	-0.09	0.79
FH für Technik und Wirtschaft Offenburg	21,030	0.76	885	0.79	626	0.72	1.04	0.95	-0.09	0.68
FH Jena	28,882	1.04	1,284	1.15	910	1.05	1.10	1.01	-0.10	0.72
FH Kaiserslautern	37,941	1.37	1,390	1.24	964	1.11	0.91	0.81	-0.10	0.68
FH Westküste, Heide	8,470	0.31	363	0.32	255	0.29	1.06	0.96	-0.10	0.71

H Bremen	38,547	1.39	2,124	1.90	1,504	1.73	1.37	1.25	-0.12	0.91
FH Ostwestfalen-Lippe	47,948	1.73	1,450	1.29	940	1.08	0.75	0.63	-0.12	0.63
FH Rosenheim	23,638	0.85	1,184	1.06	820	0.94	1.24	1.11	-0.13	0.76
FH für Technik und Wirtschaft Dresden	39,902	1.44	1,504	1.34	1,000	1.15	0.93	0.80	-0.13	0.65
FH Darmstadt	63,718	2.30	2,842	2.54	1,936	2.23	1.11	0.97	-0.14	0.79
FH Eberswalde	15,032	0.54	595	0.53	398	0.46	0.98	0.84	-0.14	0.64
FH Würzburg-Schweinfurt	35,458	1.28	1,987	1.77	1,386	1.59	1.39	1.25	-0.14	0.91
FH Fulda	31,246	1.13	1,453	1.30	985	1.13	1.15	1.01	-0.15	0.72
FH Bingen	13,942	0.50	660	0.59	433	0.50	1.17	0.99	-0.18	0.67
FH Kempten	18,186	0.66	1,030	0.92	695	0.80	1.40	1.22	-0.18	0.79
FH Erfurt	28,572	1.03	1,502	1.34	997	1.15	1.30	1.11	-0.19	0.78
FH Trier	47,668	1.72	1,673	1.49	984	1.13	0.87	0.66	-0.21	0.58
FH Nordhausen	10,955	0.39	708	0.63	473	0.54	1.60	1.38	-0.22	0.93
Technische FH Wildau	20,016	0.72	1,355	1.21	912	1.05	1.68	1.45	-0.22	0.95
H Bremerhaven	15,860	0.57	794	0.71	473	0.54	1.24	0.95	-0.29	0.63
FH Wismar	31,873	1.15	1,832	1.64	1,124	1.29	1.42	1.13	-0.30	0.80
FH Amberg-Weiden	13,963	0.50	802	0.72	486	0.56	1.42	1.11	-0.31	0.71
FH Gelsenkirchen	50,981	1.84	1,934	1.73	965	1.11	0.94	0.60	-0.34	0.49
H f. Technik u. Wirtsch. d. Saarlandes Saarbrücken	28,102	1.01	1,516	1.35	825	0.95	1.34	0.94	-0.40	0.66
FH Brandenburg	14,770	0.53	870	0.78	429	0.49	1.46	0.93	-0.53	0.59
Total	2,776,115		112,021		86,990					