

# Economies of Scope in Higher Education?

## The Interconnectivity Problem for Performance and Efficiency Measurement in Research and Teaching

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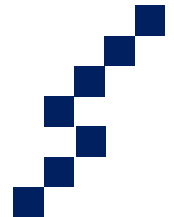
Stephan Zelewski

Tagung Performance Management  
im Hochschulbereich

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Verband der **Hochschullehrer**  
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# HELENA



**Higher Education Global  
Efficiency Analysis**

<http://www.helena.wiwi.uni-due.de>  
Förderkennzeichen 01PW11007

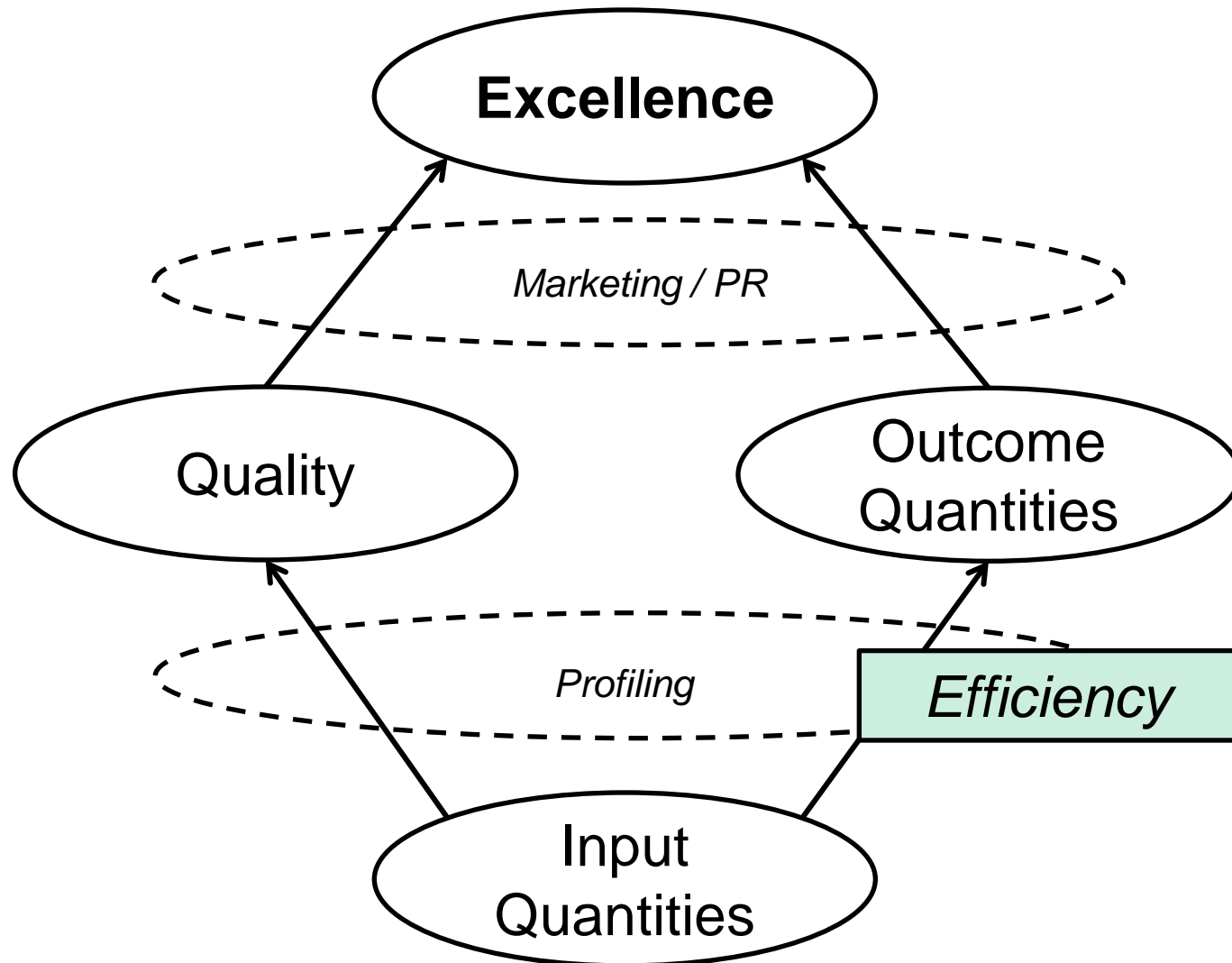
1. Research Question
2. Theoretical Framework
3. Efficiency Analysis Germany
4. Efficiency Analysis Turkey
5. Efficiency Analysis Australia
6. Conclusions

## Higher Education - Background

- HE specifics in production function e.g. multi-output service production, HE organisations as loosely coupled systems, researchers (phd and professors) for research and teaching
- HE management concepts of co-operation and merger as consequences of assumed economies of scale
- HE specifics in outcome (measurement) with assumed synergies between research & teaching: economies of scope

## Research Question and Method

- What research results can be found regarding **economies of scope** between higher education research and teaching?
- Use of data envelopment analysis for different HE data sets from Germany, Turkey and Australia





## Background

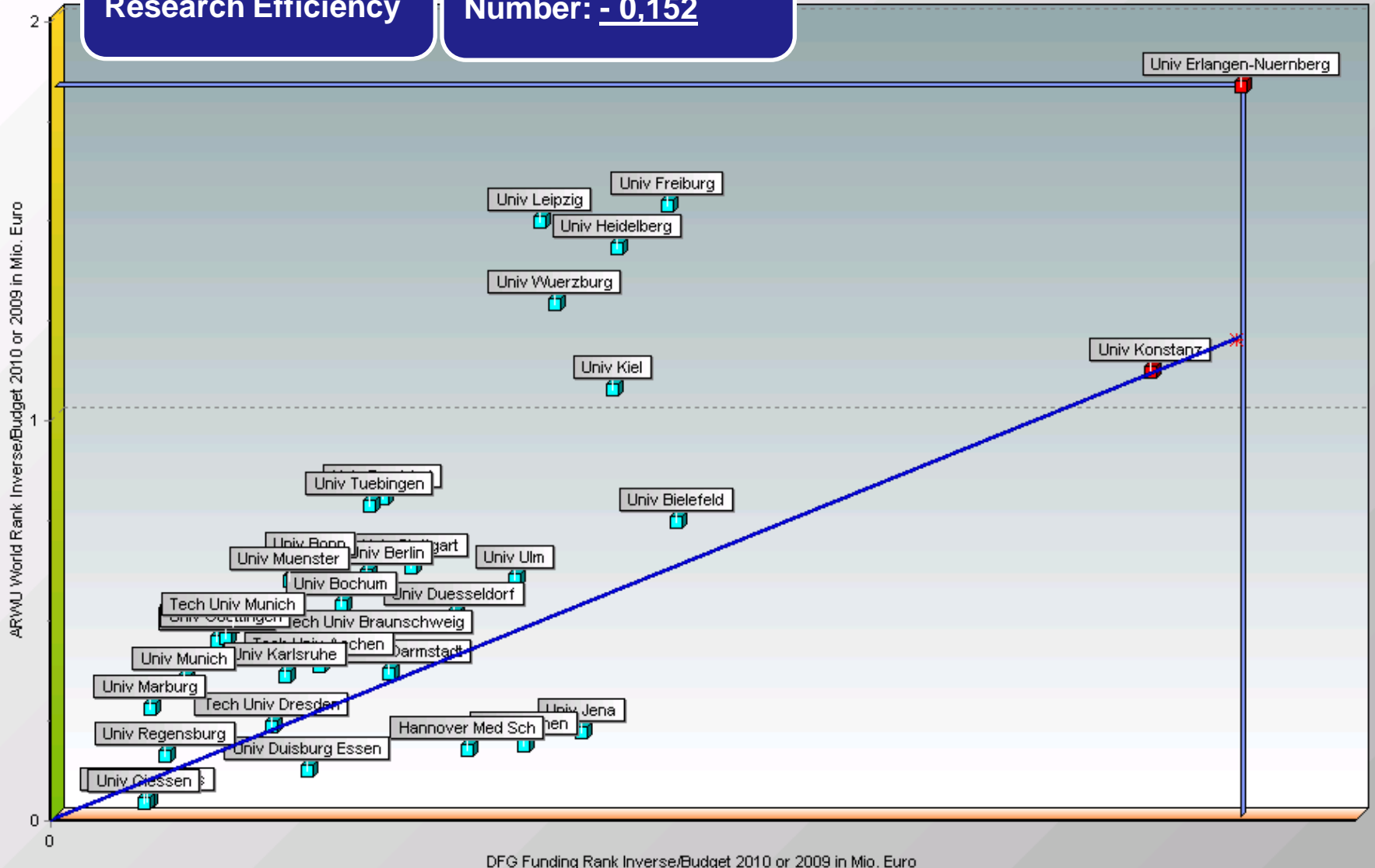
- All ARWU listed German universities without Köln and Mainz because of data irregularities (budget)
- German Excellence Initiative in order to enhance international excellence and visibility of German HEI
- Increasing focus and competition regarding research excellence, e.g. co-operation and mergers (KIT Karlsruhe)

## Case Specifics, 34 HEI

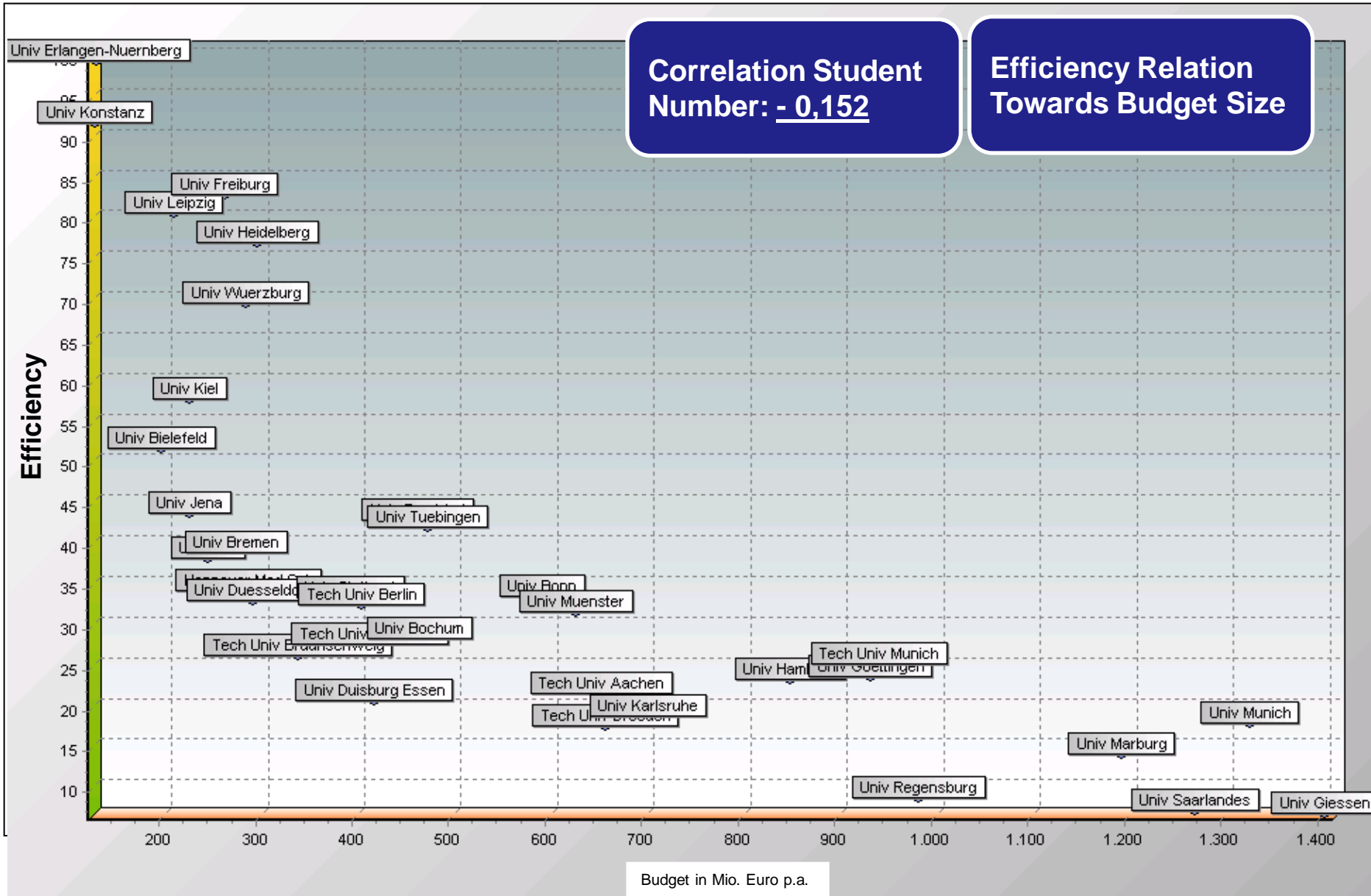
- Input: Budget size (2009 or 2010, source: HEI homepages)
- Outcome: DFG (Deutsche Forschungsgemeinschaft) ranking and ARWU Ranking positions (inverted)
- *Correlation analysis research efficiency with student numbers 2011 (source: HRK, [www.hochschulkompass.de](http://www.hochschulkompass.de))*

Efficiency Frontier  
Research Efficiency

Correlation Student  
Number: -0,152



# 3. Efficiency Analysis DE





Data

University	DFG Funding Rank	ARWU World Rank	Research Efficiency	Students 2011
Hannover Med Sch	31	451	34,80%	3054
Tech Univ Aachen	1	252	22,20%	32204
Tech Univ Berlin	27	252	33,00%	28659
Tech Univ Braunschweig	37	351	26,90%	13996
Tech Univ Darmstadt	20	351	28,20%	22218
Tech Univ Dresden	18	351	18,30%	32684
Tech Univ Munich	4	52	25,90%	26580
Univ Bielefeld	28	351	52,40%	17529
Univ Bochum	23	252	28,90%	33434
Univ Bonn	13	127	34,20%	25852
Univ Bremen	25	451	39,50%	18163
Univ Duesseldorf	32	351	33,60%	17025
Univ Duisburg Essen	39	451	21,20%	33570
Univ Erlangen-Nuernberg	8	252	100,00%	27674
Univ Frankfurt	12	127	43,50%	38280
Univ Freiburg	6	90	83,60%	22030
Univ Giessen	29	451	7,40%	24068
Univ Goettingen	9	84	24,30%	23453
Univ Hamburg	21	127	23,90%	36811
Univ Heidelberg	3	71	77,70%	26205
Univ Jena	30	451	44,40%	20888
Univ Karlsruhe	7	252	19,40%	20771
Univ Kiel	26	252	58,40%	23673
Univ Konstanz	16	351	92,30%	10082
Univ Leipzig	40	178	81,30%	25873
Univ Marburg	35	178	14,70%	21076
Univ Muenster	15	127	32,20%	37002
Univ Munich	2	51	18,50%	44788
Univ Regensburg	38	351	9,30%	17886
Univ Saarlandes	33	451	7,80%	16980
Univ Stuttgart	19	252	34,00%	20066
Univ Tuebingen	14	127	42,60%	24229
Univ Ulm	34	351	38,80%	8089
Univ Wuerzburg	17	127	70,10%	21628

## Background

- Modernization objectives in terms of economic development, political development (EU integration) and society development (Laicism)
- Still very strong state authorities for public universities (e.g. national body naming the university presidents) but a large sector of private HEI

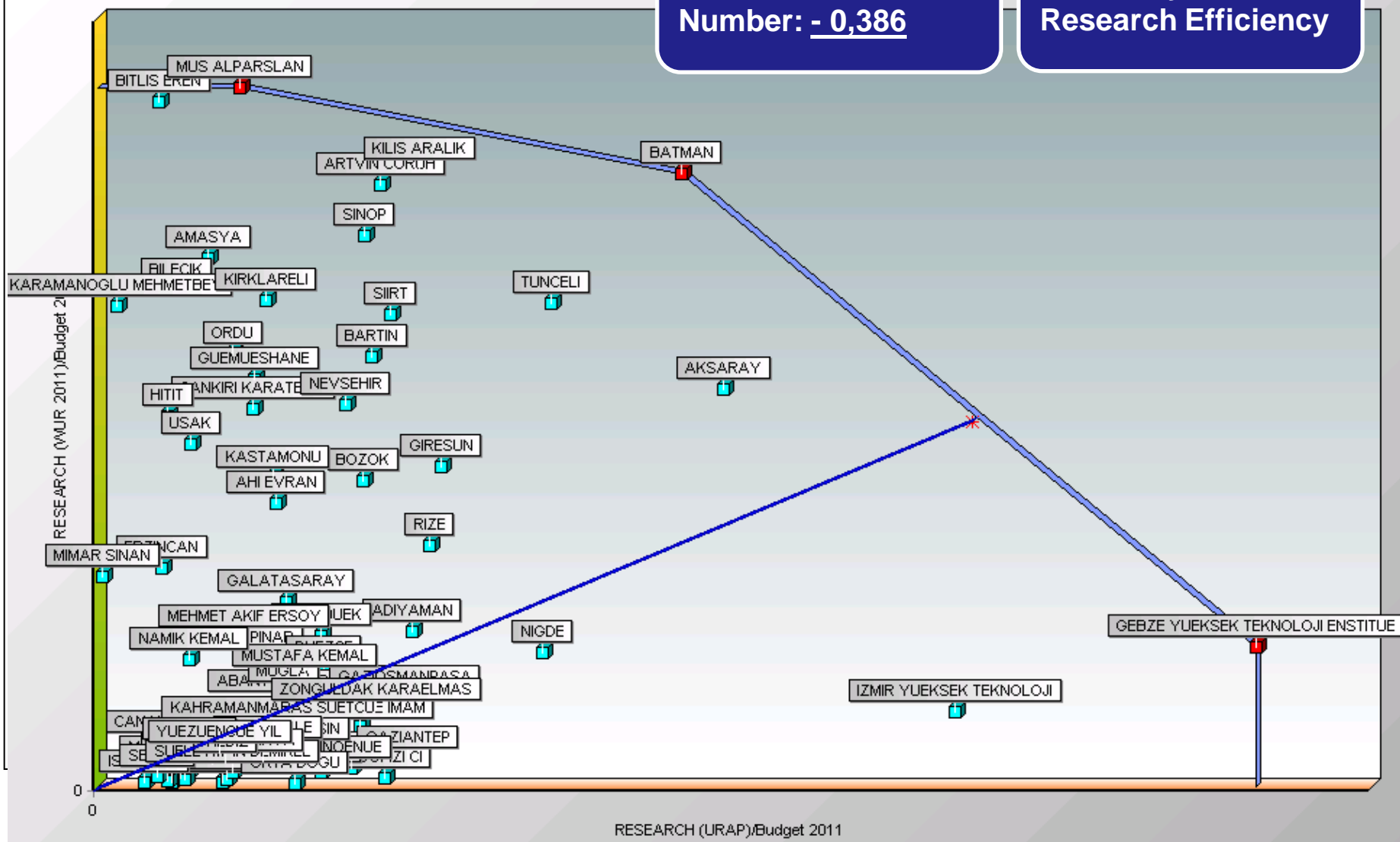
## Case Specifics, 81 HEI

- Input: Budget (Plan 2011 in TL)
- Outcome: URAP indicator (publication and citation average per academic head) and WUR 2011 (research evaluation)
- *Correlation of research efficiency scores with size of teaching operations measured by number of students 2010*

# 4. Efficiency Analysis TR

Correlation Student  
Number: - 0,386

Efficiency Frontier  
Research Efficiency



Example Data

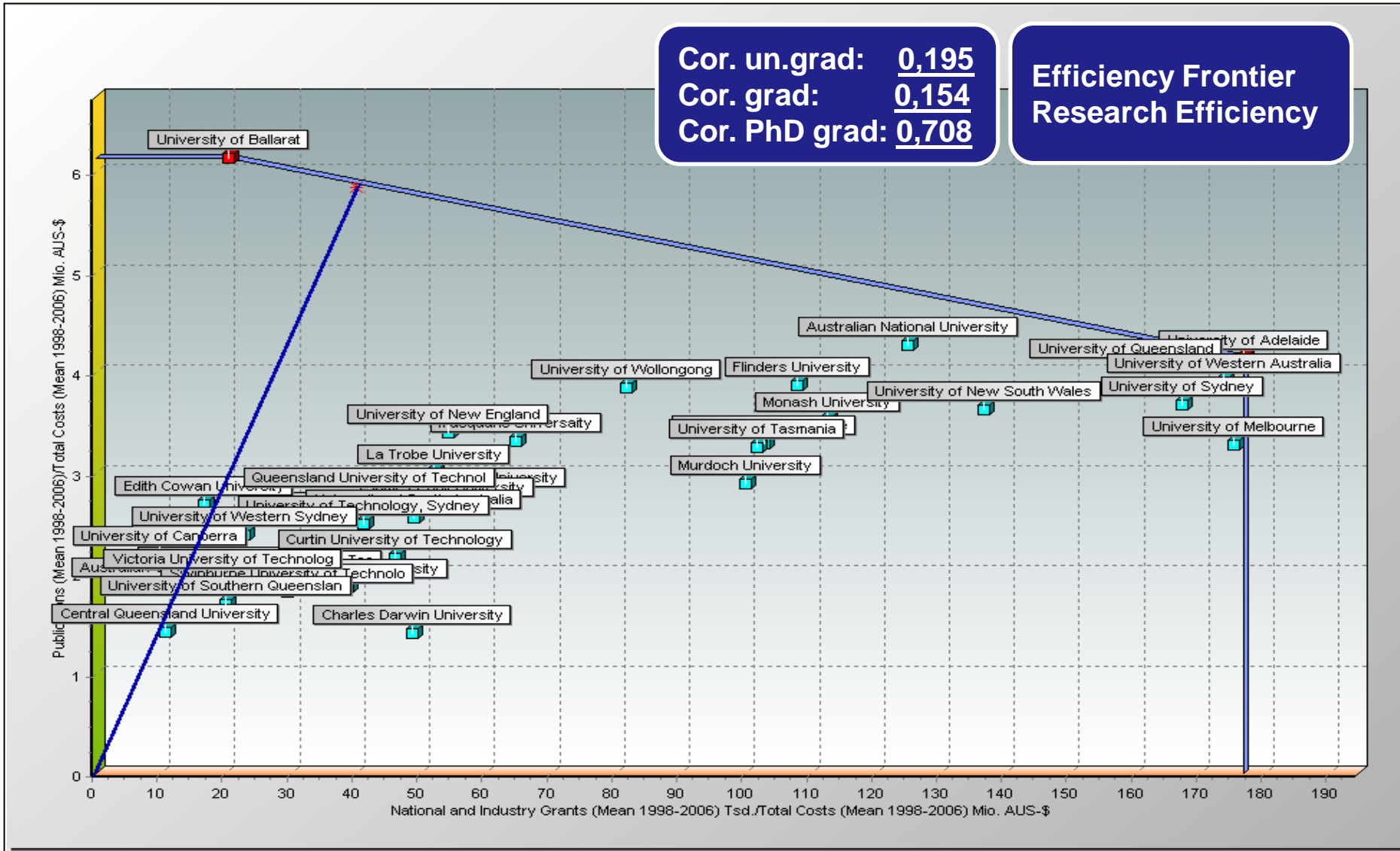
University	Efficiency Score Research	Students 2010
ABANT IZZET BAYSAL	22,90%	17.408
ADIAMAN	37,90%	9.617
ADNAN MENDERES	14,60%	24.419
AFYON KOCATEPE	17,10%	31.484
AHI EVRAN	43,90%	10.002
AKDENIZ	15,20%	25.188
AKSARAY	83,50%	6.753
AMASYA	75,70%	6.093
ANKARA	6,30%	41.791
ARTVIN CORUH	90,30%	2.441
ATATÜRK	8,00%	38.094
BALIKESIR	16,80%	29.526
BARTIN	66,50%	2.715
BATMAN	100,00%	2.629
BILECIK	71,00%	7.527
BITLIS EREN	98,00%	3.083
BOGAZI CI	24,80%	11.801
BOZOK	49,10%	7.209

## Background

- Competitive and international HE system with 36 universities
- Very high research and excellence orientation
- At the same time strategic orientation towards international student intake, mainly from Asia/China with study fees making up large parts of university budgets

## DEA Case Specifics, 36 HEI

- Input: Total costs (mean 1998-2006, source: Worthington and Higgs 2011, 395-404)
- Outcome: Publications (mean 1998-2006) and third party funding (national and industry grants, mean 1998-2006)
- *Correlation analysis with number of undergraduate, graduate and PhD completions (mean 1998-2006)*



University	Research Efficiency	Undergraduate Completions (Mean 1998-2006)	Graduate Completions (Mean 1998-2006)	PhD Completions (Mean 1998-2006)
Australian Catholic University	0,32	1905,89	1161,22	15,78
Australian National University	0,92	1940,29	1262,57	246,00
Central Queensland University	0,24	2409,67	1948,67	18,44
Charles Darwin University	0,31	517,22	308,67	17,44
Charles Sturt University	0,35	4791,89	2275,78	25,89
Curtin University of Technology	0,43	5807,67	1957,67	111,02
Deakin University	0,47	4551,67	2431,89	84,44
Edith Cowan University	0,45	3378,89	1486,11	49,78
Flinders University	0,82	2296,89	929,44	84,00
Griffith University	0,56	4580,56	1892,89	110,56
James Cook University	0,53	1600,56	467,33	72,78
La Trobe University	0,57	4346,67	2223,67	142,56
Macquarie University	0,65	3095,78	3053,78	102,00
Monash University	0,77	8454,11	3893,44	309,22
Murdoch University	0,65	2011,11	636,67	79,78
Queensland University of Technol	0,52	6006,22	2684,33	108,89
Royal Melbourne Institute of Tec	0,35	5168,33	1974,00	119,00
Southern Cross University	0,37	1656,78	652,33	41,56
Swinburne University of Technolo	0,34	1875,00	938,11	46,56
University of Adelaide	1,00	2808,11	1048,00	185,11
University of Ballarat	1,00	1065,56	723,67	12,00
University of Canberra	0,36	1737,00	1163,44	18,67
University of Melbourne	0,99	7242,11	3693,78	444,00
University of New England	0,64	1906,56	1271,67	77,33
University of New South Wales	0,84	4370,44	3964,67	337,78
University of Newcastle	0,72	3253,67	1324,22	102,33
University of Queensland	0,95	5581,89	2138,89	380,33
University of South Australia	0,50	4596,67	2258,78	116,44
University of Southern Queenslan	0,30	2170,44	1444,89	21,33
University of Sydney	0,95	6611,33	3127,44	411,00
University of Tasmania	0,71	2643,22	470,00	105,67
University of Technology, Sydney	0,47	4174,44	3775,22	75,44
University of Western Australia	0,98	2757,89	1015,67	187,78
University of Western Sydney	0,42	5812,23	2345,11	69,56
University of Wollongong	0,76	2369,44	1820,22	98,11
Victoria University of Technolog	0,35	2754,67	1560,89	46,22

Data

## Background

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- At the same time strategic orientation towards international student intake, mainly from Asia/China with study fees making up large parts of university budgets

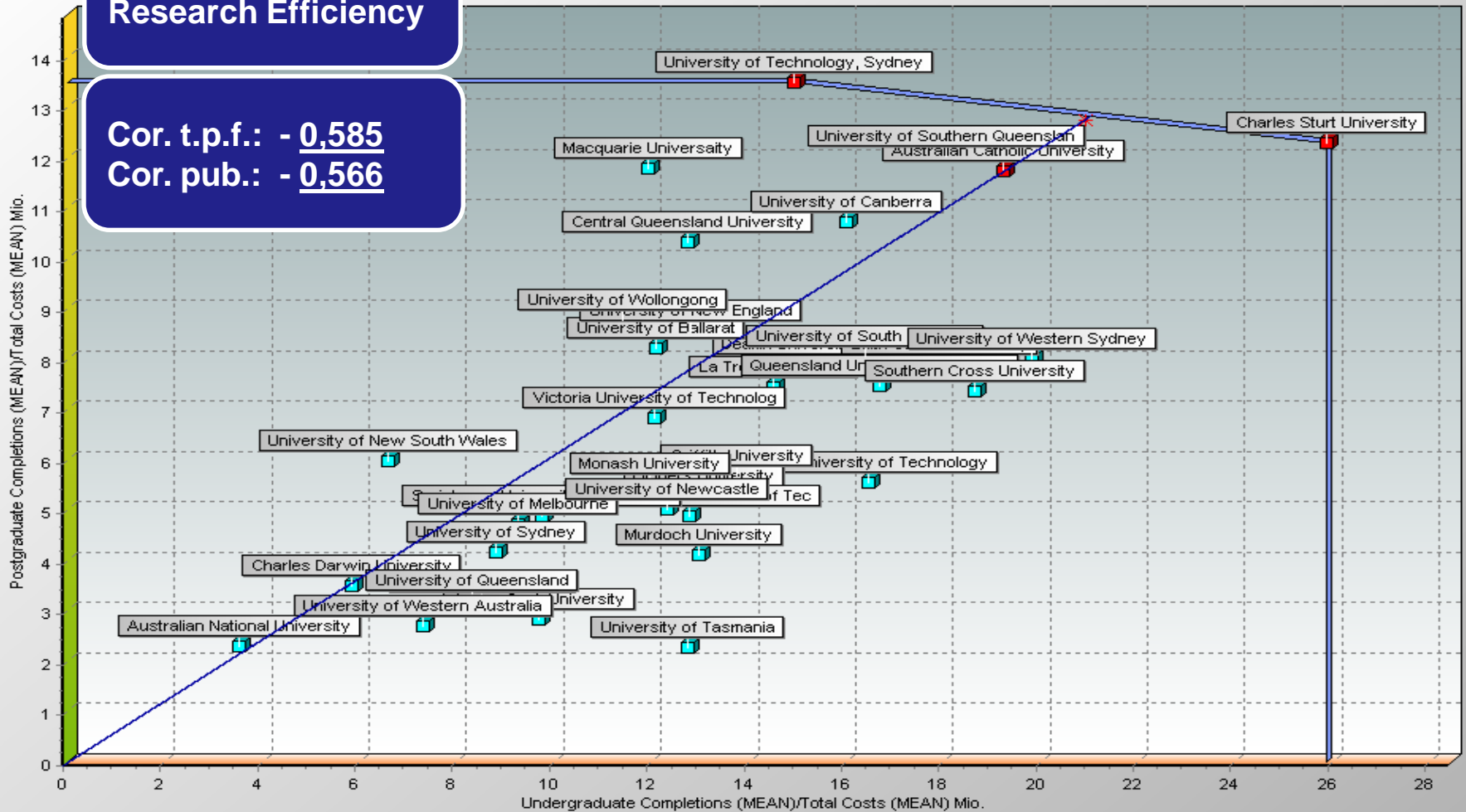
## DEA Case Specifics, 36 HEI

- Input: Total costs (mean 1998-2006, source: Worthington and Higgs 2011, 395-404)
- Outcome: graduates (undergraduate, graduate level, mean 1998-2006)
- *Correlation analysis with publications and third party funding (mean 1998-2006)*



Efficiency Frontier  
Research Efficiency

Cor. t.p.f.: - 0,585  
Cor. pub.: - 0,566



University	Teaching Efficiency	National and Industry Grants (Mean 1998-2006) Tsd.	Publications (Mean 1998-2006)
Australian Catholic University	91,40%	1284,81	185,7
Australian National University	17,70%	68808,11	2351,07
Central Queensland University	77,40%	2010,52	265,05
Charles Darwin University	27,30%	4299,27	122,91
Charles Sturt University	100,00%	3765,26	366,04
Curtin University of Technology	63,60%	16244,83	757,68
Deakin University	63,00%	11774,11	777,63
Edith Cowan University	69,30%	3136,73	504,05
Flinders University	50,50%	18990,25	680,41
Griffith University	53,20%	20564,03	921,95
James Cook University	37,40%	8916,42	441,21
La Trobe University	59,60%	15539,97	898,41
Macquarie University	87,30%	16759,41	858,81
Monash University	46,20%	79652,66	2485,8
Murdoch University	50,10%	15508,02	448,54
Queensland University of Technology	64,50%	15109,5	996,48
Royal Melbourne Institute of Tec.	49,40%	10390,98	783,47
Southern Cross University	72,10%	3428,1	164,7
Swinburne University of Technology	39,30%	5674,23	348,48
University of Adelaide	32,90%	58328,15	1366,3
University of Ballarat	63,00%	1786,84	541,16
University of Canberra	82,50%	1055,11	237,24
University of Melbourne	37,90%	137236,2	2567,9
University of New England	65,80%	8041,49	505,35
University of New South Wales	44,30%	90723,41	2405,62
University of Newcastle	47,60%	27177,5	868,01
University of Queensland	32,20%	106330,7	2712,41
University of South Australia	65,10%	13719,91	715,46
University of Southern Queensland	92,60%	2391,49	202,96
University of Sydney	34,00%	125695,3	2762,45
University of Tasmania	49,30%	21082,42	672,95
University of Technology, Sydney	100,00%	11514,22	695,67
University of Western Australia	28,20%	65653,55	1476,47
University of Western Sydney	76,60%	6653,24	698,13
University of Wollongong	66,30%	16944,93	798,15
Victoria University of Technolog	53,90%	4457,89	447,77

Data

### Economies of Scope for/towards Research

- Germany: Universities with higher student numbers have lower research efficiencies, correlation **-0,152**
- Turkey: Universities with higher student numbers have lower research efficiencies, correlation **-0,386**
- Australia: Graduates, especially PhD graduates with positive correlation with research efficiency (PhD: +0,708)
- Result: Higher qualified and successful teaching (completions) contributes to research efficiency, but not just student numbers

### Economies of Scope for/towards Teaching

- Australia: Diseconomies of Scope for Teaching Efficiency (-0,585 for third party funding and -0,565 for publications)
- Result: Research does largely hinder teaching efficiency

# Economies of Scope in Higher Education?

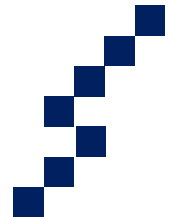
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Tagung Performance Management im Hochschulbereich

**Thank you for your attention.**



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