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Using Archetypoid Analysis to Classify Institutions and Faculties of Economics

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Using Archetypoid Analysis to Classify Institutions and Faculties of Economics

Abstract

We use archetypoid analysis as a new tool to categorize institutions and faculties of economics. The approach identifies typical characteristics of extreme (archetypal) values in a multivariate data set. Each entity under investigation is assigned relative shares of the identified archetypoid, which show the affiliation of the entity to the archetypoid. In contrast to its predecessor, the archetypal analysis, archetypoids *always* represent actual observed units in the data. The approach therefore allows to classify institutions in a rarely used way. While the method has been recognized in the literature, it is the first time that it is used in higher education research and as in our case for institutions and faculties of economics. Our dataset contains seven bibliometric indicators for 298 top-level institutions obtained from the RePEc database. We identify three archetypoids, which are characterized as the top-, the low- and the medium-performer. We discuss the assignment of shares of the identified archetypoids to the institutions in detail. As a sensitivity analysis we show how the classification changes when for four and five archetypoids are considered.

JEL-Codes: C380, I210, I230.

Keywords: archetypoid analysis, classification, RePEc, faculty of economics, economic institutions.

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Article Highlights:

- Archetypoid analysis to categorize institutions and faculties of economics
- Based on seven bibliometric indicators for 298 unites obtained from the RePEc database
- Identification of three archetypoids, which are characterized as the top-, the low- and the medium-performer

1. Introduction

The performance measurement of research institutions and universities takes up an increasing role in current policy discussions. While the associated debate on rankings and efficiency evaluations has been taken up in the scientific literature (Bolli et al. 2016, Gnewuch and Wohlrabe 2018, Gralka 2018) the underlying classification of institutions seems to have been largely neglected. However, a classification - a creation of a framework for diverse institutions - is one of the most challenging tasks a researcher can be confronted with (Hazelkorn 2007). A well-known, recurrently discussed grouping is the Carnegie Classification, which has served as a framework for American colleges and universities for more than 30 years (Pike and Kuh 2005). Although the system has its advantages, the framework is context specific and quite complex. Most researchers, especially if interested in a country without an already existing classification structure, require a simpler method for the classification of institutions. Even more so if sub-groups, as faculties, are the evaluation unit of interest.

We argue that archetypal analysis offers a suitable and straight-forward way to classify institutions based on observed data. The method was originally formulated by Cutler and Breiman (1994) and imitates the human tendency of representing a group of objects by its extreme elements (Davis and Love 2010, Epifanio 2016). The aim of the method is to find pure types (the archetypes) in such a way that the other observations are a mixture of them. Hence, archetypes can be seen as data-driven extreme points. This makes the approach an interesting tool for researches, in particular if policy recommendations are striven for. Computationally, the approach is data-driven, and requires the factors to be probability vectors: these make archetypal analysis a computationally demanding tool, yet brings better interpretability. However, the classic archetypal analysis has an important drawback: archetypes are a combination of the sampled units, but they are not necessarily observed institutions. This situation can cause interpretation problems for analysts. In order to address this limitation, a new archetypal concept was introduced: the archetypoid, which is a real (observed) archetypal case (Vinué et al. 2015). Thus, archetypoids allow an intuitive understanding of the results even for non-experts (Thurau et al. 2012).

Archetypal analysis has aroused the interest of researchers working in various fields, such as astrophysics (Chan et al. 2003), climate (Steinschneider and Lall 2015), machine learning (Morup and Hansen 2012, Seth and Eugster 2016), neuroscience (Hinrich et al. 2016), navigation (Feld et al. 2015) and sports (Seth and Eugster 2016). The same applies for the archetypoid analysis, which was used for the evaluation within fields such as astrophysics (Sun et al. 2017), sports (Vinué and Epifanio 2017) and the financial stock market (Moliner and Epifanio 2018). Building upon the study by Seiler and Wohlrabe (2013) who evaluate scientists, we look at economics faculties and institutions within the present study.[1] In contrast to the previous study, we employ the archetypoid instead of the archetypal analysis, given the more

[1] For simplicity we frequently refer to institutions of economics (instead of institutions and faculties) henceforth.

intuitive understanding of the former method. Parallel to the authors we employ RePEc (Research Papers in Economics) data for our study.

A short description of the method of analysis is provided in the next section, followed by an examination of the dataset. The presentation of the results is complemented by a sensitivity analysis that pays special attention to the number of archetypoids considered. A concluding section brings together the main findings and offers several suggestions for future research.

2. Methodology

In this section archetypal analysis, as the basis for identifying archetypoids, is outline first. Consider an $N \times m$ matrix, where $\boldsymbol{X}$ represents a multivariate data set with N observations (in our case faculties and institutions) and m characteristics (e.g. works, citations, downloads, etc.). For a given number of archetypes k, the algorithm finds the matrix $\boldsymbol{Z}$ by minimizing the residual sum of squares

$$\mathrm{RSS} = \left\| \mathrm{X} - \alpha \mathrm{Z}' \right\|_2 \tag{1}$$

where α denotes the coefficients of the archetypes with dimensions $N \times k$ and $\|\cdot\|_2$ the L_2 norm. Equation (1) is minimized subject to the following constraints

$$\alpha_{ij} \geq 0 \text{ and } \sum_{j=1}^{k} \alpha_{ij} = 1$$

for $\boldsymbol{i} = 1, \ldots N$. The k archetypes are then convex combinations of the data, i.e.

$$Z = X'\beta \tag{2}$$

Where β is an $N \times k$ matrix. The constrains

$$\beta_{ij} \geq 0 \text{ and } \sum_{j=1}^{k} \beta_{ij} = 1$$

are imposed for estimating equation (2). The last statement shows that the archetypes are convex combinations of the original data set $\boldsymbol{X}$. Equations (1) and (2) form the basis for the estimation algorithm: it alternates between finding the best α for given archetypes $\boldsymbol{Z}$ and finding the best archetypes for $\boldsymbol{Z}$ given $\boldsymbol{\alpha}$. Cutler and Breiman (1994) popularized this approach as alternating least squares.

A consequence of the approach outlined in equations (1) and (2) is that archetypes are not represented by real observed units in the data set. Vinué et al. (2015) proposed a slight modification of the original approach and introduced the term archetypoids. They proposed to modify the constrains for β in the following way

$$\sum_{j=1}^{k} \beta_{ij} = 1 \text{ with } \boldsymbol{\beta_{ij}} \in \{\mathbf{0}, \mathbf{1}\}, \text{ i.e. } \boldsymbol{\beta_{ij}} = \mathbf{1} \text{ for and only one } \boldsymbol{j} \text{ and}$$

$$\boldsymbol{\beta_{ij}} = \mathbf{0} \text{ otherwise.}$$

This condition ensures that Z must be a point in the dataset. Hence, archetypoids can be viewed as extreme points in the data.

A central question for the analysis concerns the optimal number of archetypoids for a given data set. In contrast to principal component analysis, archetypoid analysis allows to extract more archetypoids than dimensions of the data set. There is no formal rule for the determination. In praxis, usually the "elbow" criterion for the Residual Sum of Squares (RSS) curve, the so-called scree-plot, is applied. A "flattening" of the curve suggests a potential value of *k*. We are aware that this choice is arbitrary. We therefore suggest investigating several numbers of archetypoids and to take a look on the concrete interpretation of each. Our experience is the more archetypoids are considered the more similar some archetypoids become.

For a detailed description of archetypoid analysis including computational issues , we refer to Vinué et al. (2015). We extract the archetypoids using the R package *Anthropometry* version 1.13 by Vinué (2017). As our indicators (described in the next section) exhibit different scales we standardize them prior to determining the archetypoids. We do so by subtracting the mean and dividing by the standard deviation.

3. Data

We illustrate archetypoid analysis using a large data set of institutions and faculties of economics from the RePEc (Research Papers in Economics) website (http://www.repec.org). In socio-economic sciences RePEc has become an essential source for the spread of knowledge and ranking of individual authors and academic institutions.[2] RePEc is based on the active participation principle, that is authors, institutions and publishers register and provide information to the network. This approach has the main advantage that a clear assignment of works and citations to authors and articles is possible without any problems of name disambiguation. Each registered author sets a share by which he or she is affiliated with an institution. In case of no self-setting, RePEc calculates shares based on the other affiliated members of the institution. The scores are allocated to the corresponding institution accordingly. In the following, we call these accumulated author shares full-time equivalents (FTE), given that an institution with 10 authors, who all identify themselves with 80%, would have the same accumulated author share (or FTE) as an institution with 8 authors who all identify with 100%.

[2] RePEc data has been used in bibliometric research in Rath and Wohlrabe (2016), Gnewuch and Wohlrabe (2018), Hsieh et al. (2018) or Bornmann and Wohlrabe (2019) among others.

RePEc has become quite a success, as of December 2019 there were 2.8 million pieces of research from 3,200 journals and 5,000 working paper series. Additionally, more than 55,000 authors and 14,000 institutions from 101 countries are listed on the website.

RePEc currently offers 37 rankings for institutions and faculties based on bibliometric data which are shown in Table 1. There are five main categories: number of (published) works, citations, citing authors, journal pages, and RePEc access statistics. Each of these main categories can be combined with different weighting schemes: simple or recursive impact factors, number of authors and combinations of them. In the category "distinct number of works" different versions of a paper are counted only once. Published work is counted only if, first the publisher provides the meta data to RePEc and second, the author assigns the work to his/her account. Table 1 reveals that there is a focus on citations both directly and indirectly. In 14 rankings, citations are counted with quality and time adjustments. Moreover, citations matter indirectly through the different impact factors. The simple impact factor captures the quality level of a journal and is similarly defined as the impact factor published by Thomson Reuters Journal Citation Reports.

Table 1: Bibliometric output measures in RePEc for institutions based on individual author scores

		Without weighting	Simple Impact Factor	Recursive Impact Factor	Number of Authors	Number of Authors + Simple Impact Factor	Number of Authors + Recursive Impact Factor
Works	Overall	X					
	Distinct	X	X	X	X	X	X
Citations	Overall	X	X	X	X	X	X
	Discounted by citation year	X	X	X	X	X	X
Citing Authors	Overall	X					
	Weighted by authors rank	X					
Journal Pages		X	X	X	X	X	X
NEP Cites		X					
Closeness		X					
Betweenness		X					
h-Index		X					
Euclidian Index		X					
Strength of Students		X					
Access via RePEc	Abstract Views	X			X		
	Downloads	X			X		

We downloaded the 37 publicly available rankings from the RePEc website in early December 2019, where the data refers to the November ranking. For these rankings only the top 5% of world-wide institutions are shown. The bibliometric scores are highly correlated, as shown by Zimmermann (2013) and Seiler and Wohlrabe (2013) in case of authors and by Gnewuch and Wohlrabe (2018) for economic institutions and faculties. We therefore follow the idea of Seiler and Wohlrabe (2013) and use only a subset of the 37 rankings which can be captured in four groups. These are the following seven ones:

- Published work, which includes working papers, books, software codes, and chapters
  - Number of distinct works, unweighted
  - Number of distinct works, weighted by simple impact factor
- Citations, which represent the impact of an author
  - Number of citations, unweighted
  - Number of citations, weighted by the simple impact factor
- Pages, which accounts for the published articles
  - Number of pages, unweighted
  - Number of pages, weighted by the simple impact factor
- Number of downloads, which shows the access

For each of our m = 7 bibliometric indicators we collected the corresponding institutions and faculties where the scores were publicly available. We ended up with N = 298 which can be found in the Appendix, Table 5. The list comprises both faculties (as for example the Economics department at the MIT), institutions (ifo Institute), central banks (ECB) or scientific networks (NBER).

The descriptive statistics for the original and normalized indicators can be found in Table 2. On average 77 scientists are employed at a faculty or university. The corresponding full-time equivalent (FTE) is with about 60 people slightly lower. The largest institute is the research network Institute of Labor Economics (IZA) and the smallest the economics faculty is located at the Johns Hopkins University, with respectively 902 and 19 affiliated economists. An average economics institution has published around 1,700 articles, which contain around 16,500 pages in (refereed) journals and were downloaded around 8,900 times. The typical institution has received around 26,900 citations. It is thereby important to bear in mind, that the numbers describe stock levels (up to November 2019), which explains the high values of the indicators. Even though a comparison to the previous literature is difficult, since we consider stocks (instead of flows) of faculties (instead of universities), the values seem to be in line with the literature. Using the number of publications in efficiency evaluations, Bolli et al. (2016) assume that European universities publish around 800 articles per year, while Gralka, Wohlrabe and Bornmann (2019) consider that German universities produces around 1,000 articles per year. Evaluating German faculties of economics in particular Sternberg and Litzenberger (2005)

show that the largest faculty, the faculty of economics at the University Mannheim, produces around 300 articles and receive around 500 citations over a time span of 10 years (1993 to 2002). The smaller, more average institutions, as the faculty of economics at the University Frankfurt, produces around 100 articles and receive around 100 citations in the same time period. It has to be noted, that the use of stocks instead of flows might bias the results or be even graded as unfair. RePEc unfortunately does not provide flow data. If one researcher changes its employer he or she takes his/her full publication history to the new institution. This favors the new institution and downgrades the previous one. However, economists or scientists in general often change institutions over the work life. It might be a realistic assumption that all institutions in our sample are affected in both ways: positively and negatively. Nevertheless, it is not possible to determine the net effect.

To account for the size of institutions, which influences their productivity (as shown by Worthington and Higgs, 2011, Wolszczak-Derlacz and Parteka, 2011 and Johnes and Johnes, 2016), we normalize the indicators by the number of FTE. Without normalization the identified archetypoids would reflect mostly the size of the institutions. Large institutions produce more articles and potentially receive more citations and would therefore define the extreme values in the data. Hence, the second part of Table 2 shows the normalized indicators which are used in the analysis. Within an average institution of economics around 32 articles per capita are published, which contain around 322 pages in (refereed) journals and were downloaded around 172 times (again per capita). Per FTE the typical institution has received around 570 citations. It is thereby important to bear in mind again, that these numbers describe stock levels and that the per capita view concerns the number of current FTE.

Table 2: Descriptive statistics

298 Observations	**Mean**	**Std. Dev.**	**Min**	**Max**
Absolut				
Number of Distinct Works	1704.62	1212.26	662.21	11623.95
-, Weighted by Simple Impact Factor	31015.22	27596.89	7340.26	223360.84
Number of Citations	26925.12	29890.69	5741.35	248982.71
-, Discounted by Citation Age	6007.97	6380.96	1366.55	49248.27
Number of Pages	16484.67	10555.85	6443.01	90451.84
-, Weighted by Simple Impact Factor	278398.41	252671.95	65909.15	1936830.56
Number of Downloads	8882.81	7595.53	2782.43	65784.85
N	76.71	80.80	19.00	902.00
Full-time Equivalents	59.61	51.82	13.59	473.62
Normalized				
Number of Distinct Works	31.96	11.80	7.90	76.23
-, Weighted by Simple Impact Factor	651.45	528.10	39.05	3344.34
Number of Citations	570.04	595.23	26.49	4158.03
-, Discounted by Citation Age	124.24	121.21	6.10	822.45
Number of Pages	321.85	132.86	71.71	774.08
-, Weighted by Simple Impact Factor	5996.28	5227.81	308.04	33123.79
Number of Downloads	171.15	105.35	19.58	724.75

4. Results

Given the seven indicators for each institution it is not obvious how many archetypoids are reasonable. The elbow criterion, is supposed to help to extract a clear cut-off point. In Figure 1 we show the corresponding scree-plot of the RSS, which is used to determine the number of archetypoids to retain. Based on the scree-plot we perform an analysis with three potential archetypoids. However, since a potential flattening can also be detected for 4 and 5 archetypoids we discuss how the results change, if more archetypoids are considered, in the subsequent section five.

Figure 1: RSS-plot

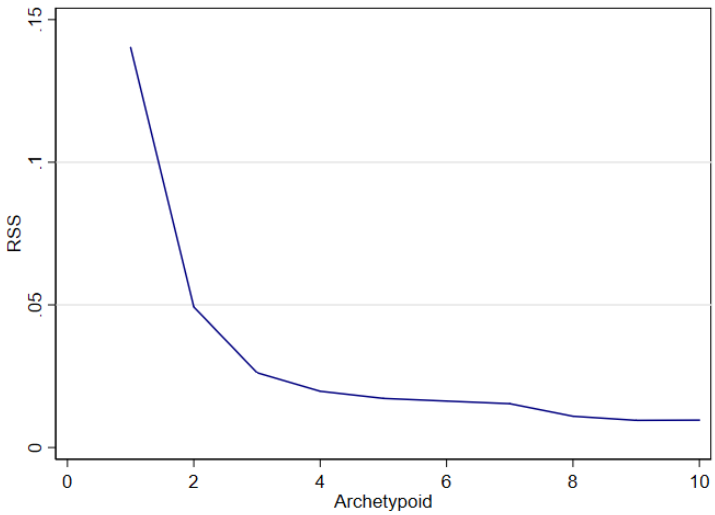
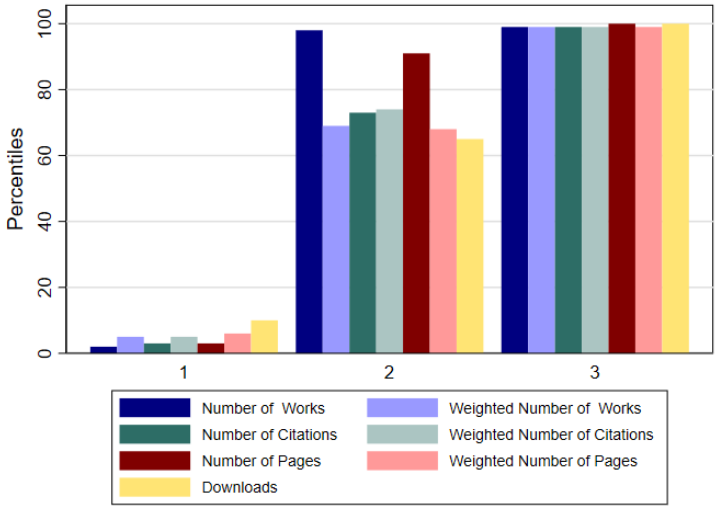


Figure 2 shows the bar-plots representing percentiles for three archetypoids. Bar-plots thereby serves as a different graphical representation of the convex hull. The height of each bar-plot denotes the share of the convex hull relative to the maximum in the category. Hence, the y-axis denotes the relevance of the indicator for the archetype. Table 3 provides additional context for the percentiles shown in Figure 2. The table reports the archetypal value for each bibliometric indicator, when the reported percentiles are applied to the original (normalized) dataset. To give an example: while Archetypoid 1 published 14 works, Archetypoid 2 published 60 articles.

The three archetypoids can be interpreted as follows:

- Archetypoid 1 represent the low performer with a relatively low number of working papers and articles (14), citations (101) and downloads (81).
- Archetypoid 3 denotes the excellent performer among the top-level institutions, given the other archetypoids. The institution performs well in all indicators, even if the indicators are quality weighted. Table 3 show that the corresponding values for each indicator are at least five times larger than the those for Archetypoid 1. In the case of citations, it is even more than 26 times larger.
- Archetypoid 2 denotes institutions between the previous two extremes, with a relatively high number of published work and pages. Nevertheless, both figures are smaller than for Archetypoid 3. In addition, compared to Archetypoid 3, the quality adjusted indicators are clearly lower as well as the citations and downloads. Still, they are larger than the figures of Archetypoid 1. The quantity dominates somewhat the quality of publications. Table 3 shows that the corresponding scores of Archetypoid 2 are substantially lower than those of Archetypoid 3 but are not as small as for Archetypoid 1.

Figure 2: Three archetypoids



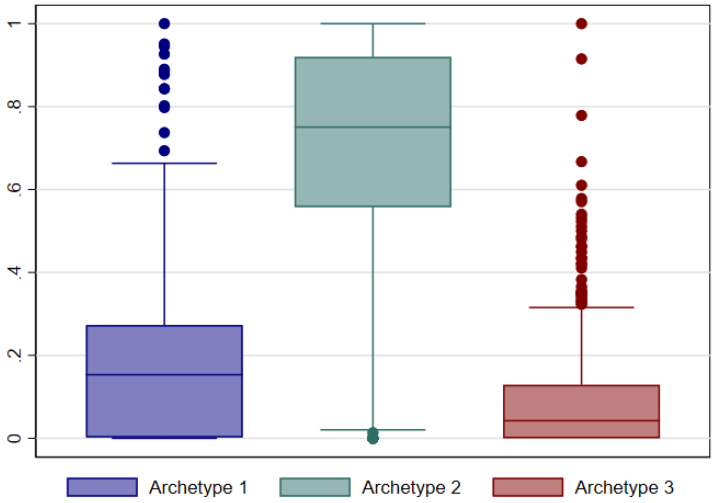
Nevertheless, as we extracted the best economic institutions from RePEc, the terminus low performer for the first archetypoid must be interpreted cautiously. Compared to all institutions listed in RePEc every institution in our sample can be classified as top, nevertheless, compared among each other some perform worse than other ones.

Table 3: Corresponding percentile values

	Number of Works	Weighted Number of Works	Number of Citations	Weighted Number of Citations	Number of Pages	Weighted Number of Pages	Downloads
1	14	153	101	30	128	1240	81
2	60	698	591	133	511	6297	165
3	64	2616	2713	587	774	24014	725

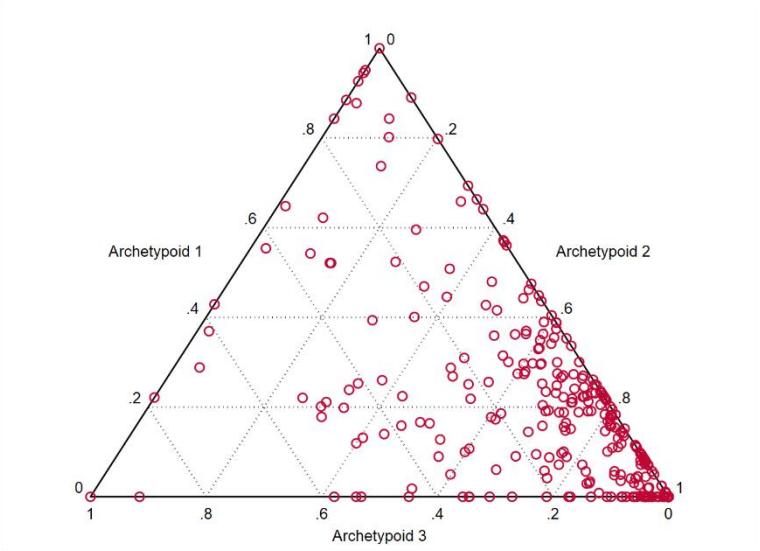
Besides the aggregated analysis it is also possible to look at the relative share of each archetypoid for each institution. In practice, percentages of all three archetypoids are allocated to the institutions. This implies, that each institution is assigned three values, which add up to one. In Figure 3 we show the box-plots for all percentage shares of the three identified archetypoids. It displays that most of the institutions in our data set are characterized by Archetype 2, the medium-performer, as it represents the largest relative shares. In comparison, the Archetype 1, the low performer, is less frequent. Of particular interest is the third archetypoid, the top-performer. As one would suspect, the majority of institutions in our sample have a low share of this archetypoid and only some – the true top-performer – are assigned a large share of this archetypoid.

Figure 3: Barplots of archetypoid shares allocated to the institutions



In addition to the more general view at the percentage shares of the three identified archetypoids, it also interesting to look at the association of single institutions to the three archetypoids. Figure 4 displays the allocation of each institutions to the identified types within a ternary plot. The edges of the triangle denote the shares and each circle denotes one institution. The diagram confirms that the Archetypoid 2 is the most frequent one. But is also shows that many institutions are a mixture of Archetypoid 1 and 2. The portion of Archetype 3 is often very small (see also Table 5).

Figure 4: Ternary plot of the three archetypoids



In Table 4 we report the top five institutions for each archetypoid, i.e. institutions with the largest relative share for the respective archetypoid. The values for each institution of the sample can be found in the Appendix in Table 5. A value of 1.000 denotes that the respective institution represents the identified archetypoid perfectly. By assumption, this is the case for at least one institution for all three archetypoids. The faculty of economics at the Massachusetts Institute of Technology (MIT) represents the Archetypoid 3, the top-performer. In contrast, the

Department of Agricultural and Resource Economics at the University of California-Davis represents the Archetypoid 1, the low-performer. More than one institution, to be precise 34 institutions, represent the medium-performer, which is plausible since the type is most common among the three archetypoids. Nevertheless, in most cases, institutions are a mixture of the three different archetypoids.

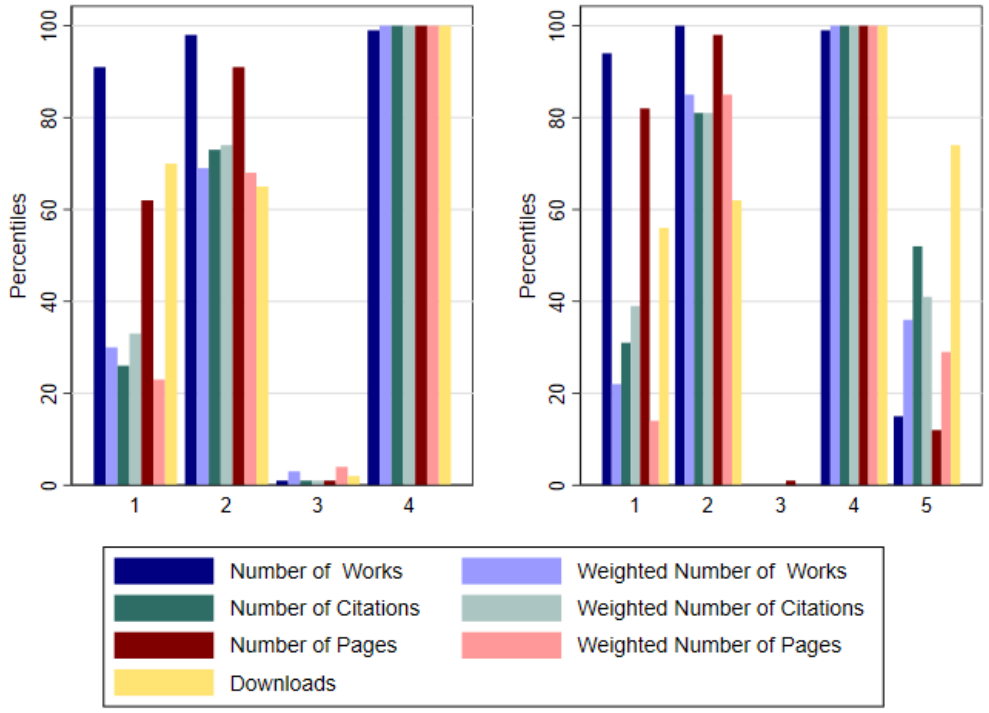
Table 4: Top five archetypoid shares

Archetypoid	1	2	3
Department of Agricultural and Resource Economics, Univ. of California-Davis	**1.000**	0.000	0.000
Sciences économiques, Sciences Po	**0.951**	0.000	0.049
Econometrisch Instituut, Erasmus Universiteit Rotterdam	**0.945**	0.000	0.055
Dyson School of Applied Economics and Management, Cornell University	**0.927**	0.000	0.074
KOF Swiss Economic Institute, Eidgenössische Techn. Hochschule Zürich (ETHZ)	**0.890**	0.110	0.000
Organisation de Coopération et de Développement Économiques (OCDE)	0.000	**1.000**	0.000
Banca dItalia	0.000	**1.000**	0.000
National Research University Higher School of Economics	0.000	**1.000**	0.000
Banque de France	0.000	**1.000**	0.000
Banco de España	0.000	**1.000**	0.000
Economics Department, Massachusetts Institute of Technology (MIT)	0.000	0.000	**1.000**
Department of Economics, Harvard University	0.000	0.085	**0.915**
Department of Economics, University of California-Berkeley	0.221	0.000	**0.779**
National Bureau of Economic Research (NBER)	0.288	0.045	**0.667**
Finance and Economics Department, Graduate School of Business, Columbia Univ.	0.369	0.020	**0.610**

5. Sensitivity Analysis

Since the scree-plot of Figure 1 showed that the number of archetypoids is arbitrary, we show what happens if we consider 4 or 5 archetypoids instead of 3. This addition not only shows the robustness of the results, but also provides some additional insights. Figure 5 displays that the already classified archetypoids 1 to 3 seem to remain, even if more classes are allowed. Moreover, we see, that the inclusion of a fourth archetypoid, allows to distinguish between two medium-performers: the ones which appear agreeable when the absolute numbers are assessed (Archetypoid 1) and the ones which hold their performance also when the output is weighted (Archetypoid 2). Similarly, the inclusion of fifth archetypoid allows to distinguish between the true low-performer (Archetypoid 3) and faculties that have a larger outreach, indicated in particular by the number of downloads (Archetypoid 5).

Figure 5: Barplots representing four and five archetypoids



6. Conclusions

In this paper we introduced archetypoid analysis to the evaluation of institutions and faculties of economics. We argue that the method offers a suitable and straight-forward way to classify institutions based on observed data. The analysis allows to extract typical characteristics (archetypoids) within a multivariate data set. We evaluate 298 economic institutions obtained from the RePEc database. We have seven bibliometric scores for each institution, spanning over various measures of (quality-weighted) number of published work, citations and access statistics.

We identified three main archetypoids, which are characterized as top- and low-performer and the institutions between these two extremes. The results are robust for the allowance of additional archetypoids. We must mention two caveats for our analysis. Firstly, we employ stock levels for the classification. While this is a typical approach for the creating of rankings, it has obvious disadvantages. For instance, institutions profit from the whole publication record of their scientists, even though some of the work could have been done at a previous institution. Secondly, our set of economic institutions and faculties are quite heterogeneous. We focus on research related indicators and leave out aspects as teaching which might influence our analysis. Thus, future research should include further characteristics of science, as teaching and the acquisition of grants, among others.

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Appendix

Table 5: Considered institutions and their shares in each archetypoid

Institution	Archetypoid Shares 1	2	3
Abteilung für Volkswirtschaftslehre, Universität Mannheim	0.000	0.960	0.040
Adam Smith Business School, Univ. of Glasgow	0.119	0.859	0.022
Anderson Graduate School of Management, Univ. of California-Los Angeles (UCLA)	0.164	0.505	0.331
Andrew Young School of Policy Studies, Georgia State Univ.	0.173	0.813	0.014
Argyros School of Business and Econ., Chapman Univ.	0.275	0.670	0.055
Athens Univ. of Econ. and Business (AUEB)	0.087	0.913	0.000
Banca dItalia	0.000	1.000	0.000
Banco de España	0.000	1.000	0.000
Bank for International Settlements (BIS)	0.072	0.775	0.154
Bank of Canada	0.000	1.000	0.000
Bank of England	0.000	1.000	0.000
Banque de France	0.000	1.000	0.000
Barcelona Graduate School of Econ. (Barcelona GSE)	0.057	0.878	0.065
Booth School of Business, Univ. of Chicago	0.000	0.422	0.578
Brookings Institution	0.521	0.156	0.323
Business School, Deakin Univ.	0.110	0.890	0.000
Business School, Imperial College	0.151	0.755	0.094
Business School, Univ. of Exeter	0.000	1.000	0.000
Business School, Univ. of Technology Sydney	0.000	1.000	0.000
Cardiff Business School, Cardiff Univ.	0.098	0.902	0.000
Carol Martin Gatton College of Business and Econ., Univ. of Kentucky	0.109	0.848	0.043
Cass Business School, City Univ.	0.148	0.748	0.105
Census Bureau, Department of Commerce, Government of the United States	0.000	0.983	0.017
Center for Operations Research and Econometrics (CORE), Univ. Catholique Louvain	0.843	0.095	0.062
Central Univ. of Finance and Econ. (CUFE)	0.000	1.000	0.000
Centre de Recherche en Économie et Statistique (CREST)	0.266	0.681	0.052
Centre dÉconomie de la Sorbonne, Univ. Paris 1 (Panthéon-Sorbonne)	0.000	1.000	0.000
Centre for Economic Performance (CEP), London School of Econ. (LSE)	0.198	0.339	0.462
Centre for Economic Policy Research (CEPR)	0.554	0.027	0.419
Centro Studi di Economia e Finanza (CSEF)	0.000	0.927	0.073
Centrum voor Economische Studiën, KU Leuven	0.330	0.610	0.060
CESifo	0.878	0.021	0.101
Charles H. Dyson School of Applied Econ. and Management, Cornell Univ.	0.927	0.000	0.074
College of Business and Behavioral Science, Clemson Univ.	0.026	0.936	0.038
College of Business and Econ., Australian National Univ.	0.223	0.740	0.037
Copenhagen Business School	0.024	0.976	0.000
Crawford School of Public Policy, Australian National Univ.	0.389	0.611	0.000
de Nederlandsche Bank	0.000	1.000	0.000
Departament dEconomia i Empresa, Univ. Pompeu Fabra	0.000	0.920	0.080
Departament dEconomia i Història Econòmica, Univ. Autònoma de Barcelona	0.136	0.855	0.009
Departamento de Economía, Facultad de Economía y Negocios, Universidad de Chile	0.300	0.695	0.004
Departamento de Economía, Universidad Carlos III de Madrid	0.111	0.858	0.032
Département Sciences Sociales, Institut National de la Recherche Agronomique	0.078	0.922	0.000
Department of Agricultural and Resource Econ., Univ. of California-Berkeley	0.843	0.000	0.157
Department of Agricultural and Resource Econ., Univ. of California-Davis	1.000	0.000	0.000

Department of Agricultural Econ., Purdue Univ.	0.568	0.432	0.000
Department of Agricultural, Food and Resource Econ., Michigan State Univ.	0.561	0.439	0.000
Department of Applied Econ., Univ. of Minnesota-St. Paul	0.388	0.612	0.000
Department of Commerce, Government of the United States	0.000	0.997	0.003
Department of Econometrics and Business Statistics, Monash Univ.	0.462	0.527	0.011
Department of Econ. and Related Studies, Univ. of York	0.157	0.820	0.022
Department of Econ., Adam Smith Business School, Univ. of Glasgow	0.191	0.771	0.038
Department of Econ., Andrew Y. School of Policy Studies, Georgia State Univ.	0.183	0.798	0.019
Department of Econ., Boston College	0.095	0.724	0.182
Department of Econ., Boston Univ.	0.107	0.602	0.291
Department of Econ., Business School, Deakin Univ.	0.261	0.739	0.000
Department of Econ., Carleton Univ.	0.094	0.906	0.000
Department of Econ., Cornell Univ.	0.622	0.091	0.287
Department of Econ., Duke Univ.	0.186	0.617	0.197
Department of Econ., Faculty of Business and Econ., Univ. of Melbourne	0.218	0.782	0.000
Department of Econ., George Washington Univ.	0.000	0.963	0.037
Department of Econ., Harvard Univ.	0.000	0.085	0.915
Department of Econ., Hebrew Univ. of Jerusalem	0.101	0.768	0.131
Department of Econ., Iowa State Univ.	0.693	0.307	0.000
Department of Econ., Johns Hopkins Univ.	0.542	0.109	0.348
Department of Econ., Management School, Lancaster Univ.	0.115	0.885	0.000
Department of Econ., Maxwell School, Syracuse Univ.	0.508	0.367	0.124
Department of Econ., McGill Univ.	0.370	0.569	0.061
Department of Econ., McMaster Univ.	0.182	0.811	0.007
Department of Econ., Monash Business School, Monash Univ.	0.349	0.603	0.048
Department of Econ., National Univ. of Singapore (NUS)	0.045	0.924	0.030
Department of Econ., New York Univ. (NYU)	0.018	0.547	0.435
Department of Econ., Northwestern Univ.	0.000	0.655	0.345
Department of Econ., Ohio State Univ.	0.204	0.680	0.116
Department of Econ., Oxford Univ.	0.071	0.815	0.113
Department of Econ., Pennsylvania State Univ.	0.173	0.614	0.213
Department of Econ., Princeton Univ.	0.000	0.468	0.532
Department of Econ., Rutgers Univ.-New Brunswick	0.428	0.470	0.102
Department of Econ., School of Arts and Sciences, Columbia Univ.	0.221	0.257	0.523
Department of Econ., Sciences économiques, Sciences Po	0.287	0.480	0.233
Department of Econ., Simon Fraser Univ.	0.211	0.728	0.061
Department of Econ., Stanford Univ.	0.119	0.400	0.480
Department of Econ., Sussex Business School, Univ. of Sussex	0.155	0.830	0.015
Department of Econ., Texas A&M Univ.	0.297	0.616	0.086
Department of Econ., Tufts Univ.	0.231	0.690	0.079
Department of Econ., Univ. College London (UCL)	0.060	0.672	0.268
Department of Econ., Univ. of Alberta	0.000	1.000	0.000
Department of Econ., Univ. of Birmingham	0.213	0.755	0.032
Department of Econ., Univ. of Calgary	0.162	0.818	0.020
Department of Econ., Univ. of California-Berkeley	0.221	0.000	0.779
Department of Econ., Univ. of California-Irvine	0.315	0.556	0.129
Department of Econ., Univ. of California-Los Angeles (UCLA)	0.090	0.691	0.219
Department of Econ., Univ. of California-Riverside	0.223	0.742	0.034
Department of Econ., Univ. of California-San Diego (UCSD)	0.000	0.644	0.356
Department of Econ., Univ. of California-Santa Barbara (UCSB)	0.401	0.360	0.239

Department of Econ., Univ. of Chicago	0.000	0.551	0.449
Department of Econ., Univ. of Colorado	0.156	0.741	0.103
Department of Econ., Univ. of Connecticut	0.215	0.785	0.000
Department of Econ., Univ. of Maryland	0.178	0.604	0.218
Department of Econ., Univ. of Minnesota	0.000	0.830	0.170
Department of Econ., Univ. of Notre Dame	0.000	0.900	0.100
Department of Econ., Univ. of Oregon	0.234	0.671	0.095
Department of Econ., Univ. of Pennsylvania	0.239	0.328	0.433
Department of Econ., Univ. of Pittsburgh	0.000	0.965	0.035
Department of Econ., Univ. of Sheffield	0.070	0.930	0.000
Department of Econ., Univ. of Southern California	0.269	0.492	0.239
Department of Econ., Univ. of Texas-Austin	0.000	0.919	0.081
Department of Econ., Univ. of Toronto	0.097	0.766	0.136
Department of Econ., Univ. of Virginia	0.088	0.750	0.162
Department of Econ., Univ. of Warwick	0.188	0.717	0.095
Department of Econ., Univ. of Western Ontario	0.252	0.655	0.092
Department of Econ., Vanderbilt Univ.	0.737	0.134	0.129
Department of Econ., W.P. Carey School of Business, Arizona State Univ.	0.191	0.692	0.117
Department of Econ., Waikato Management School, Univ. of Waikato	0.641	0.359	0.000
Department of Econ., Washington Univ. in St. Louis	0.256	0.561	0.183
Department of Geography and Environment, London School of Econ. (LSE)	0.524	0.266	0.210
Department of Management, Technology and Econ., ETHZ	0.475	0.525	0.000
Department Volkswirtschaftlehre, Universität Bern	0.189	0.750	0.061
Deutsche Bundesbank	0.000	1.000	0.000
Dipartimenti e Istituti di Scienze Economiche, Università Cattolica del Sacro Cuore	0.082	0.918	0.000
Dipartimento di Economia "Ettore Bocconi", Università Commerciale Luigi Bocconi	0.158	0.703	0.139
Dipartimento di Economia e Finanza, Libera Università Internazionale (LUISS)	0.231	0.758	0.011
Dipartimento di Economia e Finanza, Università Cattolica del Sacro Cuore	0.236	0.764	0.000
Dipartimento di Economia e Finanza, Università degli Studi di Roma "Tor Vergata"	0.264	0.719	0.017
Dipartimento di Economia e Statistica "Cognetti de Martiis", Università di Torino	0.337	0.663	0.000
Dipartimento di Economia, Management e Metodi Quantitativi, Università di Milano	0.000	1.000	0.000
Dipartimento di Economia, Università Ca Foscari Venezia	0.011	0.989	0.000
Dipartimento di Scienze Economiche "Marco Fanno", Università degli Studi di Padova	0.081	0.919	0.000
Dipartimento di Scienze Economiche, Alma Mater Studiorum - Università di Bologna	0.221	0.779	0.000
DIW Berlin (Deutsches Institut für Wirtschaftsforschung)	0.798	0.202	0.000
Düsseldorf Institute for Competition Econ., Heinriche-Heine-Univ. Düsseldorf	0.000	1.000	0.000
École dÉconomie dAix-Marseille, Aix-Marseille Univ.	0.152	0.848	0.000
École des Sciences Économiques de Louvain, Univ. Catholique de Louvain	0.443	0.527	0.030
Econometrisch Instituut, Erasmus Universiteit Rotterdam	0.945	0.000	0.055
Economic Research Department, Federal Reserve Bank of Atlanta	0.416	0.495	0.089
Economic Research Department, Federal Reserve Bank of Chicago	0.048	0.882	0.070
Economic Research Department, Federal Reserve Bank of Dallas	0.341	0.626	0.032
Economic Research Service, , Government of the United States	0.112	0.888	0.000
Economic Research, Federal Reserve Bank of San Francisco	0.469	0.343	0.188
Econ. Department, Brown Univ.	0.000	0.655	0.345
Econ. Department, Dartmouth College	0.253	0.337	0.411
Econ. Department, Georgetown Univ.	0.310	0.492	0.199
Econ. Department, London School of Econ. (LSE)	0.000	0.691	0.309
Econ. Department, Massachusetts Institute of Technology (MIT)	0.000	0.000	1.000
Econ. Department, Michigan State Univ.	0.058	0.756	0.186

Econ. Department, Organisation de Coopération et de Développement Économiques	0.072	0.917	0.012
Econ. Department, Queens Univ.	0.274	0.613	0.113
Econ. Department, Stern School of Business, New York Univ. (NYU)	0.260	0.375	0.365
Econ. Department, Univ. of California-Davis	0.218	0.548	0.233
Econ. Department, Univ. of California-Santa Cruz (UCSC)	0.596	0.265	0.139
Econ. Department, Univ. of Essex	0.041	0.914	0.045
Econ. Department, Univ. of Michigan	0.042	0.769	0.189
Econ. Department, Univ. of Missouri	0.296	0.601	0.103
Econ. Department, Univ. of Strathclyde	0.273	0.699	0.028
Econ. Department, Univ. of Wisconsin-Madison	0.166	0.487	0.346
Econ. Department, Yale Univ.	0.211	0.302	0.486
Econ. Discipline Group, Business School, Univ. of Technology Sydney	0.000	1.000	0.000
Econ. Research, World Bank Group	0.301	0.573	0.127
Econ., New York Univ. Abu Dhabi	0.188	0.725	0.087
Eitan Berglas School of Econ., Tel Aviv Univ.	0.521	0.153	0.325
Ekonomihögskolan, Lunds Universitet	0.000	1.000	0.000
European Central Bank	0.000	0.961	0.039
European Centre for Advanced Research in Econ. and Stat., Univ. Libre de Bruxelles	0.300	0.657	0.043
Fachbereich Wirtschaftswissenschaft, Freie Universität Berlin	0.131	0.847	0.022
Fachbereich Wirtschaftswissenschaft, Goethe Universität Frankfurt am Main	0.045	0.938	0.017
Facoltà di Economia "Giorgio Fuà", Università Politecnica delle Marche	0.000	1.000	0.000
Facoltà di Economia, Università degli Studi di Roma "Tor Vergata"	0.010	0.990	0.000
Facultad de Economía y Empresa, Universidad del País Vasco – E. H. Unibertsitatea	0.000	1.000	0.000
Facultad de Economía y Negocios, Universidad de Chile	0.183	0.817	0.000
Facultad de Economía, Universidad de València	0.084	0.916	0.000
Facultat dEconomia i Empresa, Univ. de Barcelona	0.000	1.000	0.000
Faculté de droit, déconomie et de finance, Univ. du Luxembourg	0.057	0.943	0.000
Faculté des Hautes Études Commerciales (HEC), Univ. de Lausanne	0.000	0.959	0.041
Faculteit der Economische Wetenschappen, Erasmus Universiteit Rotterdam	0.232	0.753	0.016
Faculteit Economie en Bedrijfskunde, Rijksuniversiteit Groningen	0.332	0.611	0.058
Faculteit Economie en Bedrijfskunde, Universiteit Gent	0.000	1.000	0.000
Faculteit Economie en Bedrijfskunde, Universiteit van Amsterdam	0.191	0.765	0.044
Faculteit Economie en Bedrijfswetenschappen, KU Leuven	0.205	0.780	0.015
Faculty of Business and Econ., Univ. of Melbourne	0.226	0.774	0.000
Faculty of Econ., Univ. of Cambridge	0.274	0.602	0.124
Faculty of Econ., Univ. of Tokyo	0.363	0.602	0.035
Fakultät für Wirtschaftswissenschaften, Universität Wien	0.142	0.851	0.007
Federal Reserve Bank of Atlanta	0.359	0.519	0.122
Federal Reserve Bank of Boston	0.021	0.956	0.023
Federal Reserve Bank of Chicago	0.034	0.847	0.119
Federal Reserve Bank of Cleveland	0.169	0.811	0.021
Federal Reserve Bank of Dallas	0.222	0.707	0.071
Federal Reserve Bank of Minneapolis	0.128	0.541	0.331
Federal Reserve Bank of New York	0.000	0.866	0.134
Federal Reserve Bank of Philadelphia	0.050	0.892	0.058
Federal Reserve Bank of Richmond	0.297	0.632	0.071
Federal Reserve Bank of San Francisco	0.446	0.394	0.161
Federal Reserve Bank of St. Louis	0.802	0.115	0.083
Federal Reserve Board (Board of Governors of the Federal Reserve System)	0.000	0.966	0.034
Finance and Econ. Department, Graduate School of Business, Columbia Univ.	0.369	0.020	0.610

Graduate School of Business, Columbia Univ.	0.140	0.438	0.422
Graduate School of Business, Stanford Univ.	0.000	0.460	0.540
Groupe dAnalyse et de Théorie Économique Lyon St-Étienne, Univ. de Lyon	0.050	0.950	0.000
Groupement de Recherche en Économie Quantitative, Aix-Marseille Univ.	0.249	0.751	0.000
Handelshögskolan i Stockholm	0.029	0.844	0.127
Handelshögskolan, Göteborgs Universitet	0.081	0.911	0.008
Harris School of Public Policy, Univ. of Chicago	0.090	0.557	0.353
Harvard Business School, Harvard Univ.	0.000	0.729	0.271
HEC Montréal (École des Hautes Études Commerciales)	0.355	0.625	0.021
School of Econ. and Management, Universiteit van Tilburg	0.390	0.590	0.021
ifo Institut - Leibniz-Institut für Wirtschaftsforschung an der Universität München e.V.	0.572	0.428	0.000
Innocenzo Gasparini Institute for Econ. Research, Università Commerciale L. Bocconi	0.224	0.427	0.348
Institut dÉconomie Industrielle (IDEI), Toulouse School of Econ. (TSE)	0.429	0.000	0.571
Institut for Økonomi, Aarhus Universitet	0.147	0.817	0.036
Institut für Volkswirtschaftslehre, Johannes-Kepler-Universität Linz	0.144	0.845	0.011
Institut für Volkswirtschaftslehre, Universität Zürich	0.000	0.971	0.029
Institut für Weltwirtschaft (IfW)	0.663	0.337	0.000
Institute of Labor Econ. (IZA)	0.362	0.554	0.084
Institutet för Näringslivsforskning (IFN)	0.002	0.951	0.048
Institutt for samfunnsøkonomi, Norges Handelshøyskole (NHH)	0.036	0.899	0.065
Inter-American Development Bank	0.000	1.000	0.000
International Bank for Reconstruction & Development (IBRD), World Bank Group	0.000	1.000	0.000
International Econ. Section, The Graduate Institute of Intern. and Development Studies	0.000	0.956	0.044
International Food Policy Research Institute (IFPRI)	0.201	0.799	0.000
International Monetary Fund (IMF)	0.000	0.981	0.019
Judge Business School, Univ. of Cambridge	0.101	0.844	0.055
Kellogg Graduate School of Management, Northwestern Univ.	0.000	0.789	0.211
Kennedy School of Government, Harvard Univ.	0.132	0.405	0.463
KOF Swiss Economic Institute, Eidgenössische Technische Hochschule Zürich	0.890	0.110	0.000
Laboratory of Econ. and Management (LEM), Scuola Superiore SantAnna	0.279	0.613	0.108
Leibniz-Zentrum für Europäische Wirtschaftsforschung (ZEW)	0.000	1.000	0.000
Lille Économie et Management (LEM)	0.000	1.000	0.000
London School of Econ. (LSE)	0.145	0.685	0.170
Management School, Lancaster Univ.	0.195	0.805	0.000
Melbourne Institute of Applied Economic and Social Research, Univ. of Melbourne	0.353	0.647	0.000
Monash Business School, Monash Univ.	0.270	0.718	0.013
National Bureau of Economic Research (NBER)	0.288	0.045	0.667
National Graduate Institute for Policy Studies (GRIPS)	0.000	1.000	0.000
National Research Univ. Higher School of Econ.	0.000	1.000	0.000
Nationalekonomiska Institutionen, Ekonomihögskolan, Lunds Universitet	0.000	1.000	0.000
Nationalekonomiska institutionen, Handelshögskolan, Göteborgs Universitet	0.158	0.822	0.020
Nationalekonomiska Institutionen, Uppsala Universitet	0.000	1.000	0.000
Norges Handelshøyskole (NHH)	0.000	1.000	0.000
Økonomisk Institut, Københavns Universitet	0.000	0.946	0.054
Økonomisk institutt, Universitetet i Oslo	0.165	0.740	0.095
Organisation de Coopération et de Développement Économiques (OCDE)	0.000	1.000	0.000
Paris School of Econ.	0.480	0.455	0.066
Peter G. Peterson Institute for International Econ. (IIE)	0.394	0.291	0.315
Research and Statistics Group, Federal Reserve Bank of New York	0.000	0.827	0.173
Research Department, International Monetary Fund (IMF)	0.008	0.875	0.116

Research Division, Federal Reserve Bank of St. Louis	0.885	0.000	0.115
Research School of Econ., College of Business and Econ., Australian National Univ.	0.270	0.683	0.047
Resources for the Future (RFF)	0.241	0.717	0.042
Rotman School of Management, Univ. of Toronto	0.000	0.893	0.107
School of Business and Econ., Maastricht Univ.	0.250	0.747	0.003
School of Business and Econ., Universidade Nova de Lisboa	0.000	0.972	0.028
School of Business and Econ., Vrije Universiteit Amsterdam	0.436	0.562	0.002
School of Business, Leicester Univ.	0.089	0.911	0.000
School of Econ. and Finance, Queen Mary Univ. of London	0.000	0.941	0.059
School of Econ. and Management, Universiteit van Tilburg	0.374	0.619	0.007
School of Econ. and Political Science, Universität St. Gallen	0.000	0.990	0.010
School of Econ., Faculty of Arts and Social Sciences, Univ. of Sydney	0.000	0.993	0.007
School of Econ., Finance and Management, Univ. of Bristol	0.041	0.923	0.036
School of Econ., Univ. College Dublin	0.226	0.747	0.027
School of Econ., Univ. of Kent	0.093	0.907	0.000
School of Econ., Univ. of Manchester	0.245	0.732	0.024
School of Econ., Univ. of Nottingham	0.295	0.631	0.074
School of Econ., Univ. of Queensland	0.404	0.596	0.000
School of Econ., Univ. of Surrey	0.000	0.959	0.041
School of Econ., UNSW Business School, UNSW Sydney	0.363	0.572	0.065
School of International and Public Affairs (SIPA), Columbia Univ.	0.648	0.013	0.339
School of Management, Yale Univ.	0.100	0.598	0.302
Schweizerische Nationalbank (SNB)	0.000	1.000	0.000
Sciences économiques, Sciences Po	0.951	0.000	0.049
Scuola di Economia e Management, Università degli Studi di Firenze	0.008	0.992	0.000
SKEMA Business School	0.031	0.925	0.044
Sloan School of Management, Massachusetts Institute of Technology (MIT)	0.159	0.459	0.383
Solvay Brussels School of Econ. and Management, Univ. Libre de Bruxelles	0.231	0.769	0.000
Stern School of Business, New York Univ. (NYU)	0.050	0.598	0.352
Sussex Business School, Univ. of Sussex	0.181	0.809	0.010
Tepper School of Business Administration, Carnegie Mellon Univ.	0.089	0.779	0.132
Tinbergen Instituut	0.658	0.312	0.030
Toulouse School of Econ. (TSE)	0.248	0.683	0.069
UN Univ.-Maastricht Economic Research Institute of Innovation and Technology	0.075	0.921	0.004
Università Commerciale Luigi Bocconi	0.056	0.829	0.115
Univ. Paris-Dauphine (Paris IX)	0.000	1.000	0.000
Univ. of Piraeus	0.024	0.976	0.000
UNSW Business School, UNSW Sydney	0.219	0.724	0.057
Vancouver School of Econ., Univ. of British Columbia	0.251	0.529	0.221
Victoria Business School, Victoria Univ. of Wellington	0.226	0.774	0.000
Volkswirtschaftliche Fakultät, Ludwig-Maximilians-Universität München	0.000	0.972	0.028
W.P. Carey School of Business, Arizona State Univ.	0.192	0.696	0.112
Waikato Management School, Univ. of Waikato	0.449	0.551	0.000
Walter A. Haas School of Business, Univ. of California-Berkeley	0.178	0.311	0.511
Warwick Business School, Univ. of Warwick	0.210	0.727	0.063
Wharton School of Business, Univ. of Pennsylvania	0.030	0.848	0.122
Wirtschaftswissenschaftliche Fakultät, Heinriche-Heine-Universität Düsseldorf	0.000	1.000	0.000
Wirtschaftswissenschaftliche Fakultät, Humboldt-Universität Berlin	0.000	1.000	0.000
Wirtschaftswissenschaftliche Fakutät, Universität Zürich	0.000	0.993	0.007
Wirtschaftswissenschaftlicher Fachbereich, Rhein. Friedrich-Wilhelms-Univ. Bonn	0.000	0.939	0.061

Woodrow Wilson School of Public and International Affairs, Princeton Univ.	0.201	0.298	0.500
World Bank Group	0.020	0.955	0.026
WU Wirtschaftsuniversität Wien	0.072	0.928	0.000