Apples to Apples: Lessons from Use of Academic Analytics Data at U. of Colorado Boulder

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http://www.colorado.edu/pba/peer/acanalytics.htm

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Situation 1: One department or program

- Questions
  - How do we fit in?
  - What can we say about how we fit in?
- Approach
  - Develop comparison set
  - Assemble measures
  - Show all measures

- *Later:* Situation 2, comparing several depts/programs at your own institution

Develop initial comparison set

- Starting points
  - Discipline(s) the dept/program is associated with in Academic Analytics
  - Often limit to AAU
  - **Get both "departments" and PhD programs**
- Check vs. *apriori* list from chair – and/or national rankings, or professional association, any authoritative list
  - Who's missing?
- Iterate to a too-big comparison set by
  - Bringing in more disciplines, and/or broad field
  - Bringing in specific schools

Aside: Why a usual peer might be missing

- Complementary disciplines
  - E.g., “speech and hearing sciences” and “communication disorders and science”
- General and specific disciplines w/i a broad field are used differently
  - Peers may be in broad field but not in a specific fine discipline
  - Example, Business: 200 schools have a dept/school in broad field Business, only 56 in general discipline “business administration.” Some schools are listed only in specifics such as accounting.
  - Similar for Education
- Outside usual peer schools – E.g. Clark, Geography

Aside: If you picked only “depts” or only PhD programs

Example, Geography. 175 units total

- 41 depts w no PhD program
  - 2% AAU, 3.6 articles/cap, $37k grants/cap
- 7 PhD programs w no dept – 57% AAU, 8.1, $151k
- 59 schools w both dept and PhD prog – 42% AAU, 6.9, $ 78k
  - 6 list fewer faculty in the PhD program than in the dept
  - 12 list more
  - 41 list the same
- *The group for you depends on what you are and what you want*

To get to a comparison set

- For each school in the too-big list, show demographics:
  - Unit name(s)
  - Number of faculty in Academic Analytics comparative data
  - Unit type: “Department” or PhD program
  - In AAU/not; on chair’s list/not; other relevant “demographics”
  - Maybe scholarly work levels, because these suggest different kinds of units
- Demographics will suggest what units are “not like the others” – or not like yours
- Use that info to narrow or combine, usually to fewer schools and one unit per school. Sometimes cannot include all from chair’s list.

Aside: Reasons to drop units

- Dept and PhD program have same name, same faculty count – take one, makes no difference which
- One engineering field, faculty counts did not fit chair expectations
  - School Faculty counts for
  - Cornell: program >> dept = chair; program includes web list
  - Irvine: program = dept >> chair; AA includes affiliated
  - Northwestern: program ~= dept = chair = core from web – OK!
  - Penn: program = dept << chair. AA is core only.
- Marketing faculty count is same as count for whole B-school
  - Cannot limit to marketing faculty unless use list of names

Aside: Reasons to cull or combine units

- Units with “and”: Boulder’s department is “chemistry and biochemistry”
  - With PhD programs in each – but a single faculty
  - Publishing and grant patterns differ markedly in the two disciplines
    - Per-capitas higher in biochem
  - Across both disciplines, every imaginable pattern of depts and PhD programs
    - From 1-1 at GA Tech, UCSD, UCSB to 4-4/5 Kansas, Hopkins
  - Medical complicates, can be difficult to discern
- Really a subdiscipline: Applied math, sometimes separate, sometimes in math but not tagged
  - In “applied math” discipline, 15 AAU’s have a dept, but 28 have a PhD program

Once have comparison set, Assemble measures

- Types
  - Volume – number of articles; grant dollars
  - Per-capita – volume per faculty member
  - Intensity -- citations/article, dollars/grant
  - Pct-who -- Pct of faculty with any article, grant, etc. – Gini's would be better

Crossed with

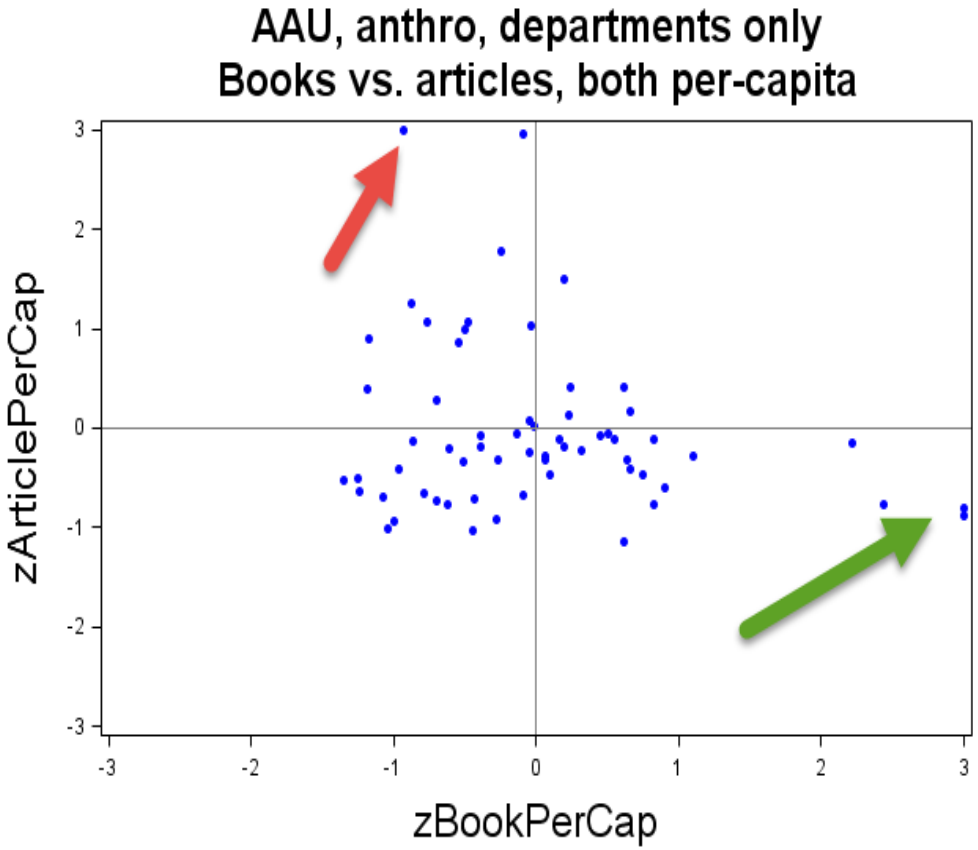
- Areas
  - Articles and citations; conference proceedings
  - Books
  - Grants
  - Honors and awards

Show all measures

- Show by school/unit, with demographics and unit names
- Aim at question: Where do we fit?
- Show how the several dimensions relate
  - Scatterplot matrix with points labelled is great, if not too many points

Example: “Book” vs. “article” departments

- In AAU anthro, books and articles are compensatory
- Red: high on articles, < 0 on books
- Green: high on books, < 0 on articles
- Combination means little
- Z-scores are relative to AAU only

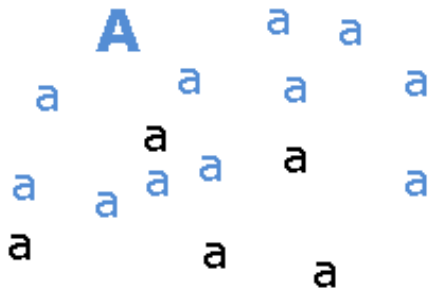


Sample statement: CU-Boulder geography

- Conditions
  - Wanted ranks. Wanted all schools. Wanted in a hurry.
  - Wanted departments – *so PhD-only schools were not included*
- Statement: In the 2013 Academic Analytics release, CU-Boulder's geography department ranks
  - 7th on total peer-reviewed journal publications
  - 4th on total honors and awards
  - 3rd on total citations
  - 2nd on total grant dollars
  - Despite ranking 12th on number of faculty
  - All of about 100 departments at US institutions that grant the PhD in any field

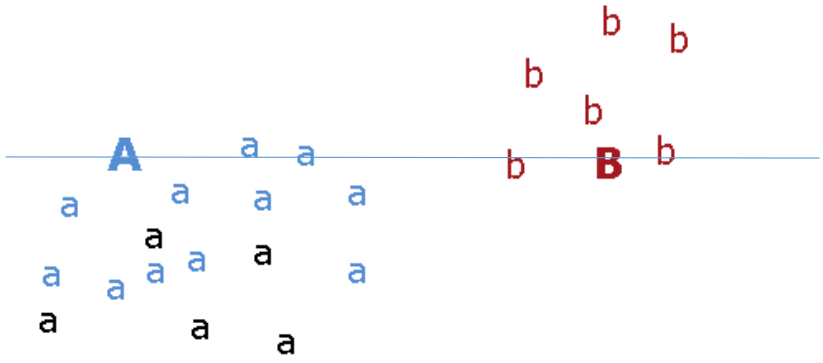
Situation 2: The plot thickens

- Recap, Situation 1: One department or program
  - Questions: How do we fit in? What can we say about how we fit in?
  - Approach: Develop comparison set, assemble measures, show all measures
  - **A**: My one department or program
  - **a**, **a**: Comparison set – two dimensions only. Some more apt than others.



Situation 2

- My A vs. others' a's . . . vs. . . . My B vs. others' b's
- Question: How do A and B stack up vs. each other, vs. their peers?
- Now need
  - Summary measures – can't deal with 20+ dimensions
  - Some assurance that the two comparison sets are themselves comparable
- In the illustration
  - A = B but
  - A:a's >> B:b's



How assure comparable comparison sets?

- Can't do full customization described for situation 1
- Can still use mix of depts and PhD programs, of single and combined disciplines, of disciplines and broad fields
- Can reduce variance by taking subset of schools – e.g., AAU
  - With all schools, 208 depts in psychology, 17 in applied math – big difference
  - With all: AAU is under 40% of schools in many disciplines, but 80%+ of schools in some humanities disciplines
- Can show % w PhD program, % AAU, # faculty, number of units, etc.
- Can put out something and let depts complain
- Realize that fully comparable comparison sets just don't exist

Need summary measures

- Combine across *areas* (articles, books) and/or across *types* (volume, per-capita
- If combine across different scales (awards, dollars) must use Z-scores
  - Z = difference from average in standard deviation units
- Traditional combination: Average or weighted average
- Legacy FSP combined across all areas using
  - 7 per-capita measures
  - 6 percent-who measures
  - 2 intensity measures
  - *No volume measures*

Consider the OR combination

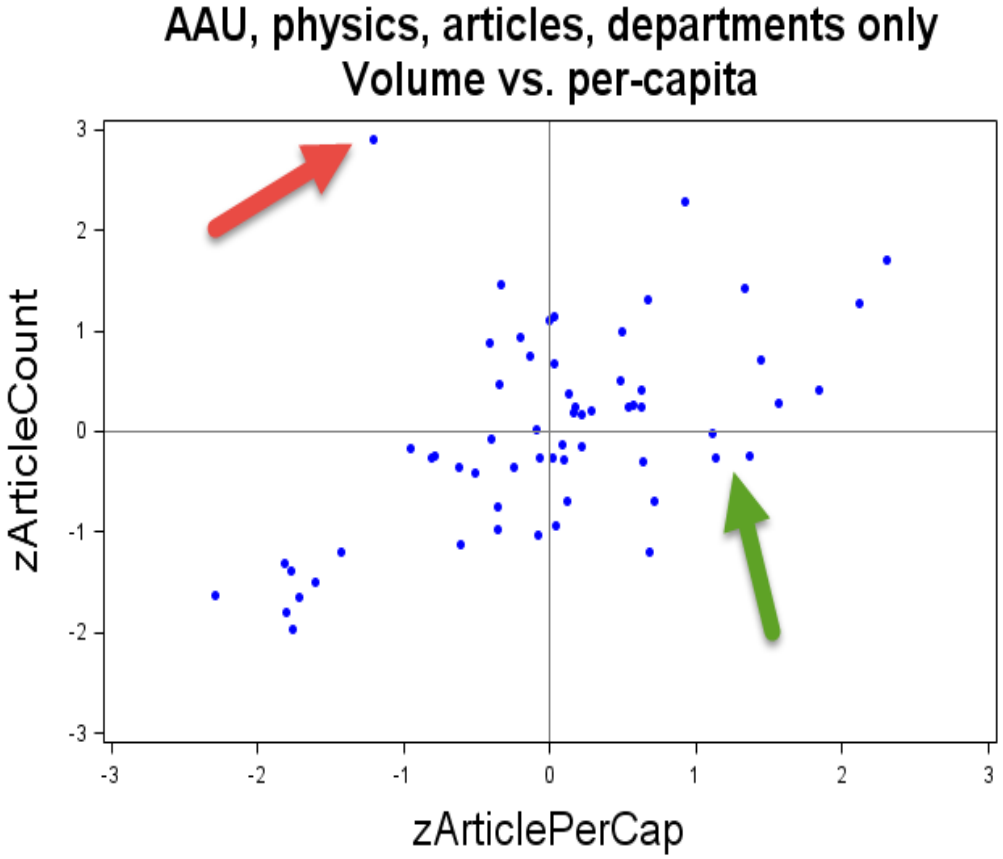
- If a department or program can be good in different ways, it's legitimate to combine with OR or MAXimum functions
  - A physics dept is good if it's high relative to others in *either* volume of articles *or* articles per capita
  - An anthro dept is good if it's high relative to others in *either* articles *or* books
- This seems like a commonsense statement but is completely counter to usual metric construction
- Example on next slide

Volume vs. per-capita, physics articles

- MIT (red): high volume, per-capita Z < -1
- Green: high per-capita, volume Z < 0

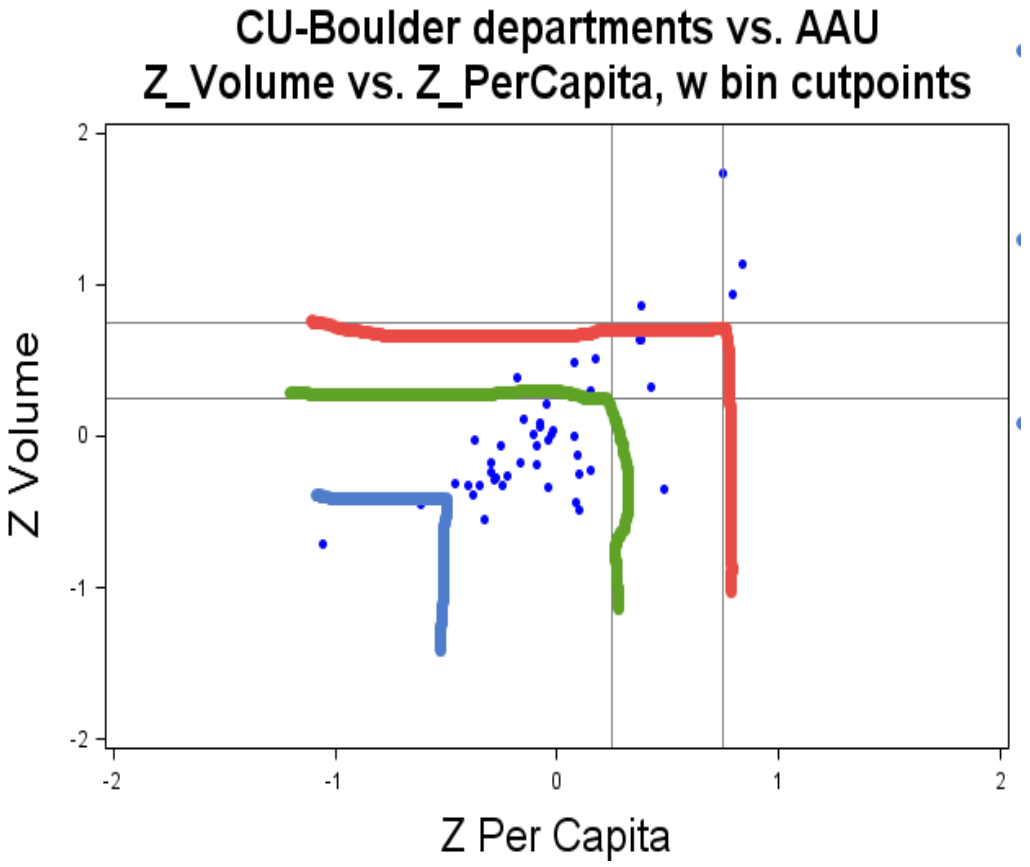
- Volume may relate to reputation more strongly
- Per-capita helps little units

- Z-scores are relative to AAU only



CU-Boulder, 2015, stack ‘em up: What we did

- Required by Regents
- Departments only, with some discipline fixes; AAU only
- 2 measures: Z_volume, Z_percap, across areas
- Use OR to combine when must “put departments in bins”
  - Bins are L-shaped – here, at Z = .25 and .75



Situation 2 is difficult. At least . . .

- Know and explain derivation of comparison sets
- Know and explain derivation of measures
- Acknowledge assumptions and extreme reduction. At CU-Boulder
  - 49 bins of 1, 2, or 3 came from over 20,000 data points plus derivations
  - 2,900 units with 75,000 faculty
  - 655,000 articles, 1.1m citations, 140,000 conference proceedings
  - 88,000 grants with 14.8 billion dollars
  - 53,000 honors and awards
- Hope the results stir up interest in some to explore further