

Understanding the Ecosystem of Geospatial Research and Service in Universities

Weihe Wendy Guan and Elizabeth Hess
Center for Geographic Analysis
Institute for Quantitative Social Science
Harvard University



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Geographic Analysis
Harvard University



Background

- Geographic Information Science (GIS) is a thriving applied science.
- There are research of GIS, and research with GIS (apply GIS in the research of other subjects)
 - Research of GIS = GIS research
 - Research with GIS = GIS service
- There are benefits from a tight connection between GIS research and service:
 - Research outcomes feed into applications, enabling service to other fields.
 - Unmet needs from the application fields push the envelope of GIS research, generating new topics and directions.
- Many universities have established GIS centers (or units).

Questions

- How do these GIS centers balance between GIS research and service?
- If GIS research belongs to a department, where does GIS service belong?
- How are GIS service funded?
- Are there significant differences in these centers' operational scale, scope, responsibility and priority?
- If yes, what are the factors determining them? Size of the university? Public or private? With or without a geography department? Length of center history?
- What are the common and unique challenges and opportunities for these centers?

Online Survey

- Is easy to understand and quick to complete. The estimated completion time was within 10 minutes.
- Must support quantitative analysis. Responses were captured in a spreadsheet, and most questions were multiple choices.
- Provides flexibility. Allows for entering additional information beyond the listed choices.
- Protects privacy. Allows the participants to specify which part(s) of their answers can be shared.
- No cost. The survey was implemented as a Google Form with a link distributed by emails, and the incentive for taking the survey was to receive the sharable parts of the survey responses in its original format as soon as the survey was closed.

Sections in the Survey

1. **Introduction** – explaining the purpose and conditions of the survey.
2. **General Information** – capturing the university, organization and responder's name and contact information.
3. **Administrative Information** – capturing the age and affiliation of the center.
4. **Financial Information** – capturing the budget and income sources of the center.
5. **Personnel Information** – capturing the number of employees and type of jobs.
6. **Responsibilities** – capturing the center's roles in teaching, research and services.
7. **Operational Information** – capturing the center's hardware and software portfolios.
8. **Collaboration and Communication** – capturing the center's interaction with people and organizations internal and external of the university.
9. **Challenges and Opportunities** – capturing the center's biggest challenges and most promising direction of growth.
10. **Permission for sharing** – capturing the responders' preferences on sharing their answers with others.

Invited to the Survey

- Subscribers on the mailing lists of twelve (12) GIS related communities
 - The mailing lists included local, regional, national and international communities
 - Their focuses of interest ranged from libraries to classrooms, from teaching to research, from data creation to mapping to software development, from commercial products to open source tools
- Contact emails of forty-four (44) GIS related centers
 - Invitees included centers in public and private universities in the USA and several other countries
 - These centers have a diverse affiliation in both academic fields and administrative organizations within their universities
- There are some overlap between the mailing lists and direct invitees.

GIS Communities Invited to the Survey

- Boston Open Source Geo
- Crisis Mappers
- Esri Higher Education Listserv
- GIS for Libraries
- GIS in National Institute for Technology in Liberal Education
- GIS Teaching Alliance (GISTA) Boston
- International Association of Chinese Professionals in Geographic Information Science (CPGIS)
- Maps, Air Photo, GIS Forum - Map Librarianship
- New England Chapter of the Urban & Regional Information Systems Association (NEURISA)
- Northeast Arc Users Group
- Open Geo Portal
- University Consortium for Geographic Information Science (UCGIS)

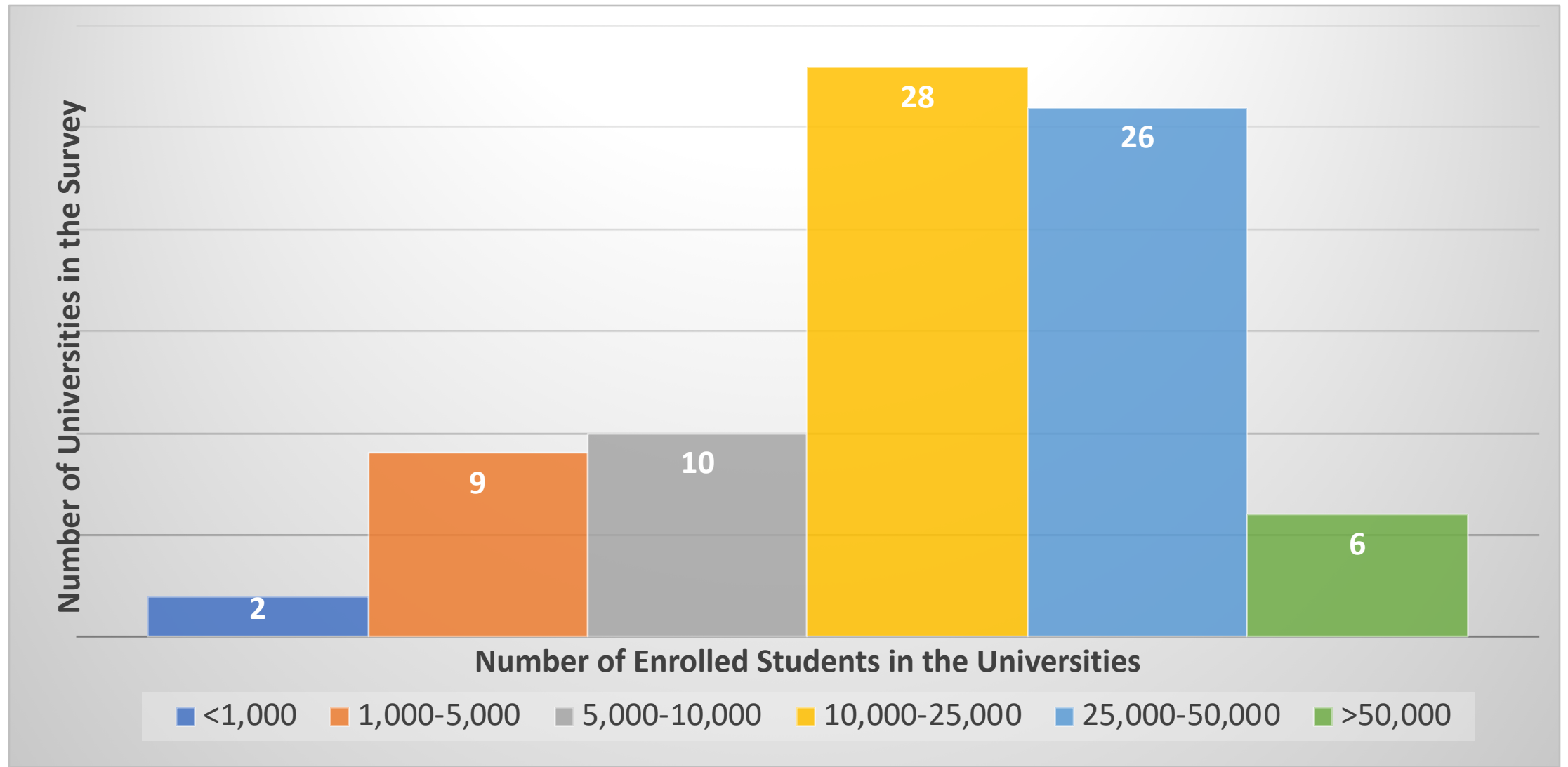
Results of the Survey

- The survey was open from February 22 to April 19 of 2018 (8 weeks).
- Received 85 responses, with a few duplications.
- The valid responses represented 81 centers in 76 universities from 12 countries.
- 83% of them are from the USA.
- Other countries include Canada, Denmark, France, Hong Kong (China), Italy, Japan, Netherland, Portugal, Singapore, Sweden and Switzerland.
- 60% are public universities, 40% are private universities.

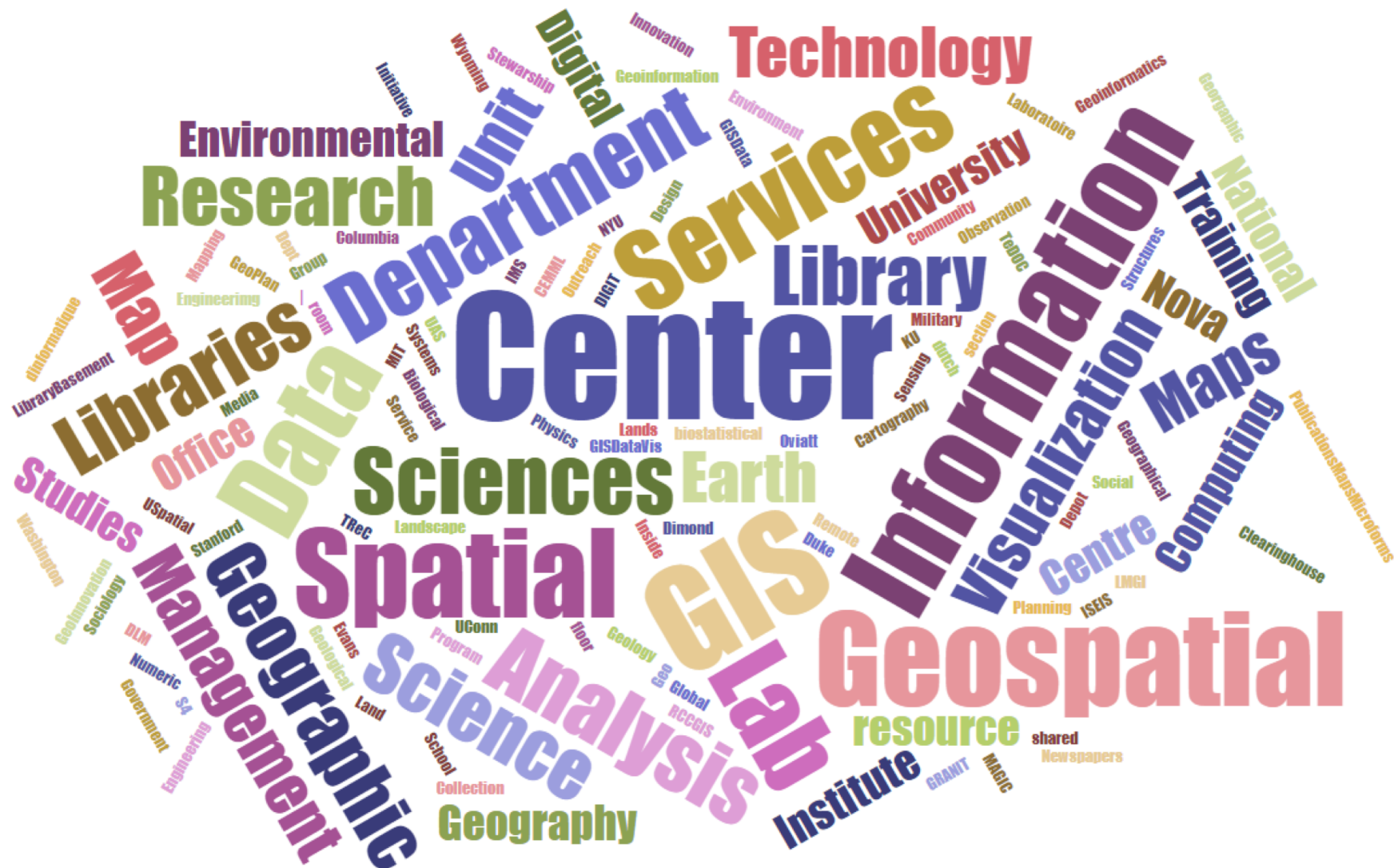
Number of surveyed centers in public or private universities, with or without a geography department

Number of Centers	Public University	Private University	Total
With Geography Department	44	10	54
Without Geography Department	5	22	27
Total	49	32	81

Distribution of surveyed universities by the total number of enrolled students



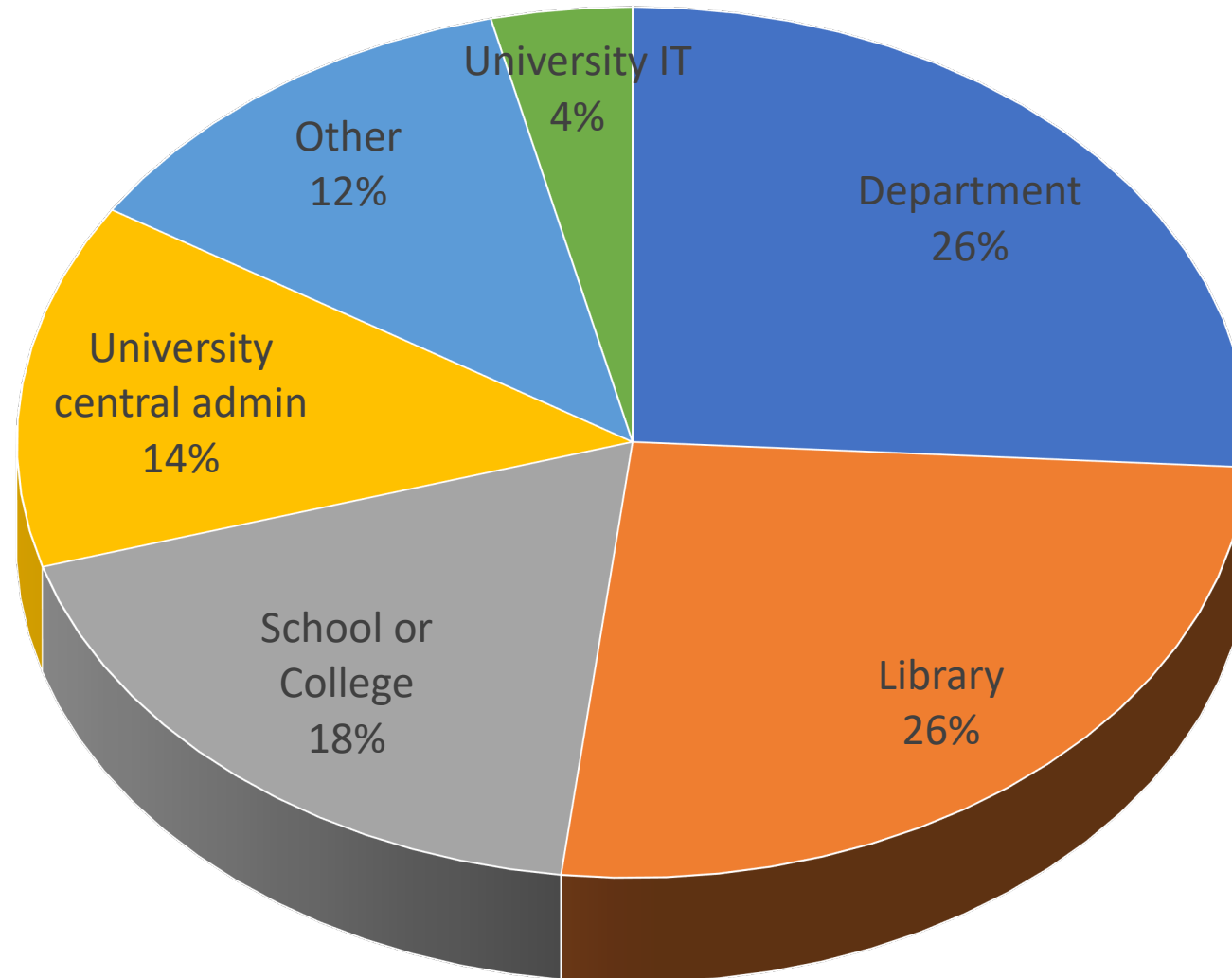
Text cloud of words in the center names



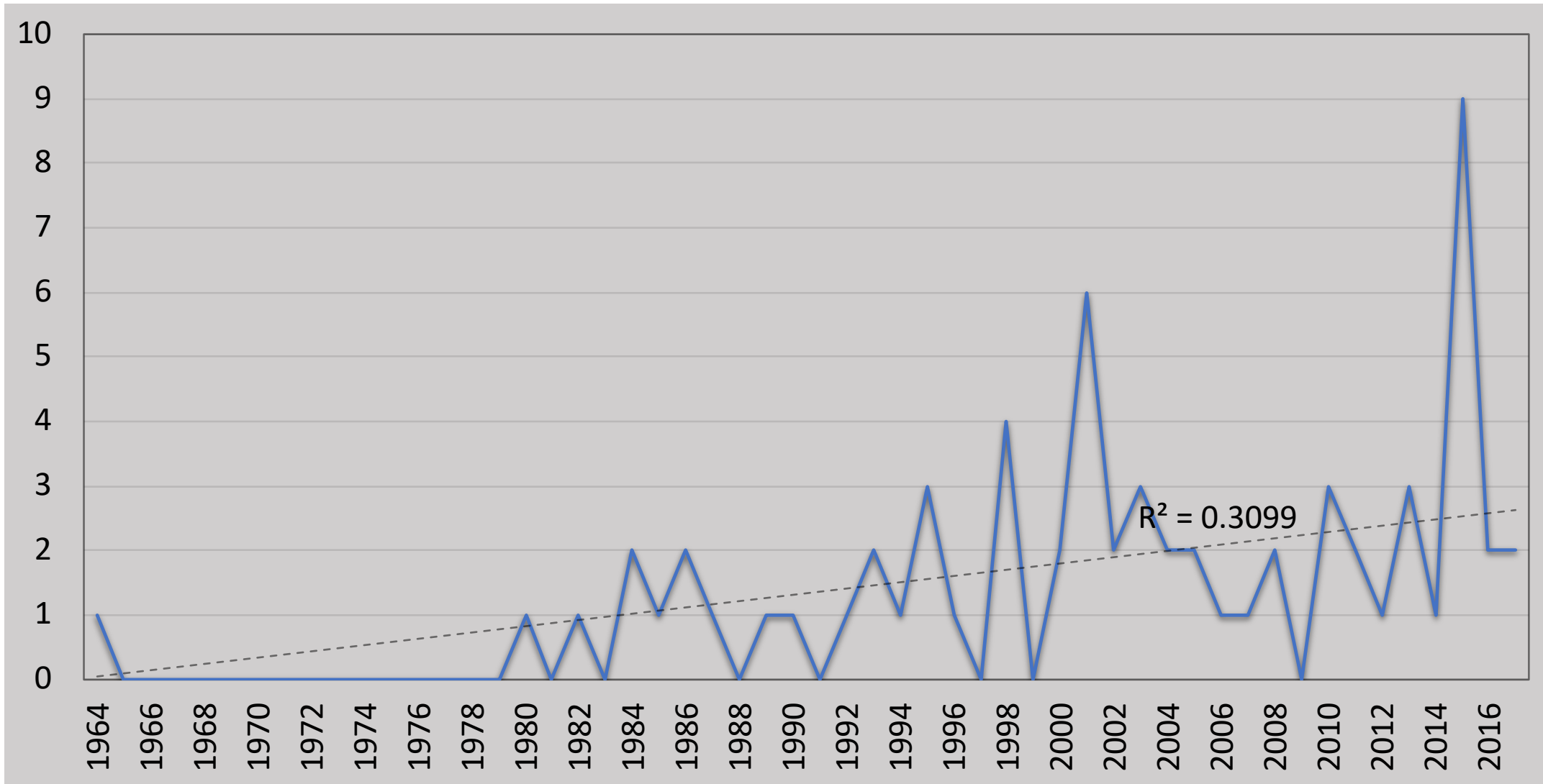
Text cloud of words in the names of the administrative homes for the centers



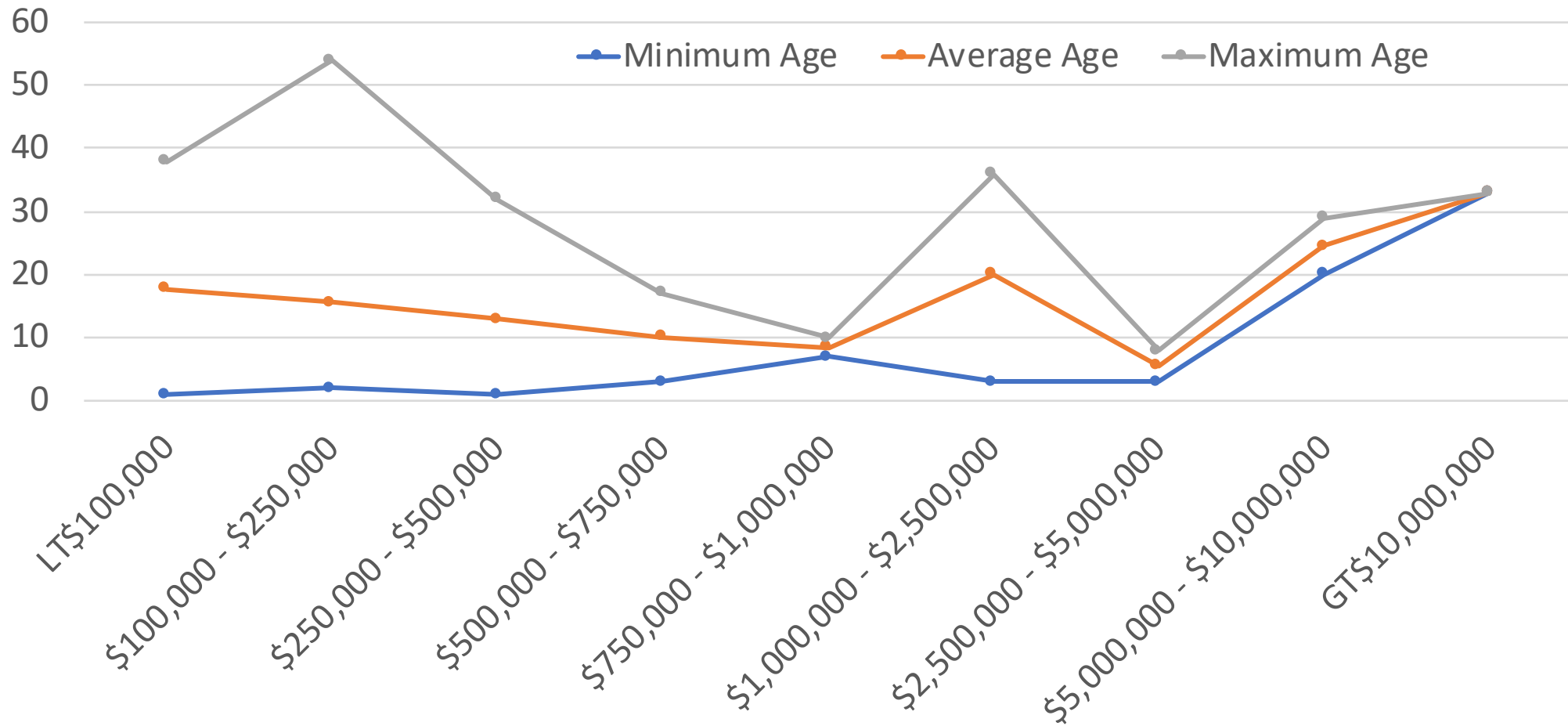
Administrative Homes of the Centers



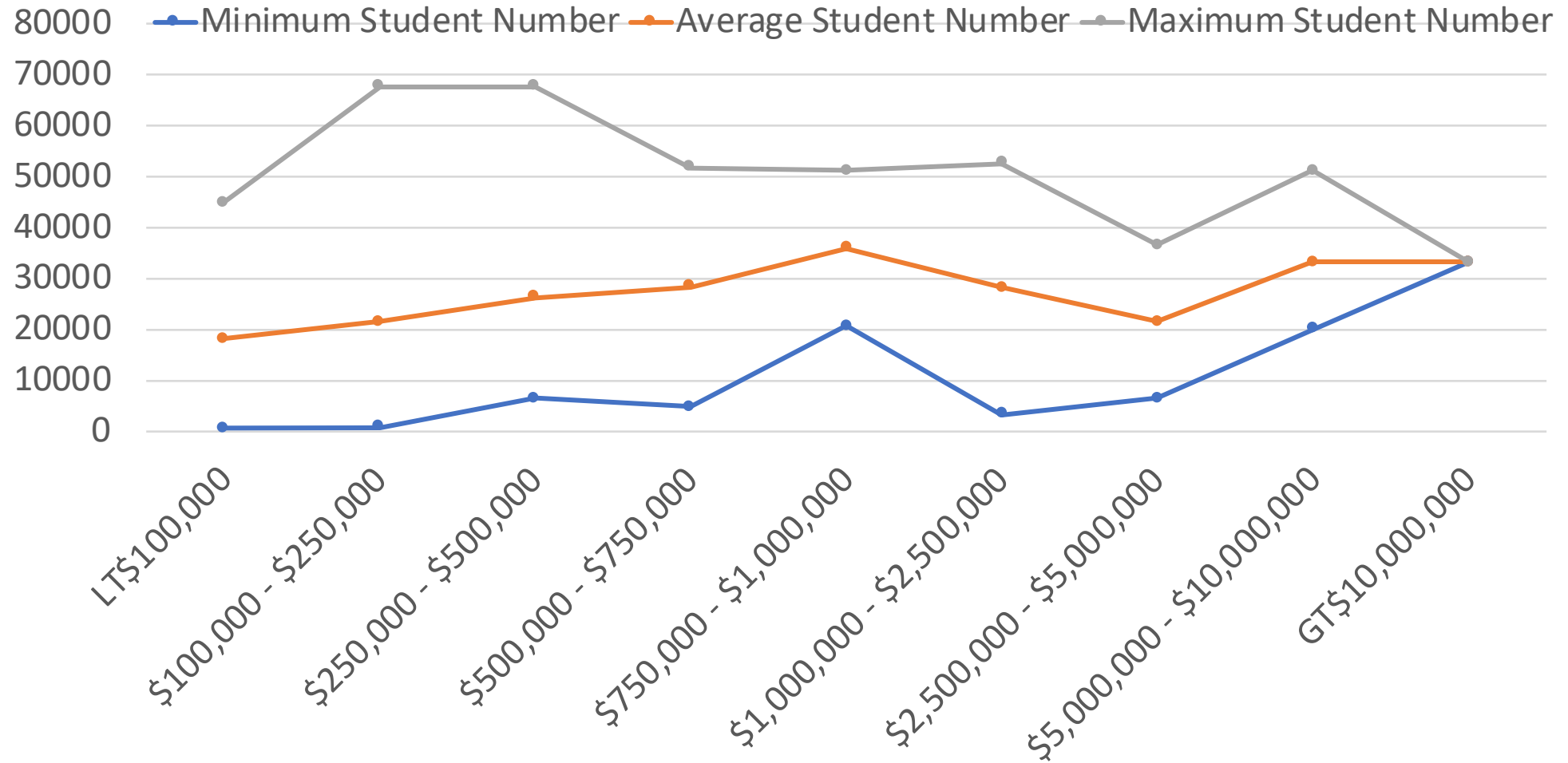
Number of Centers Established by Year



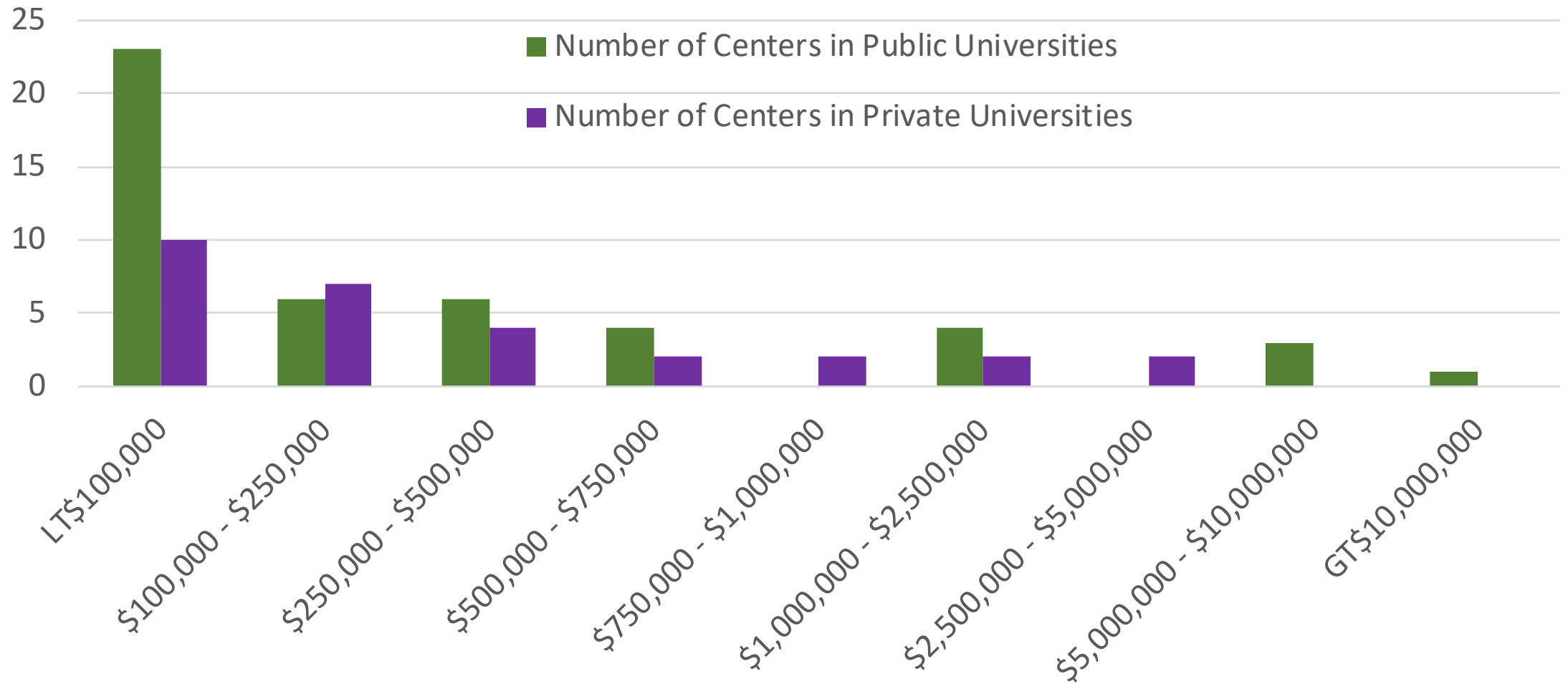
Centers' Age by Budget Size



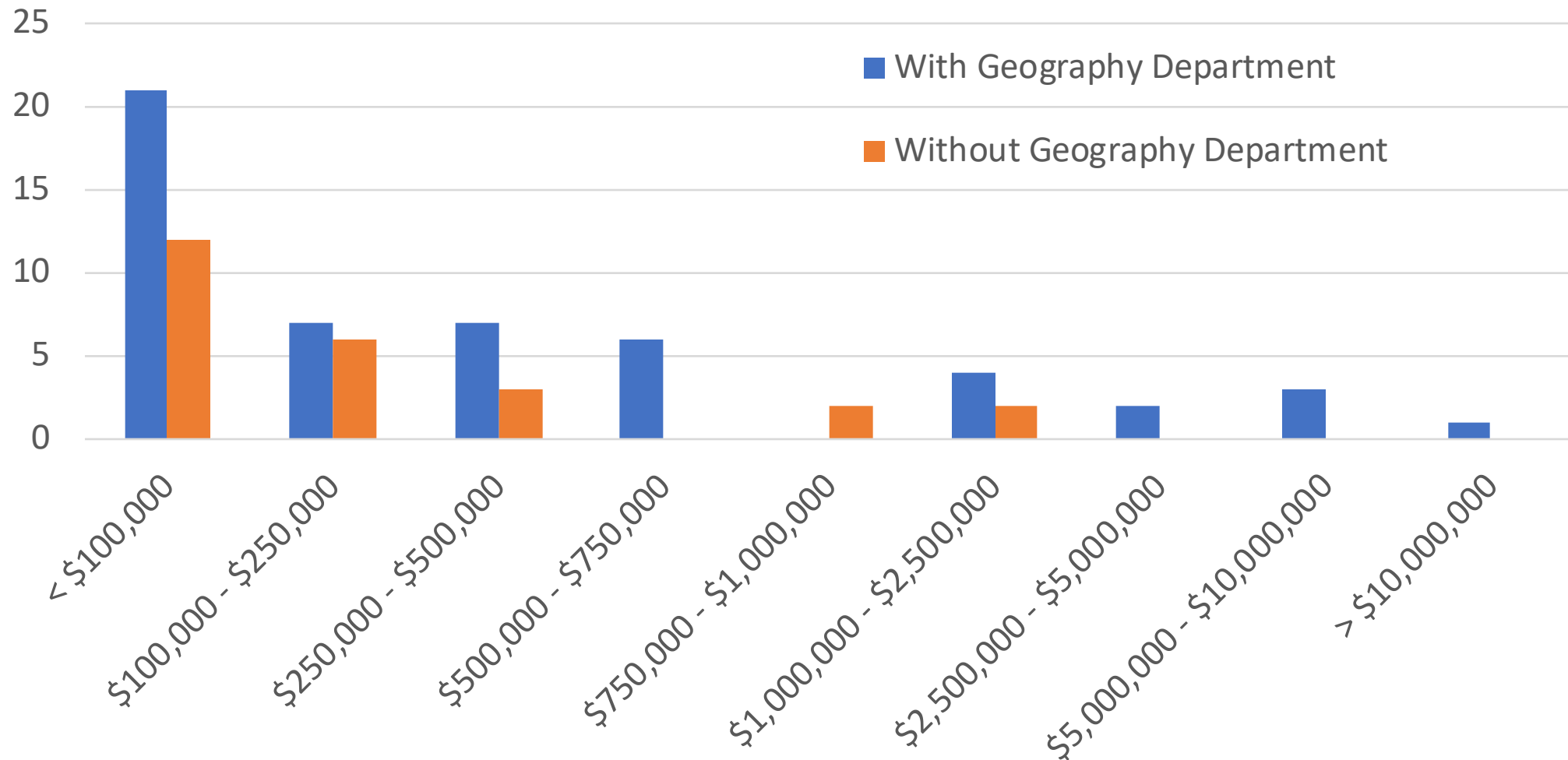
Size of Universities by Centers' Budget Size



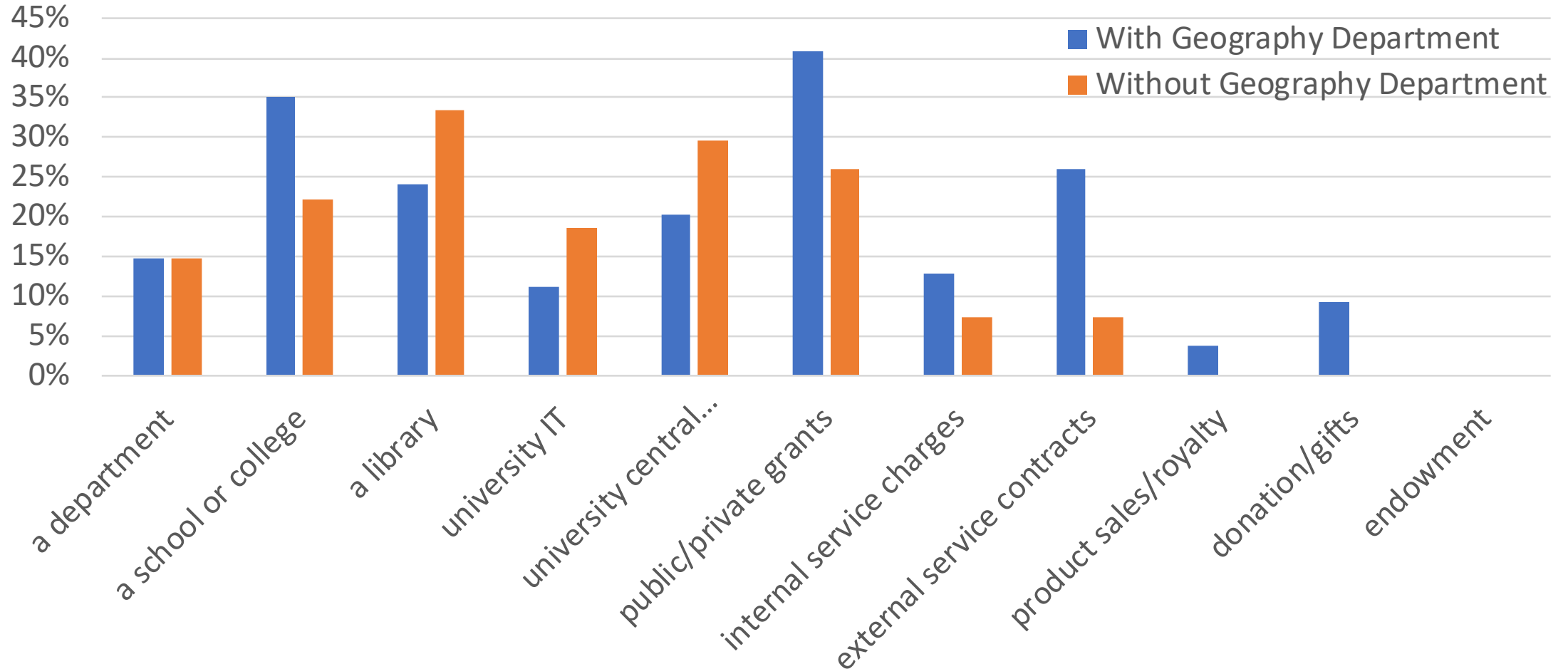
Number of Centers by Annual Operating Budget – Grouped by University Type



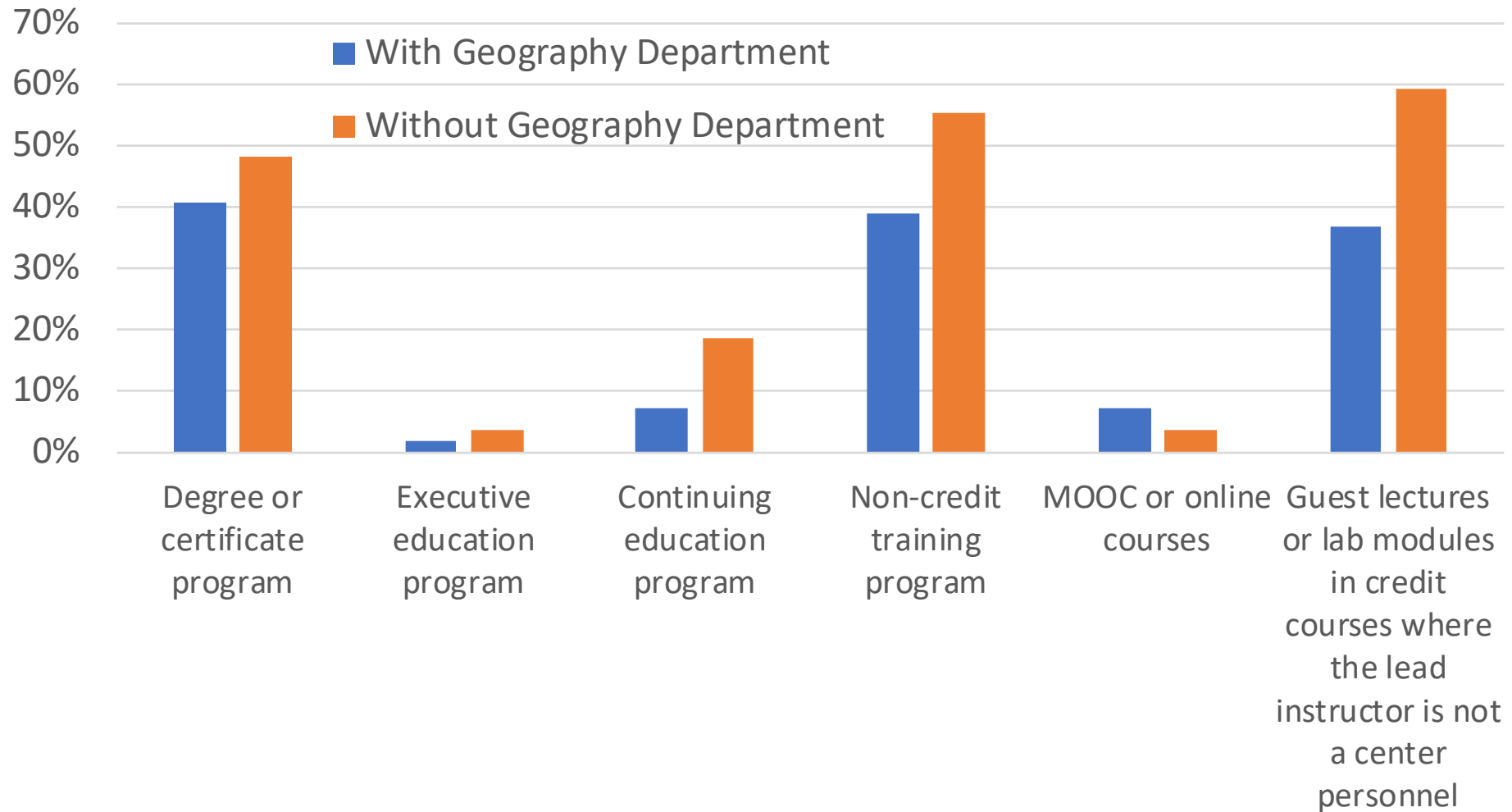
Number of Centers by Annual Operating Budget – Grouped by with or without Geography Department



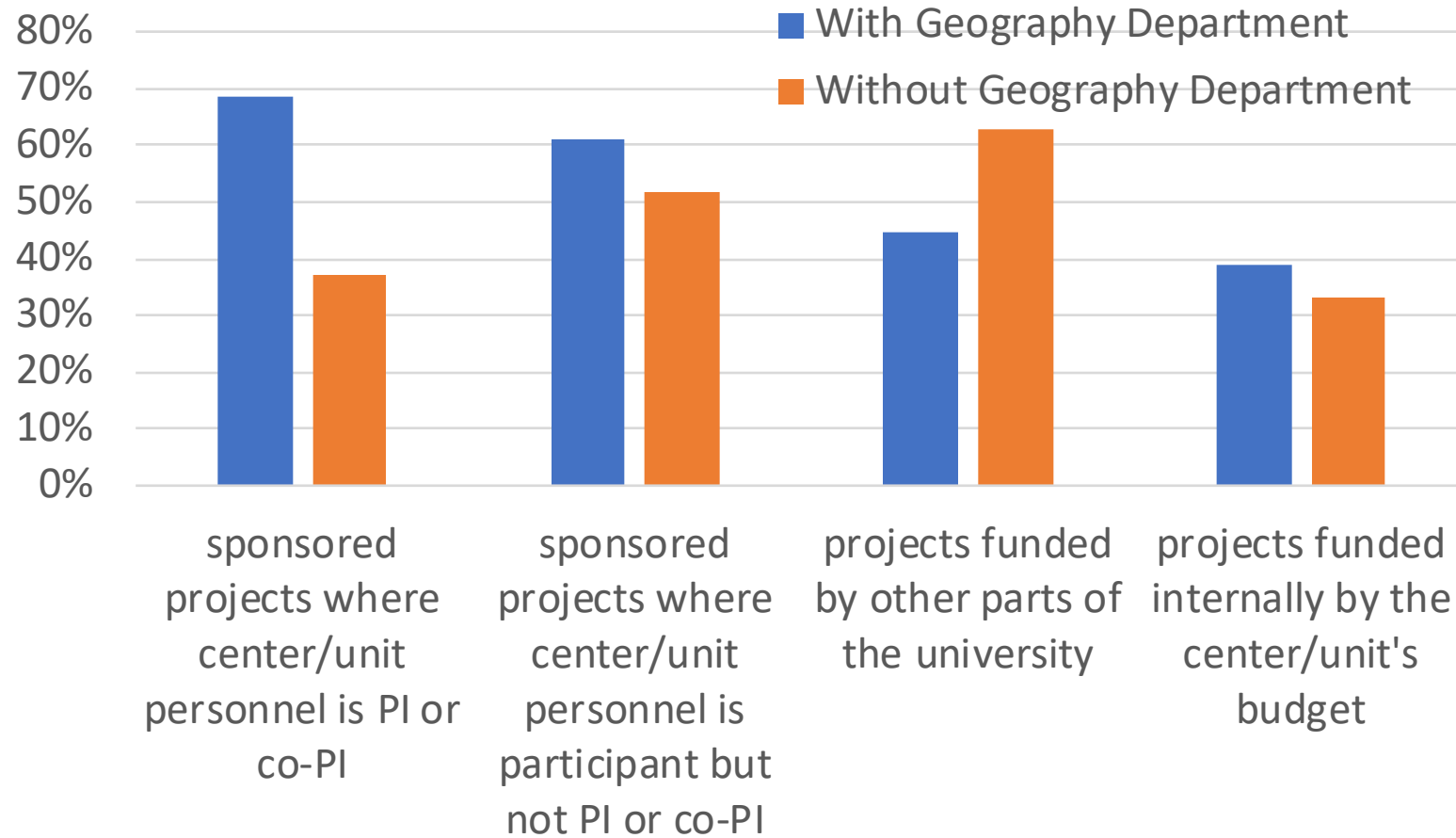
10 Percent of Centers with 10% or more Funding from These Sources

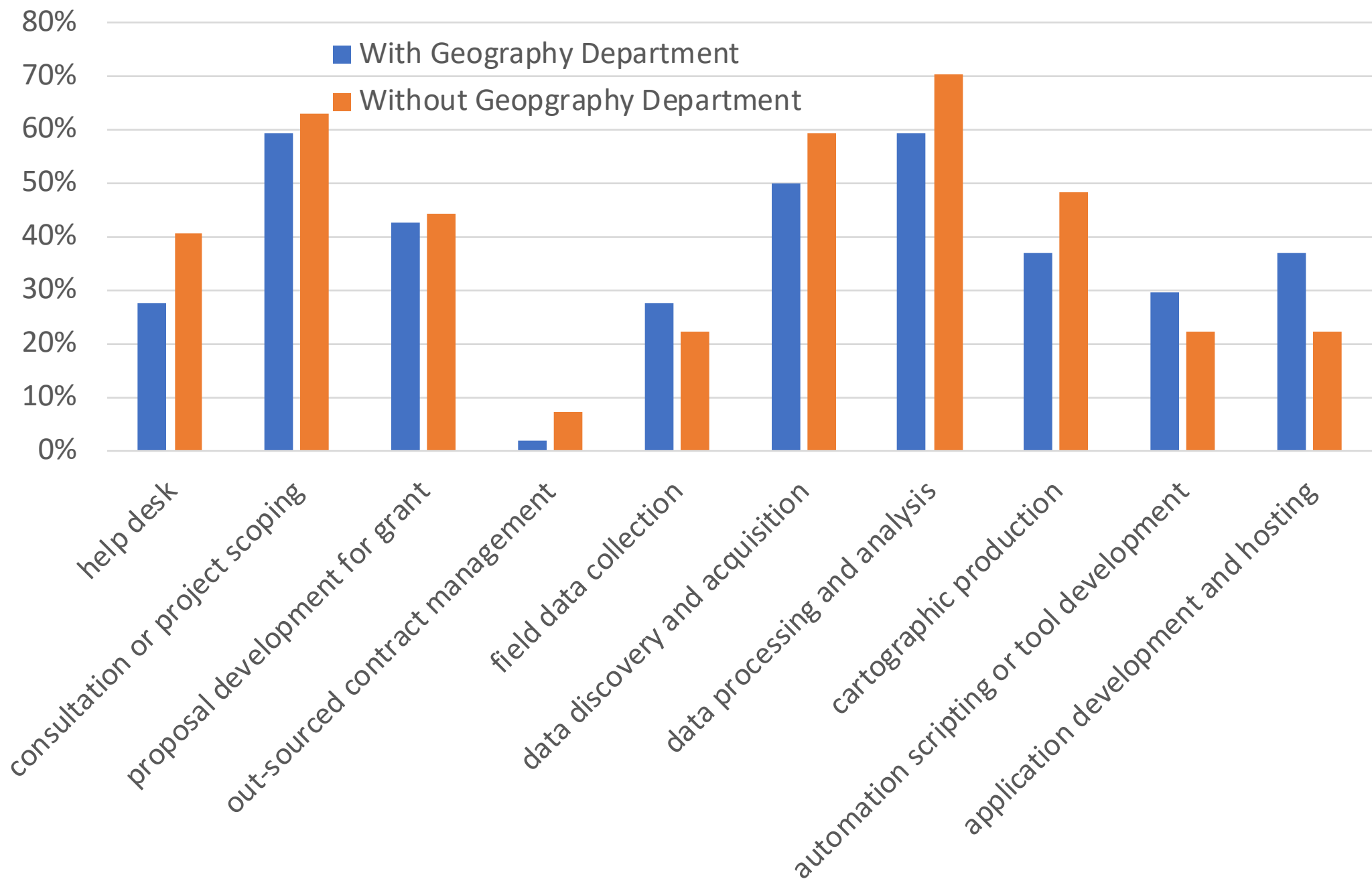


Percent of Centers Offering These Teaching Programs



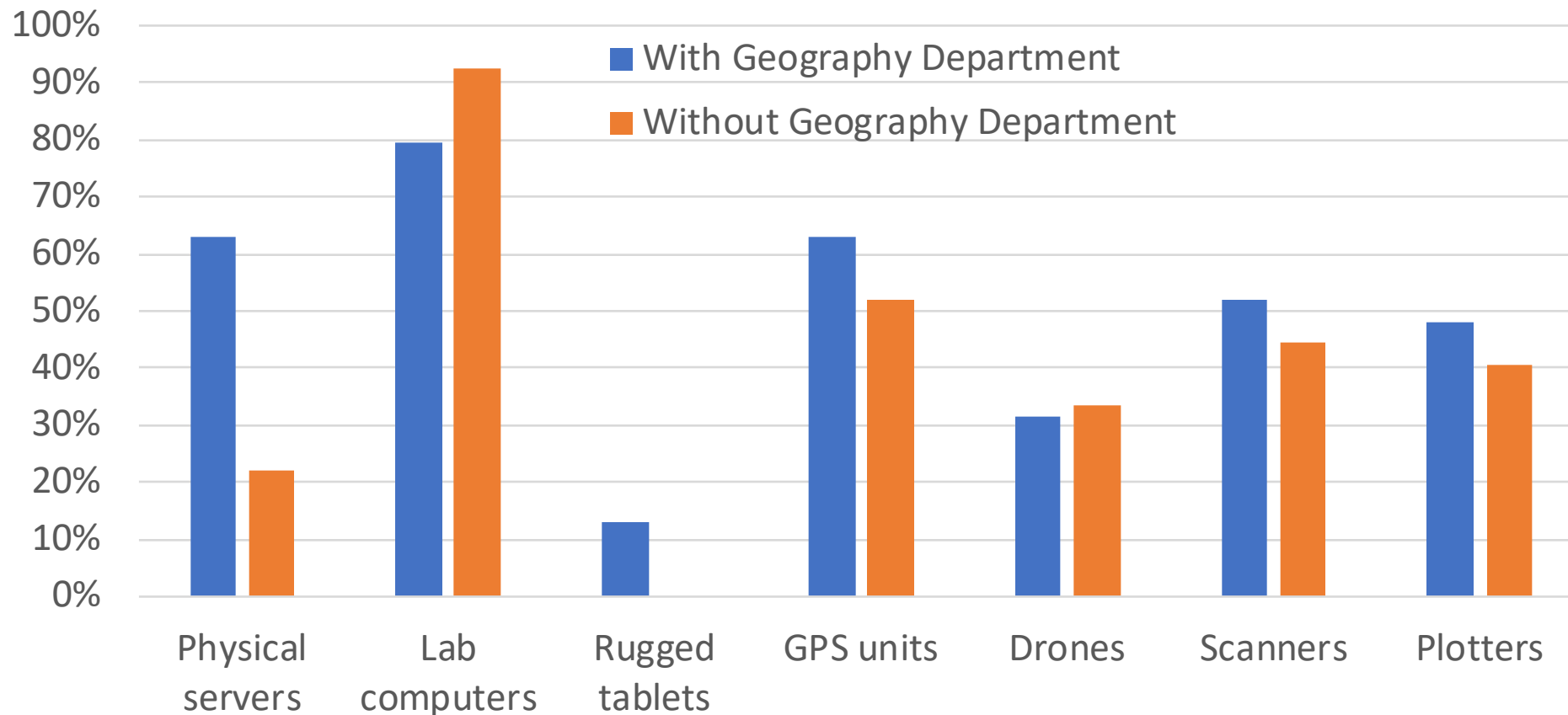
Percent of Centers Engaged in These Research Projects



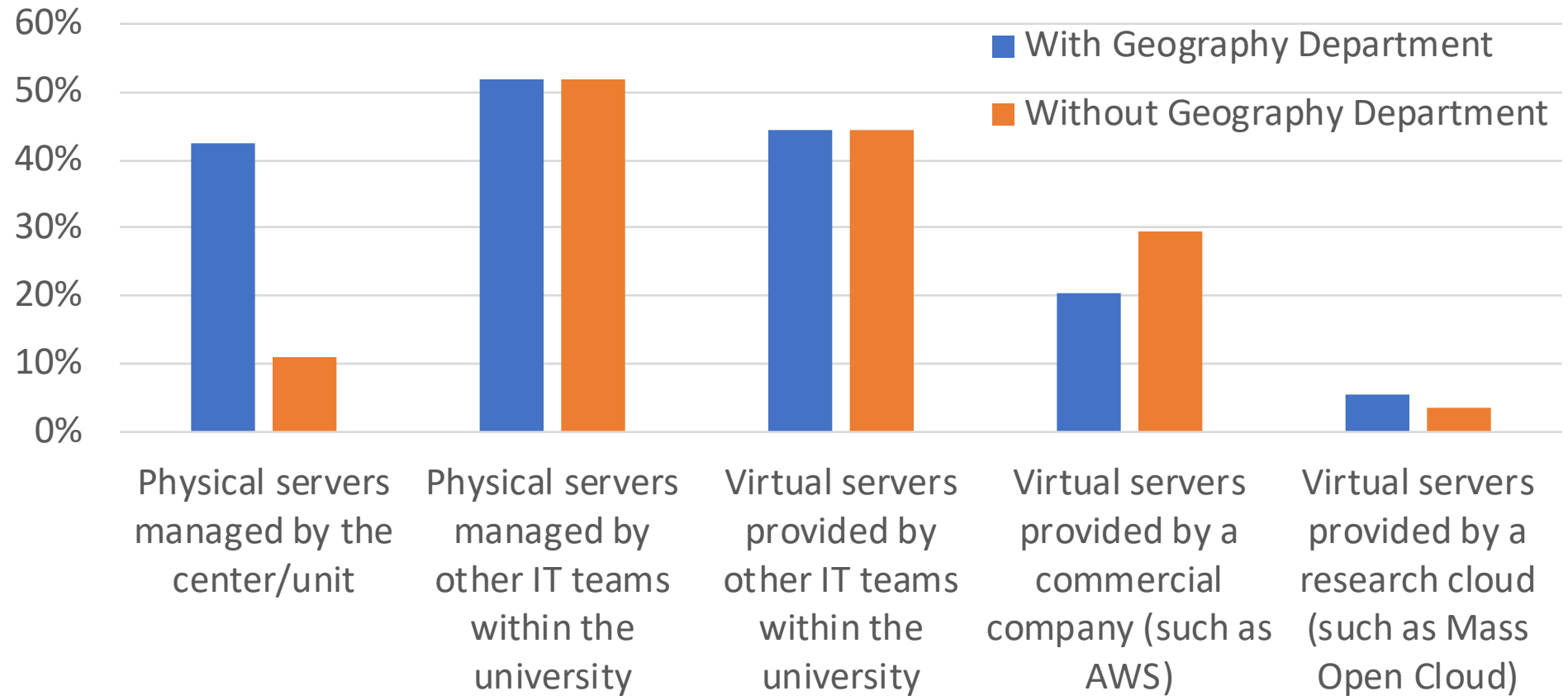


Percent of Centers Providing These Services

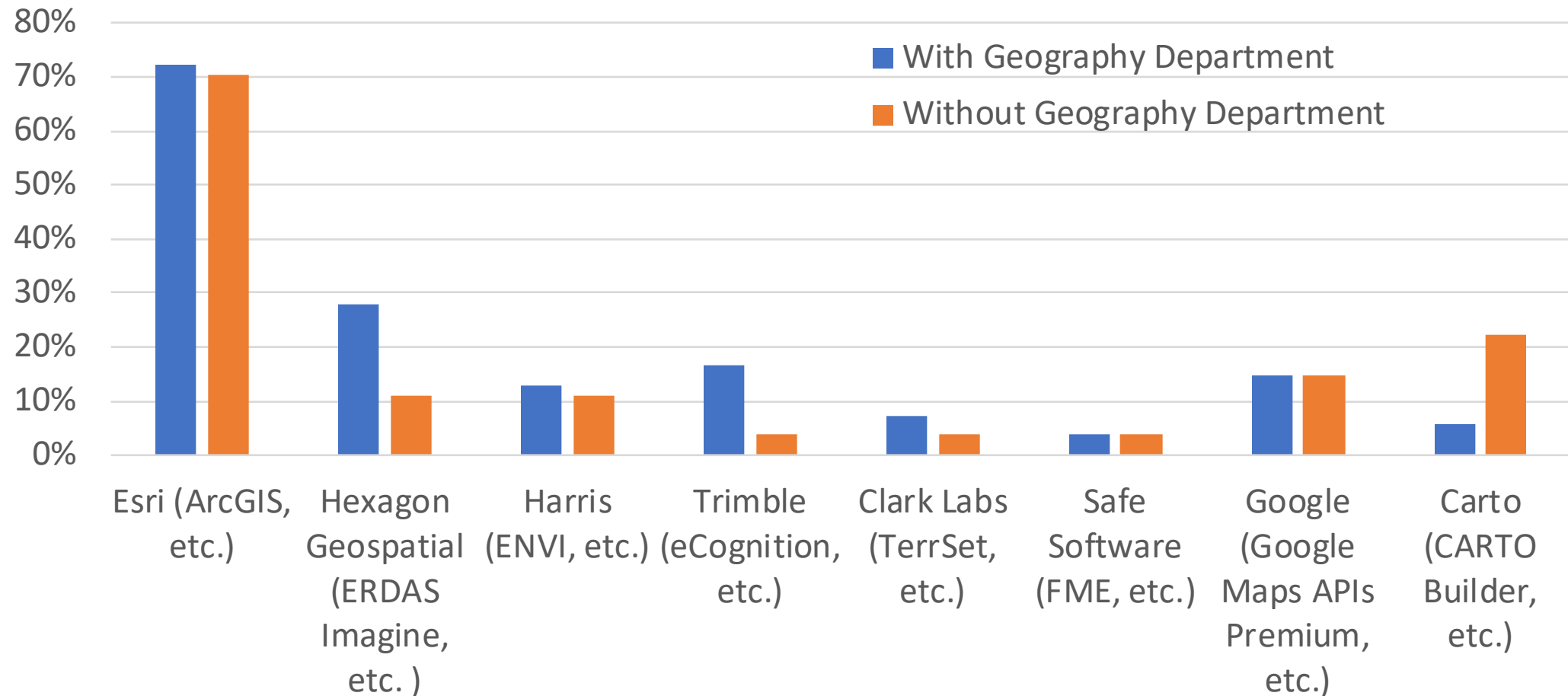
Percent of Centers Owning These Equipment



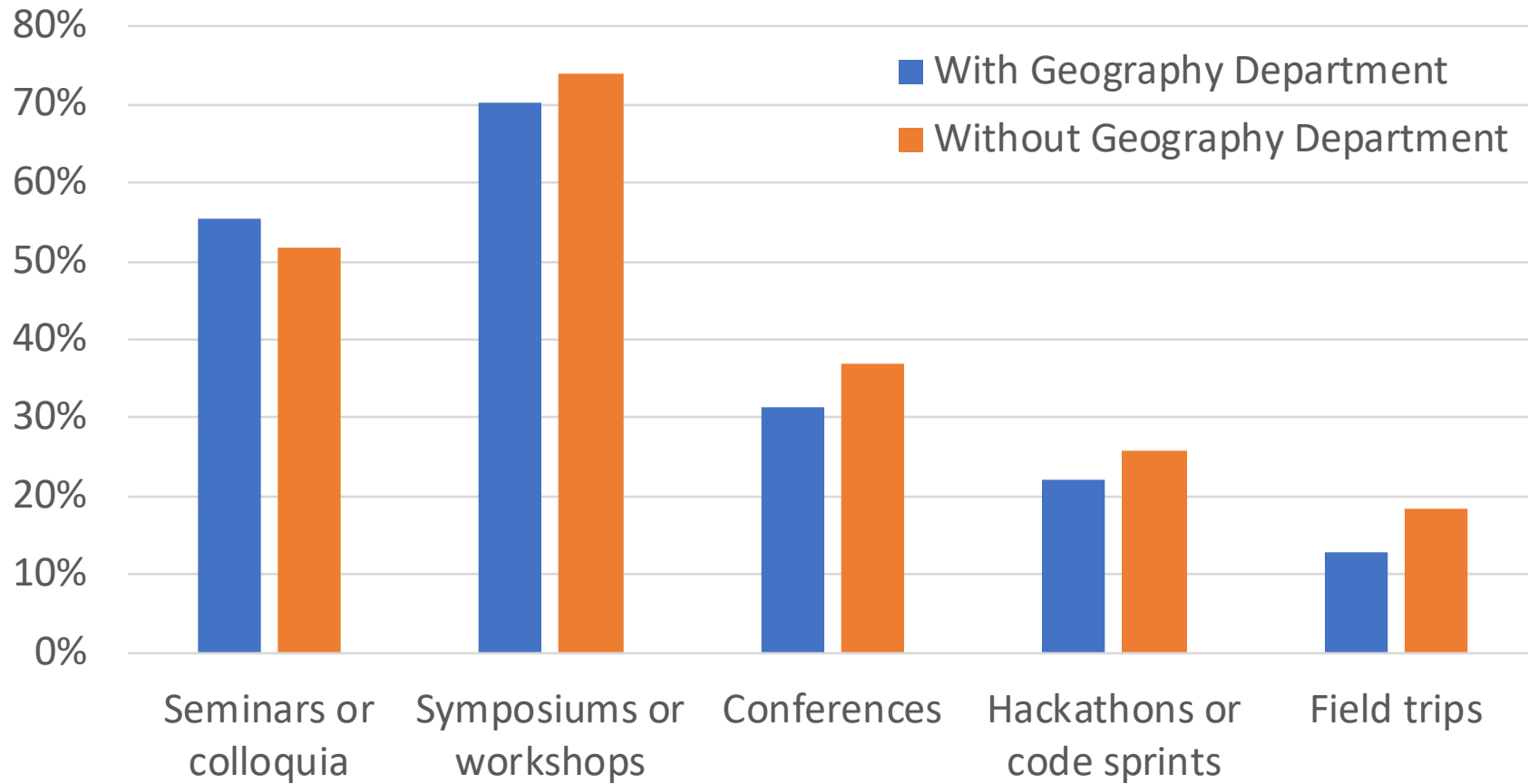
Percent of Centers Using These Hosting Services



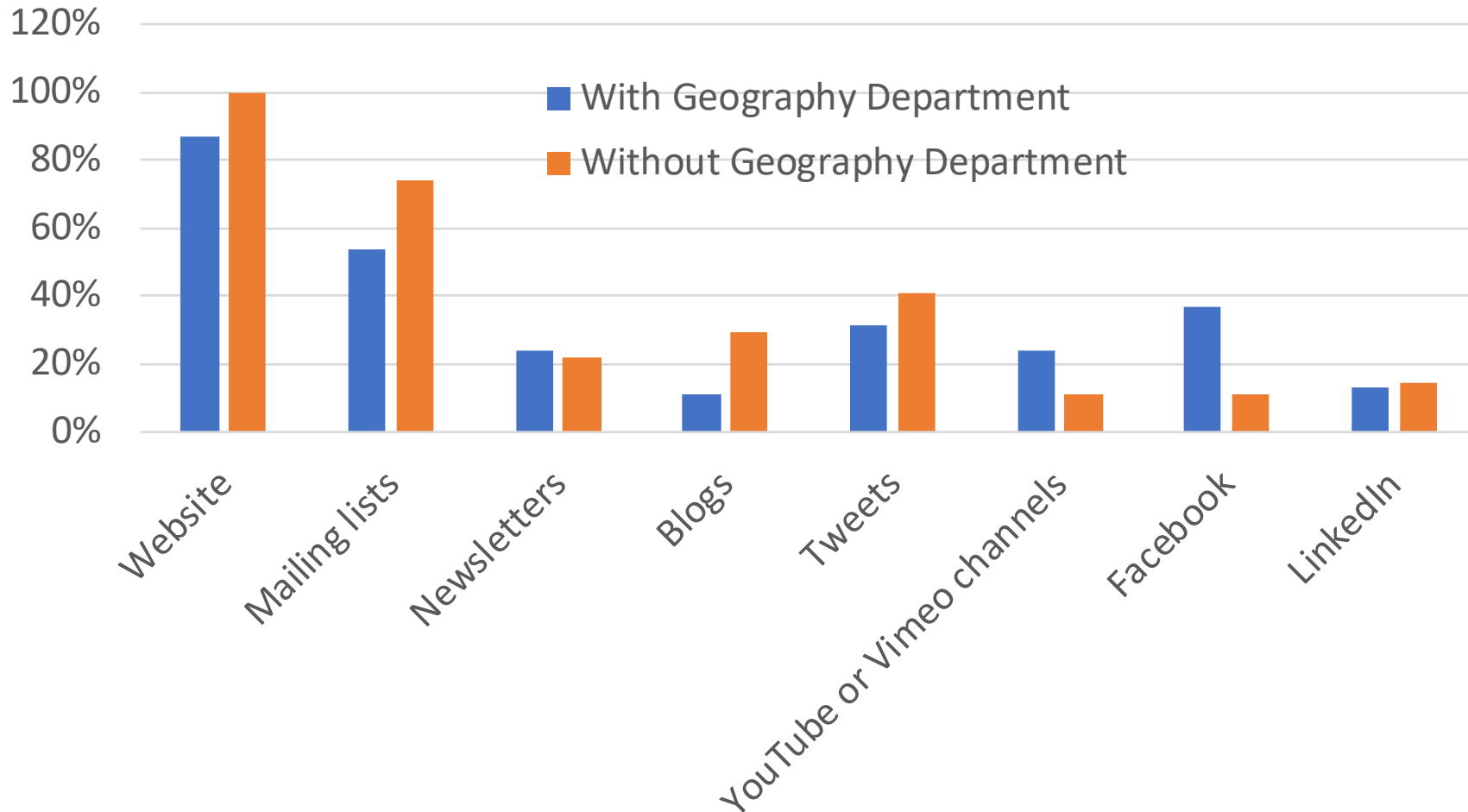
Percent of Centers Managing These Site Licenses



Percent of Centers Host These Events



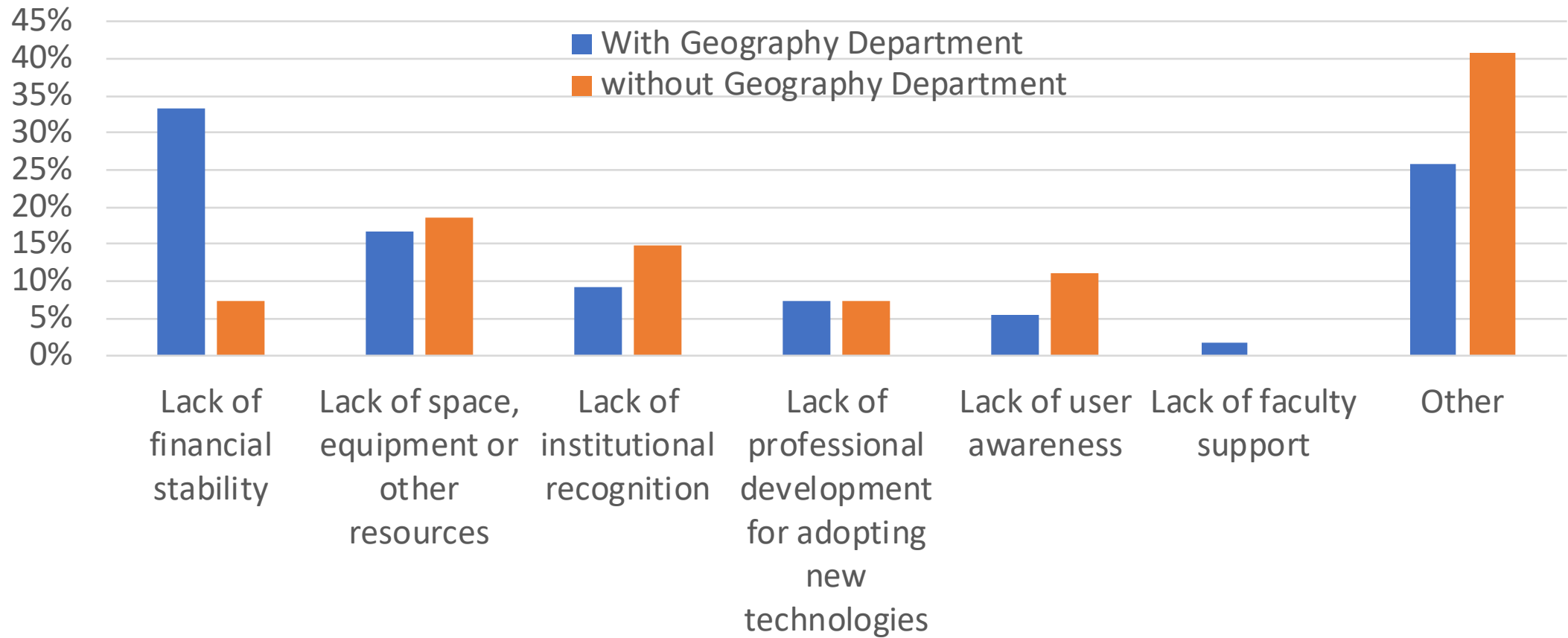
Percent of Centers Using These Communication Channels



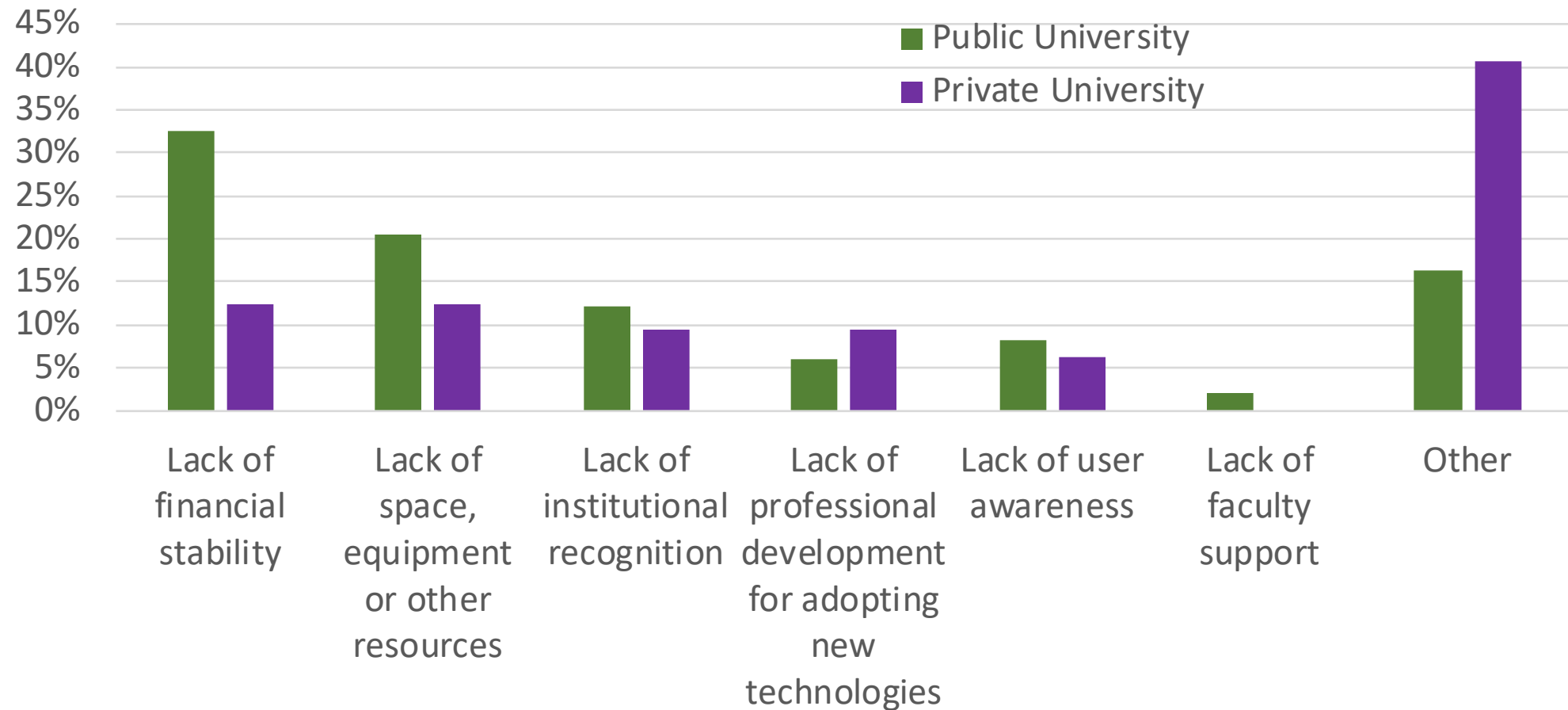
Number of centers as members of GIS related organizations

Organization Name	Organization Abbreviation	Number of Centers / Units as a Member
University Consortium for Geographic Information Science	UCGIS	23
Open Geospatial Consortium	OGC	13
Washington State Geographic Information Council; NYS GIS Clearinghouse, GISMO, etc.	State or Local	4
Association of Geographic Information Libraries in Europe	AGILE	3
United Nations Global Geospatial Information Management	UNGGIM	2
Open-source collaboration for finding and sharing geospatial data	GeoBlackLight	1
Open Source Geospatial Foundation	GeoForAll	1
North American Cartographic Information Society	NACIS	1
Open GeoPortal	OGP	1
Urban and Regional Information Systems Association	URISA	1
	None	47

Percent of Centers Identifying These as their Biggest Challenge (with or without geography department)



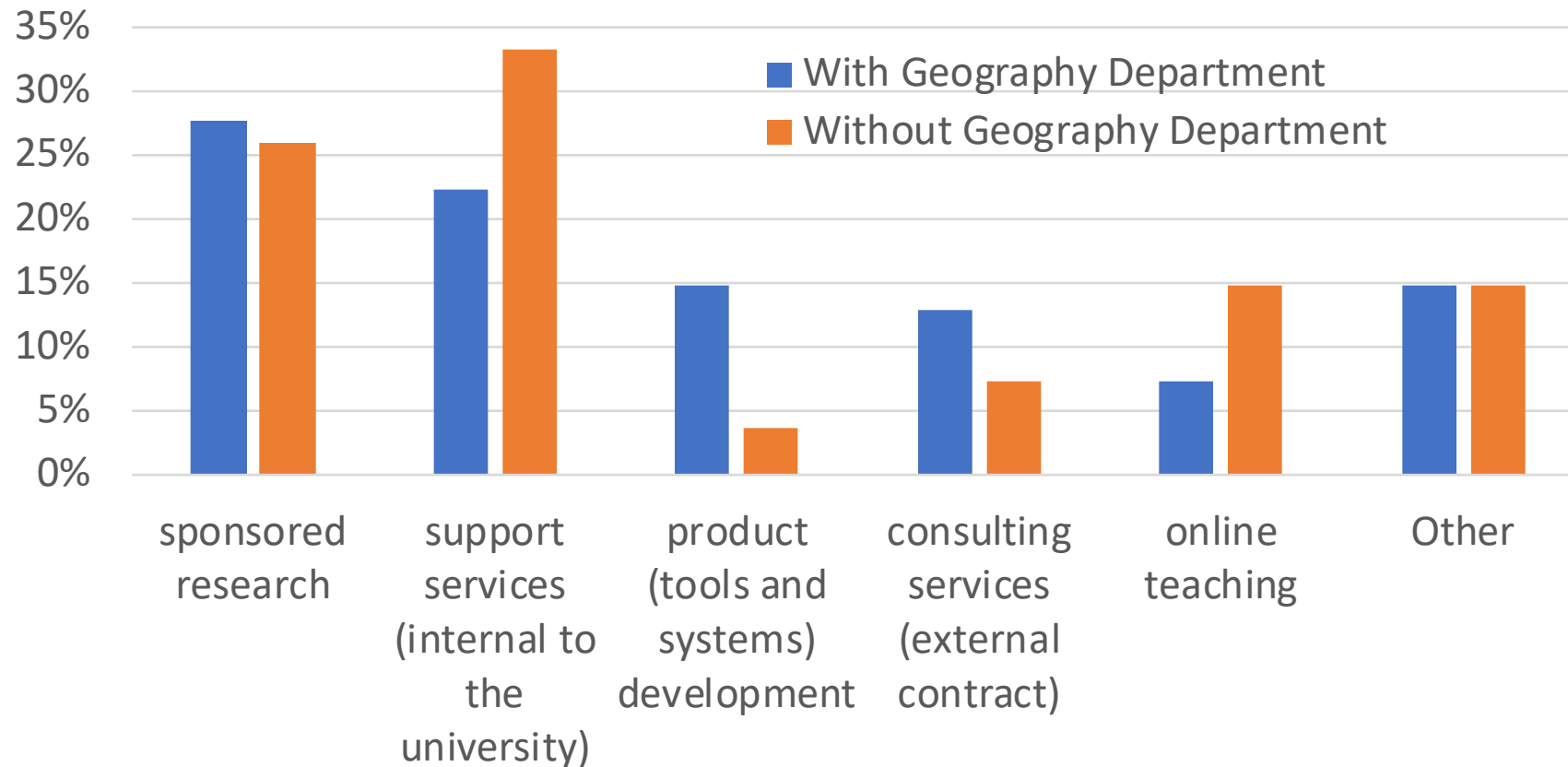
Percent of Centers Identifying These as their Biggest Challenge (public vs private university)



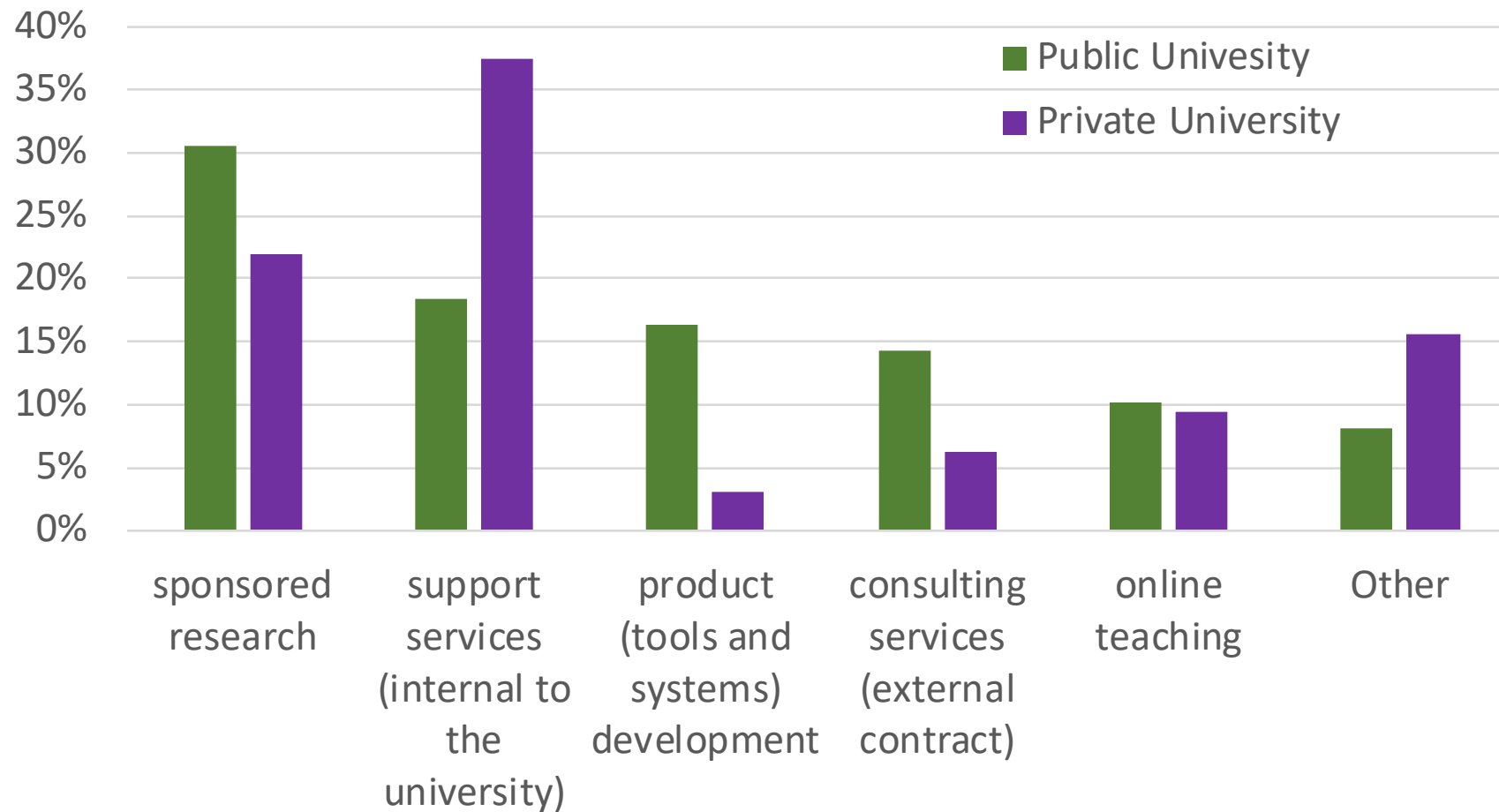
Other Major Challenges

- Inadequate staff skillset:
 - Hiring and staff retention
 - Current staff skillset does not match current responsibilities/opportunities
 - Lack of professional educators
 - Can't keep up with power users' demands
 - Majority of employees are "off-campus"; nation (and world) wide
- Lack of time or capacity to:
 - Build the center's awareness and capabilities
 - Build a proper GIS infrastructure for creative works
 - Transition from traditional stats/admin data to big data
 - Manage scale and support dispersed geospatial research

Percent of Centers Identifying These as Their Most Promising Direction for Growth (with or without geography department)



Percent of Centers Identifying These as Their Most Promising Direction for Growth (public vs private university)



Other Major Opportunities

- Data development:
 - Diversification outside of GIS in data management and visualization
 - Creating and providing access to data and maps for open access
 - Providing access to historical geographic data
 - Developing data-related instruction and services in library
- Course development:
 - Spatial Sciences Initiative and Degree Granting Program
 - Delivering spatial analysis courses to students across the curriculum
 - More students

A glance of the landscape

- The overwhelming majority were straddling research and service in the same center.
- Most centers were established since 1980, accompanying the growth of GIS as an applied science and technology.
- A center's age alone is not a good indicator for its budget size (proxy for its success).
- Centers with a large budget (\$5 million/year or more) were all older than 20 years of age, in public universities with a geography department.
- There was no significant difference between centers in public and private universities (when separating out the factor of geography department).

A glance of the landscape (cont.)

- In this survey, about 10% of public universities did not have a geography department, while two-thirds of private universities did not.
- Among universities without a geography department, there was no clear consensus as to where a GIS center should belong, and how it should be funded. Every university seemed to be exploring its own way.
 - These centers would do more service and training, less sponsored research.
 - They have relatively more stable funding, but a harder time keeping up with new technology.

Limitations of the survey

- It did not include any center that was formed earlier and subsequently discontinued before 2018, no conclusion can be made on the success rate of centers formed at any particular era.
- Data is skewed heavily towards universities in the USA.
- Countries and regions without access to Google (such as mainland China) could not participate in this survey.
- Responders may have limited knowledge or some misunderstanding on the questions (such as how to count number of staff, how to estimate annual budget).
- Challenges and opportunities were limited to the “biggest one”, not allowing a ranked list of multiple entries.

Future perspectives

- Longitudinal data is needed to monitor centers' success over time.
- In-depth discussion is needed to understand the complex factors affecting a center's success.
- The relationship between existing GIS centers and new initiatives (such as Data Science centers) is worth monitoring.
- There may not be a standard model for GIS centers in universities, but there is a great potential for these centers to share experiences and learn from each other.

Thanks! Questions?

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wguan@cga.harvard.edu
<https://gis.harvard.edu/>



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