

Impacts of an Interdisciplinary Research Center on Participant Publication and Collaboration Activities

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Conceptual Framework

- Borner et al. (2010), Falk-Krzensinski et al. (2011), Wagner et al. (2011)
 - Interdisciplinary scientific research (IDR) has been on the rise in recent decades.
- Tash (2006)
 - Research centers are significant vehicles for facilitating IDR.
 - Because of the large amount of resources invested in research centers, a need exists to understand centers from the perspective of what is working and what is not.
- Trochim et al. (2008)
 - Evaluators still know relatively little about how to evaluate the progress and effectiveness of large IDR centers.

Need for Study

- Klein (2008)
 - Evaluation of IDR remains one of the “least-understood aspects” of the phenomenon (p. S116).
- Stokols et al. (2008)
 - It is of major interest to funding agencies to know to what extent center participants are collaborating across disciplines to tackle research problems.
- Norman et al. (2011)
 - One approach: examine the effect of affiliation with the center on the interdisciplinary publication and collaboration activities of its participants.
- Ponomariov & Boardman (2010)
 - While many studies have examined IDR within other contexts, few have examined the effects of participation at an IDR center on the publication patterns of its participants.

Study Purposes

1. Assess the early effects of affiliation with an interdisciplinary research center on participant publication and collaboration behaviors
2. Determine what factors contributed to these effects for participants whose publication and collaboration behaviors were most changed after affiliation

NIMBioS

www.nimbios.org

- An NSF-funded science synthesis center.
- Mission: Develop a community of researchers who work across disciplinary lines to address fundamental and applied biological problems.
- Focus of study: Working groups. Typically involve 10-12 participants and meet 2-4 times over a two year period, with each meeting lasting 3-5 days.
- One of the key indicators of success for any working group is scholarly output, including journal articles.

Research Questions

1. **To what extent does affiliation with NIMBioS working groups affect participant publication output?**
2. **To what extent does affiliation with NIMBioS working groups influence the collaboration behaviors of participants?**
3. **To what extent does affiliation with NIMBioS working groups affect the interdisciplinarity of participant research?**
4. **For participants who show the greatest impacts in publication and collaboration behaviors, what factors contribute to this impact?**

Participants

- 46 participants from 6 completed working groups
- Participant criteria:
 - Faculty member
 - Physical attendance of one meeting
 - Still considered a member at the conclusion of the group
 - Not members of NIMBioS leadership

Participants

Variable	Number of participants	Percent of participants
Male	39	85%
Social scientist	8	17%
Tenured before NIMBioS affiliation	32	70%
	Median	Range
Number of meetings attended	3	1-4
Year of PhD	1995	1962-2008

Methodology

Bounded Case Study with Mixed Methods Approach

- Ponomariov & Boardman (2010)
 - Effect of university research centers on productivity and collaboration patterns of affiliated faculty
- Current Study: All participants became affiliated with NIMBioS in 2009.
- Publication records for each participant were collected from Web of Science for 2007-2008 as a “before” period and 2010-2011 as an “after” period.
- Publication data were analyzed by year against several demographic control variables using Poisson or negative binomial regressions.

Methodology

Independent Variable

- NIMBioS affiliation in year i

Dependent Variables

- number of publications in year i
- number of distinct co-authors in year i
- number of distinct countries of co-authors in year i
- number of distinct institutions of co-authors in year i
- and number of distinct Web of Science (WOS) subject categories (SCs) in year i per participant

Control Variables

- Social science
- Gender
- Tenured before center affiliation
- Year of PhD Degree
- Lagged publication productivity

Methodology

WOS SC:

- Assigned at the journal level
- Every article within a given journal is tagged with the categories of its respective journal.
- 250 SCs in the natural and physical sciences, social sciences, and arts & humanities.
- Subject categories are reviewed annually and changes or additions are made in accordance to evolving areas of research.
- Changes are retroactive.

Methodology

- Brinkerhoff (2003)
 - Success Case Method
- Developed for use in business to determine “how success was achieved.”
- For current study, male and female participants were identified who had shown the most change in dependent variables and were invited to interview.
- Four males and two females agreed to interview.

Research Question 1 - Findings

To what extent does affiliation with NIMBioS working groups affect participant publication output?

Publication Output

Affiliation with a NIMBioS working group was not a significant predictor of publication output ($p = 0.963$).

Research Question 2 - Findings

To what extent does affiliation with NIMBioS working groups influence the collaboration behaviors of participants?

Co-authorship

Affiliation with a NIMBioS working group was a significant predictor of co-authorship. Affiliation was estimated to increase number of co-authors by 40% ($p = 0.006$).

Research Question 2 - Findings

To what extent does affiliation with NIMBioS working groups influence the collaboration behaviors of participants?

Cross-institutional Co-authorship

Affiliation with a NIMBioS working group was a significant predictor of cross-institutional co-authorship. Affiliation was estimated to increase cross-institutional co-authorship by 45% ($p = 0.002$).

Research Question 2 - Findings

To what extent does affiliation with NIMBioS working groups influence the collaboration behaviors of participants?

International Co-authorship

Affiliation with NIMBioS was a significant predictor of international co-authorship. Affiliation was estimated to increase international co-authorship by 21% ($p = 0.042$).

Research Question 3 - Findings

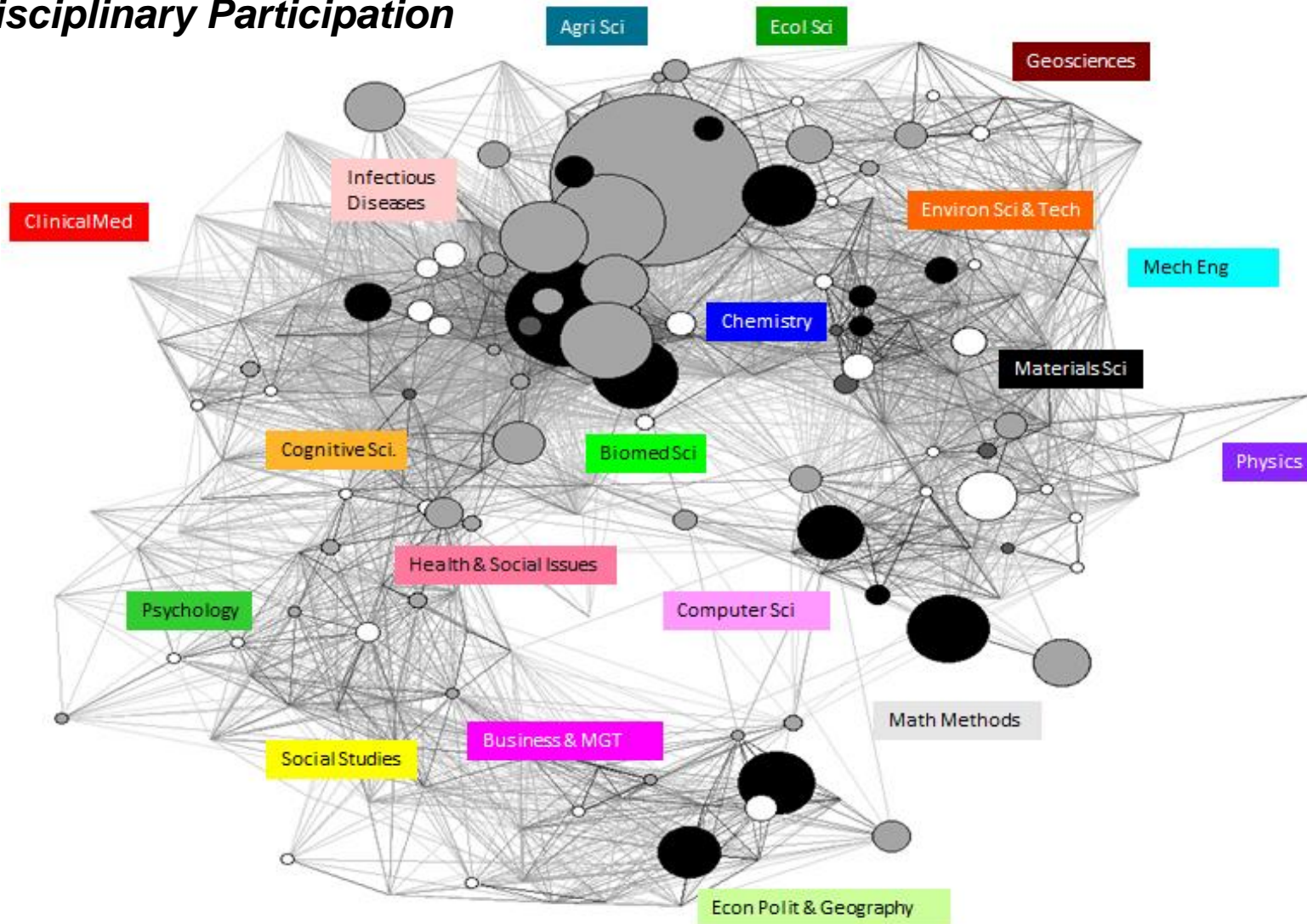
To what extent does affiliation with NIMBioS working groups affect the interdisciplinarity of participant research?

Disciplinary Frequency

Affiliation with a NIMBioS working group was not a significant predictor of number of WOS SCs in which a participant publishes ($p = 0.736$).

Research Question 3 - Findings

Disciplinary Participation



Research Question 4 - Findings

For participants who show the greatest impacts in publication and collaboration behaviors, what factors contribute to this impact?

Most Successful Cases

Collaboration and publication factors included:

- 1) Collaborations with researchers from other disciplinary fields that would not have occurred had they not been a part of the group;
- 2) publishing in journals in which they had not published before affiliation with the working group; and
- 3) connections made that will facilitate future interdisciplinary collaborations.

Research Question 4 - Findings

For participants who show the greatest impacts in publication and collaboration behaviors, what factors contribute to this impact?

Most Successful Cases

Group structure factors included:

- 1) Breaking into sub-groups; and
- 2) an overall positive and welcoming group atmosphere.

Leadership factors included:

- 1) The ability of leaders to keep the group organized;
- 2) the maintenance of a positive and welcoming atmosphere by leaders, and
- 3) emergence of one clear “leader” who took charge of the group’s daily routine.

Research Question 4 - Findings

For participants who show the greatest impacts in publication and collaboration behaviors, what factors contribute to this impact?

Least Successful Case

Group structure factors included:

- 1) Lack of organization within the group, particularly among participants from one institution;
- 2) the wrong people were involved with the group; and
- 3) lack of follow-through on tasks.

Leadership factors included:

- 1) Difficulty with communication and organization; and
- 2) lack of follow-through on tasks by leaders.

Conclusions

- The results of this study indicate that affiliation with a NIMBioS working group affects the collaboration, and to a lesser extent, publication behaviors of affiliated faculty in ways consistent with the mission of the center
- The multi-dimensional approach taken in this study appears to be a valid and useful approach to evaluation of IDR center activities.
- Future research: comparison group, longer time period, more participants, network analysis

Thank You

Extra Slides

Parameter	Number publications in year <i>i</i>		Total number co-authors in year <i>i</i>		Number cross-institutional co-authors in year <i>i</i>		Number international co-authors in year <i>i</i>		Number WOS SCs in year <i>i</i>	
	IRR (95% CI)	Wald <i>z</i>	IRR (95% CI)	Wald <i>z</i>	IRR (95% CI)	Wald <i>z</i>	IRR (95% CI)	Wald <i>z</i>	IRR (95% CI)	Wald <i>z</i>
Affiliated with NIMBioS in year <i>i</i>	0.995 (0.985-1.005)	0.002	1.396 (1.100-1.770)	7.553	1.453 (1.149-1.837)	9.757	1.207 (1.007-1.446)	4.149	1.029 (0.873-1.212)	0.114
Number of publications in year <i>i</i> -1	1.152 (1.120-1.184)	99.994	1.067 (1.029-1.107)	12.287	1.07 (1.029-1.112)	11.686	1.059 (1.029-1.091)	15.087	1.092 (1.070-1.117)	64.214
Year of PhD degree	1.024 (0.985-1.005)	1.024	0.987 (0.873-1.002)	2.894	0.986 (0.971-1.000)	3.666	0.985 (0.975-0.996)	7.843	1.002 (0.992-1.011)	0.131
Tenured before affiliation	0.973 (0.722-1.312)	0.031	0.939 (0.629-1.376)	0.13	0.819 (0.551-1.217)	0.976	0.692 (0.515-0.931)	5.926	1.102 (0.844-1.438)	0.512
Social science	0.802 (0.617-1.401)	2.75	0.559 (0.386-0.783)	10.956	0.621 (0.434-0.888)	6.82	0.886 (0.665-1.179)	0.649	0.907 (0.711-1.157)	0.618
Male	1.886 (1.382-2.574)	15.992	2.022 (1.294-3.160)	9.558	1.963 (1.298-2.969)	10.217	1.426 (1.015-2.002)	4.194	1.501 (1.102-2.045)	6.64

Control variable	Explanation
Social science	Research fields vary widely in terms of productivity, and collaboration (Durieux & Gevenois, 2010). Social scientists have been found to have fewer co-authors than those in other scientific fields (Moody, 2004; Ponomariov & Boardman, 2010). This variable is coded 1 if the researcher self-identified a social science field as his or her primary field of study, and 0 if he/she did not.
Gender	Including gender as a control variable is warranted as studies have shown that female scientific productivity lags behind males (Cole & Cole, 1973; Long, 1992). Another study found that males are more likely to produce interdisciplinary research (Ponomariov & Boardman, 2010). This variable is coded 1 for male and 0 for female.
Tenured	It is important to assess the impact of affiliation with NIMBioS on junior faculty, especially regarding productivity, which is a primary criterion for tenure. This variable is coded 1 for study members who held at least the rank of Associate Professor during the year he or she affiliated with the center and 0 for those who did not.
Year of PhD Degree	Year of PhD is important to include as scientists who received their degrees more recently may be more apt to adopt patterns of interdisciplinary collaboration than scientists who received their degrees when the IDR was not the norm.
Lagged publication productivity (lagged one year)	Past publication productivity has been shown to impact number of subsequent publications per year, number of collaborators per year, level of interdisciplinary research published, and number in institutions collaborated with (e.g., more productive scientists are more likely to be capable of higher numbers of collaborations)(Ponomariov & Boardman, 2010).

Subject Category	Rank Before	% of 276 articles	Rank After	% of 272 articles
Ecology	1	45%	1	39%
Evolutionary Biology	2	16%	3	10%
Biology	3	13%	2	18%
Zoology	4	8%	8	7%
Multidisciplinary Sciences	5	8%	5	8%
Genetics & Heredity	6	7%	20	2%
Mathematics, Applied	7	5%	6	7%
Environmental Sciences	8	5%	9	6%
Mathematical & Computational Biology	9	5%	4	9%
Biodiversity Conservation	10	5%	10	6%
Economics	11	5%	7	7%
Mathematics	12	4%	15	3%
Physics, Mathematical	13	4%	13	3%
Veterinary Sciences	14	4%	14	3%
Mathematics, Interdisciplinary Applications	15	4%	12	5%
Behavioral Sciences	16	3%	17	2%
Environmental Studies	17	3%	11	5%
Agricultural Economics & Policy	18	2%	23	1%
Cell Biology	19	2%	51	0%
Infectious Diseases	20	2%	16	2%

Working Group Info

Working Group	Total no. of participants	Participants eligible for study ^a	No. of meetings	Date of first meeting	Date of last meeting
Group A	16	8	3	4/16/09	11/4/10
Group B	21	4	4	4/27/09	8/15/11
Group C	12	6	4	5/26/09	12/14/10
Group D	16	10	3	6/7/09	5/16/11
Group E	14	5	3	6/10/09	9/13/11
Group F	17	13	3	7/27/09	2/10/11

^a Total number of participants includes participants who dropped out of the group along the way.