

COLLABORATION IN ACADEMIA: MOTIVES, FORMS AND IMPACTS ON SCIENTIFIC PRODUCTIVITY

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Outline

- Study context;
- Academic collaboration?
- Forms of collaboration?
- Motives: what drives collaboration in academia?
- Research questions and data;
- Results: impacts of collaboration on productivity
- Discussion and study implications.



Study context

- “a successful university **must be global in presence.....**
- To produce cutting-edge research, one needs an environment of collaboration...**the name of the game is NOW COLLABORATION”**
(UbuntuNet Alliance, 2016) (emphasis added)



Study context (2)

- **Increasing push and demand for Open Science; Open innovation and co-creation;**
- **Big data and analytics** are shown to bring about social benefits;
- **New social contract** for universities and research institutions: **become full economic and social development agents or PERISH;**



Study context (3)

- **Fewer excuses for not collaborating: More reliable, easily accessible and ever decreasing cost of ICT is opening new opportunities for collaboration;**
- **Many universities and research institutions are cash-trapped and collaboration may bring about much needed additional resources;**
- **More and more, Success in collaboration is becoming an effective way to get recognition and promotion locally and globally for a researcher;**



Study Rationale

- **Existing literature on collaboration:**
 - **Limited in scope as focused on:**
 - Applied engineering;
 - Motivations; mechanisms, financial costs and benefits;
 - Co-authorship as the ultimate measure of collaboration: bibliometric studies;
 - Industry-university collaboration
 - **Two competing views:**
 - collaboration does nothing to increase scientific productivity: just a pretext to generate more funds;
 - Collaboration may increase scientific productivity but will ultimately change universities' missions



Our Study approach

- **Unit of study:** individual researcher (vs institution);
- **Uses a survey** (vs bibliometric review);
- **Takes into account all scientific disciplines;**
- **Empirically test for the impact of collaboration on scientific productivity;**



Collaboration and collaborative research???

- **Collaboration:** “the Exchange of scientific ideas, results and methods, as well as the undertaking of joint activities with peers, industry and institutions”
- **Collaborative research:** “ project between a university researcher and another partner such as other university researchers; a company representative or an organization representative



Forms of collaboration

- Consulting;
- Special courses and seminars to train and upgrade manpower;
- Hiring of university graduates by industry and other public bodies: governments and international institutions;
- Faculty participation on advisory boards;



Motives for collaboration: Brousseau's Contract Theory

- 1) **Strategic**: Partners determine the goals and directions of collaborative activities;
- 2) **Organizational**: Collaborative activities are clearly defined; budget requirements are discussed; prospectus and methodology of the research are defined;
- 3) **Operational**: Partners make decisions about the use of joint resources; the publication and diffusion of the collaborative research output.





More time, more resources and more effort are spent as one moves from a strategic collaboration to an operational





IMPACTS OF COLLABORATION ON SCIENTIFIC PRODUCTIVITY?



DATA

- **A mail survey of the 9,350 scientists** (professors) in Québec's universities;
- **Questionnaire made of 11 sections:**
 - Researcher's affiliation;
 - Collaborative partners in Canada and in rest of the world:
 - Peers
 - Industry
 - institutions
- **All scientific disciplines included;**
- **1,566 (17%) usable questionnaires;**



DESCRIPTIVE RESULTS

- **95% of respondents had entered a collaborative relationship in the last 5 years;**
- **83% collaborated with other researchers;**
- **60% collaborated with institutional partners;**
- **40% collaborated with industry partners.**



ANOVA test for the difference in productivity among scientists from different disciplines



Disciplines	Mean Differences	
	PTY (All scientific outputs)	PTY2 (Only journal articles and book chapters)
Social sciences vs Natural sciences	.917	.100
Social sciences vs Engineering	1.145*	.337
Social sciences vs Human sciences	1.404*	.770*
Natural sciences vs Engineering	.228	.236
Natural sciences vs Human sciences	.587	.670*
Engineering vs Human sciences	-.259	.434*



Interpretation

- When **all scientific outputs are accounted for**, there is a **statistically significant productivity difference** between:
 - Social sciences and Engineering;
 - Social sciences and Human sciences;
- When only **book chapters and journal articles are accounted for**, a **statistically significant difference in productivity exists between**:
 - Social sciences and human sciences;
 - Natural sciences and human sciences;
 - Engineering and Human sciences





Analytical Model and Results



Analytical Model

- $$\begin{aligned} \text{PTY} = & b_0 + b_1 \text{PTC} + b_2 \text{INTCOL} + \\ & b_3 \text{CCUNIV} + b_4 \text{CCIND} + b_5 \text{CCINST} + \\ & b_6 \text{HHCOL} + b_7 \text{PROXIINT} + b_8 \text{PROXIND} \\ & + b_9 \text{PROXUNIV} + b_{10} \text{DISPL} + \\ & b_{11} \text{CCOLUNIV} + b_{12} \text{CCOLIND} + \\ & b_{13} \text{CCOLINST} + b_{14} \text{CATREAL} \end{aligned}$$



Variables definition and hypothesized impact on academic productivity

Variables	Variable definition	Expected effect on academic productivity
PTY	Productivity index	Dependent variable
PTC	Percentage of work done in collaboration	+/-
INTCOL	Intensity of collaboration	+
CCUNIV	Collaboration takes place with peers	+
CCIND	Collaboration takes place with industry	+
CCINST	Collaboration takes place with institutions	+
HHCOL	Collaboration begins right after graduation	+
PROXIINT	Intellectual closeness to partners	+
PROXIND	Geographic closeness to industry	+
PROXUNIV	Geographic closeness to other universities	+
DISPL	Scientist's field of research	-
CCOLUNIV	Main collaborators are other scientists;	+
CCOLIND	Main collaborators are from industry	-
CCOLINST	Main collaborators are from institutions	-
CATREAL	Types of outputs	-

OLS Regression Results

Variables	Variable definition	Parameter estimates (t-ratios)
PTC	Percentage of work done in collaboration	-.015* (-3.14)
INTCOL	Intensity of collaboration	.048* (2.40)
CCUNIV	Collaboration takes place with peers	.164* (4.99)
CCIND	Collaboration takes place with industry	.122** (1.99)
CCINST	Collaboration takes place with institutions	.142* (3.58)
HHCOL	Collaboration begins right after graduation	-.093 (-.36)
PROXIINT	Intellectual closeness to partners	1.289* (2.98)
PROXIND	Geographic closeness to industry	-.623* (-2.71)
PROXUNIV	Geographic closeness to other universities	-.222 (-.70)
DISPL	Scientist's field of research	-1.021* (-4.49)
CCOLUNIV	Main collaborators are other scientists;	-1.156 (-.51)
CCOLIND	Main collaborators are from industry	-1.637* (-2.68)
CCOLINST	Main collaborators are from institutions	.043 (.098)
CATREAL	Types of outputs	-2.145* (-9.48)

R-square = .22; F= 26; N = 1254; Degrees of freedom = 1239; * = coefficient is significant at 1% level; ** = coefficient is significant at 5%

Key Findings

- **Collaboration is more prevalent among academics when all outputs are accounted for** (not only those that matter for academic advancement);
- **Bibliometric studies underestimate the extent of collaboration** by researchers;
- Understandably, **researchers in humanities** (theology, literature and philosophy) **have fewer collaborative outputs**;
- Similarly, **those involved in collaboration aimed at producing softwares; scientific instruments; artistic production and other patented products have fewer collaborative outputs**;
- **Collaboration is conducive to academic productivity increase regardless of the type of partners**;



Key Findings (2)

- **Operational collaborations are more prevalent than strategic and organizational collaborations. This is true regardless of i) the stage at which researchers enter collaborative relations and ii) their degree of intellectual closeness to partners;**
- **Both the field of research and geographic closeness to industry have significant impact on productivity and conducive to operational collaboration;**



Policy Implications

- **Universities are able to satisfy the needs of industry and institutions without compromising academic standing;**
- **Thus, a new social contract for universities** whereby they are active social and economic development agents **is possible and commendable;**
- **University administrators should foster collaborative relationships** as they increase academic productivity. **A diversified set of incentives for researchers may be helpful in this respect.**



Policy implications (2)

- **University administrators could also aggressively pursue opportunities for collaboration** (e.g. symposia and conferences bringing together their researchers and industry and institutions) **as a means to raise the standing of their universities and raise awareness of the research being done;**
- **From a knowledge management perspective**, insofar as operational collaboration is prevalent, **fostering a collaborative friendly environment may lead to better research results diffusion and utilization;** This **may generate both individual and social benefits.**



Lessons for Africa


- **Since operational collaboration is prevalent, increased collaboration by African universities and research institutions may increase the uptake of research results and help in the fight for poverty reduction;**
- **UBUNTUNET Alliance, WACREN, the NRENs and their allies are instrumental in that process;**
- **Administrators of African universities and research centers need to design incentive packages to reward researchers involved in collaboration;**



Challenges (for harvesting the full potential of collaboration in Africa)

- **Lack of quantitative data and metrics on research;**
- **Lack of integration of science and technology policies and Intellectual property policies;**
- **In many cases, inexistence of such policies;**
- **In many instance, administrators of African universities and research centers lack the knowledge and/or motivation to transform their institutions into knowledge transfer hubs.**





Thank you for your attention

Questions?

Comments?

