Is the important thing to win or to participate? The case of a competitive grant race promoting scientific collaboration

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Outline of the presentation

- Motivation
- Research questions
- Theoretical framework
- Empirical results
- Exploratory analysis
- Policy implications and discussion

Motivation

- Researchers invest a lot of time raising money and they are judged on that
 - "Grant applications divert scientists from spending time doing science ... [a] chemist in the U.S. can easily spend 300 hours per year writing proposals" (Stephan, 1996)
 - "[Researchers] are judged on the amount of money they bring to their institutions, writing, reviewing and administering grants absorb their efforts" (Ioannidis, 2011)

Motivation

- Rising attention of national funding agencies for efficient funds allocation
 - *"The Director of the Office of Management and Budget shall require each agency to prepare an annual performance plan"* (US Government Performance and Result Act, 1993 sec. 2803)

Our research questions

- 1. Is the application process only costly for scientists?
 - Extant studies do not include an analysis of the effects of the application process
- 2. Does being awarded have an impact on the subsequent scientist's productivity?
 - Extant studies on the effect of national funds for scientists' work present mixed results (Arora and Gambardella, 2005; Gush et al., 2015; Jacob and Lefgren, 2011; Azoulay et al., 2015)

Theoretical framework – The setting:

- Two types of researchers :
 - High quality researchers (with productivity θ_H)
 - Low quality researchers (with productivity $\boldsymbol{\theta}_{L}$)
- Researchers decide whether or not to apply for a grant based on:
 - the effort needed *e*
 - the expected success rate in getting funded *s*
- Researchers aim at maximizing their scientific utility u_R :
 - u_R is decreasing in the effort produced (e)
 - u_R is increasing in the expected success rate of getting funded (s)
- Summarizing u_R can be written as follows:

$$u_R = s - e$$

• The reservation utility in case of absence of application u_0 is set to zero

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Theoretical framework - Analysis

• Researchers take their application decision *a* based on:

$$Max_{a \in \{0,1\}} \{a * (s - e)\}$$

- Since the funding agency screens the applications, only high quality researchers will apply for the grant (*s* is too small for low type researchers)
- The subsequent scientific productivity of the high quality researchers has:
 - The natural high productivity for all high type researchers : θ_{H}
 - An additional effect due to the application for applicants only: A
 - An additional effect due to the funds received for awarded only: F

Theoretical framework - Summary

• The subsequent scientific productivity for all type of researchers can be summarized as follows:

Low productivity researchers	θμ
High productivity researchers not applying	θ _Η
High productivity researchers applying not funded	$\boldsymbol{\Theta}_{H} + \boldsymbol{A}$
High productivity researchers applying and successfully funded	$\theta_H + A + F$

- We expect the funding to have a positive effect on productivity (**F** > 0)
- The application process could have a positive effect (*A* > 0) if the effort has intrinsic value for scientific production or a negative effect if it diverts the researcher from producing science (*A* < 0)

In a nutshell

- We implement a 2-step analysis:
- 1) Comparison of high level non-applicants vs. applicants

2) Comparison applicants non-awarded vs. applicants awarded

Our contributions

- We add to the economics literature on the impact of public funding on scientists' productivity
 - Extant studies do not include an analysis of the effects of the **application process**
 - We add evidence to the extant studies on the impact of being awarded a grant

Our empirical setting

• The SINERGIA Program is one of the funding schemes of the Swiss National Science Foundation

Introduced in October 2008

 Aims to promote the interdisciplinary collaboration of research groups that propose breakthrough research

Our study sample

- SNSF provided us with detailed information about successful and unsuccessful applicants (755 distinct applicants)
- We constructed a sample of potential applicants



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Our study sample: Matched sample of potential applicants (PSM)

- We identified a pool of 25,715
 Swiss scientists affiliated to the 11 major Swiss universities and not working in the applicants' teams
- For each *applicant* we identify a *potential applicant* using a propensity score matching (PSM) approach on all observables
 - $\Rightarrow 730 \text{ distinct matched non-applicants} \\\Rightarrow 1060 \text{ obs. scientist-application}$

	Logit
VARIABLES	Pr(Applying)
Publication count before application	0.023***
	(0.0022)
Average citation before application	-0.12***
	(0.014)
Average IF before application	0.043***
	(0.012)
Average authors before application	0.48***
	(0.016)
Average publication growth	0.096*
	(0.052)
Average citation growth	0.011*
	(0.0058)
Average IF growth	-0.10
	(0.069)
Average co-author growth	-0.068
	(0.11)
Seniority	0.018***
	(0.0043)
Constant	-9.30***
	(0.20)
Applicant scientists	25715
Dummy application year	yes
Dummy discipline	yes
Dummy Institution	yes

Scientist's productivity

- We consider four scientist's research outcomes :
 - **Publication quantity**: Count of articles published in [*t*,*t*+4]
 - Publication quality: Average number of citations received per article-year in [t,t+4] and average impact factor of journals where articles are published [t,t+4]
 - Success of collaboration: Dummy that equals one if a scientist co-authors at least one paper with her co-applicants in [*t*,*t*+4]

Where *t* is the Application year

Methodology

- We implement a *diff-in-diffs* estimation strategy (Jaffe, 2002)
 - Control for time invariant unobservable characteristics
 - Common time trends are eliminated
- Robustness checks: OLS and IV estimations

Applicants vs. potential applicants: Estimation strategy



Equivalent regression formulation of the Diff-in-Diffs:

Scientist's outcome_{it}= $\beta_0 + \beta_1 Applicant_i + \beta_2 Post Application_{it} +$

 β_3 (Applicant_i * Post Application_{it}) + controls $\beta_4 + \varepsilon_{it}$

Applicants vs. potential applicants: Results

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	Probit
VARIABLES	log(publication count)	log(average citations per paper)	log(IF)	Pr(succesful collaboration)
Applicant*Post				
application	0.29***	-0.36***	0.10***	0.20***
	(0.036)	(0.033)	(0.030)	(0.043)
Applicant	0.46***	-0.10***	-0.0078	0.43***
	(0.044)	(0.038)	(0.035)	(0.025)
Post application	-0.11***	-0.12***	-0.099***	-0.012
	(0.028)	(0.027)	(0.027)	(0.029)
Seniority	0.030***	-0.011***	-0.010***	0.00041
	(0.0018)	(0.0015)	(0.0013)	(0.00092)
Constant				
Scientist-application	2120	2120	2120	2120

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Awarded vs. not Awarded: Estimation strategy



scientist-application

Equivalent regression formulation of the Diff-in-Diffs:

Researcher's outcome_{it}= $\beta_0 + \beta_1 Awarded_i + \beta_2 Post Application_{it} +$

 β_3 (Awarded_i * Post Application_{it}) + controls $\beta_4 + \varepsilon_{it}$

Awarded vs. non-awarded applicants: Results

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	Probit
VARIABLES	log(publication count)	log(average citations per paper)	log(IF)	Pr(succesful collaboration)
Awarded*Post application	0.034	0.086	0.027	0.17***
	(0.043)	(0.053)	(0.026)	(0.041)
Awarded	-0.075	0.13*	0.16***	-0.044
	(0.054)	(0.069)	(0.062)	(0.040)
Post application	0.16***	-0.53***	-0.0087	0.20***
	(0.029)	(0.036)	(0.017)	(0.027)
Controls	yes	yes	yes	yes
Constant	1.86*	-1.12	-1.56	
	(1.05)	(1.24)	(0.99)	
Scientist-application	1060	1060	1060	1060
Observations	2,120	2,120	2,120	2,120
R-squared	0.141	0.274	0.280	0.10
Dummy application year	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes

Further analysis: Researchers learning and exploring new grounds

- When applying for a multi-disciplinary collaboration grant like SINERGIA researchers are often driven towards acquiring new knowledge outside of their core field
- We test this hypothesis by measuring their learning and the type of knowledge they are acquiring

Scientist's research outcomes: learning



Scientist's learning = New journals cited



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Learning of applicants and awarded

	OLS		OLS
VARIABLES	log(learning)	VARIABLES	log(learning)
Applicant*Post application	0.15***	Awarded*Post application	-0.025
	(0.039)		(0.063)
Applicant	0.22***	Awarded	0.0083
	(0.030)		(0.075)
Post application	-0.41***	Post application	-0.25***
	(0.032)		(0.039)
Seniority	0.0042***	Controls	
	(0.0014)	Age	0.015***
Constant			(0.0027)
		Constant	3.06**
Scientist-application	2120		(1.44)
Observations	4,240	Scientist-application	1060
R-squared	0.573	Observations	2,120
Dummy application year	yes	R-squared	0.284
Dummy discipline	Yes	Dummy application year	yes
Dummy Institution	yes	Dummy Institution	yes
Robust standard errors in parentheses		Controls	yes
*** p<0.01, ** p<0.05, * p<0.1		*** p<0.01, ** p<0.05, * p<0.1	

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Distance of the new journals cited

	(1)
	OLS
VARIABLES	log(1+Journal distance)
Applicant	0.15***
	(0.037)
Awarded	-0.061
	(0.038)
Seniority	0.0071***
	(0.0016)
Constant	4.05***
	(0.081)
Observations	2,120
R2	0.186
Dummy application year	yes
Dummy discipline	yes
Dummy Institution	yes

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Key findings

- The **application process** is beneficial for scientists
 - In terms of quantity of articles published, quality (measured by IF of journals), probability of observing a successful collaboration, and scientist's learning and exploring new grounds
 - It impacts negatively on the citations received (learning cost and lack of visibility)
- Being awarded with funds
 - has no significant impact on scientist's productivity outcomes
 - except for probability of observing successful collaborations

Discussion

- Scientists benefit from the application process
 - Occasion to team up with other scientists and exchange knowledge (
 publication quantity and quality and learning)
 - High sunk costs lead applicants to maintain the collaboration (个 successful collaboration)
 - When applying scientists enter new fields. Could explain the decrease in citations (↓ average citations received)
 - Costs of building reputation in new field
 - Costs of absorbing new knowledge

Discussion

- Being awarded with funds has a limited effect
 - Scientists might support their project with alternative funds
 - Rich endowment of resources (Swiss specificities)
 - Seniority of scientists applying
 - Funded scientists boost their probability of successful collaborations (个 successful collaboration)
 - Proof of collaboration for the funding agency

Policy implication

 Our results lead us to claim that "The important thing is not to win, it is to participate"

- Funding agencies should promote their funding programs in order to attract a large number of scientists
- Funding agencies should pay particular attention in designing application requirements - they are an occasion for scientists to develop successful collaborations

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Thank your for your attention!

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The important thing is not to win but to participate:

The case of a competitive grant race benefiting scientists without awarding them

BACK UP SLIDES

Motivation

- The scientific community is debating about the utility of spending energy and time in participating to grant competitions where there are few chances to get awarded
- Application success rates:
 - NSF 23%
 - NIH 15%
 - H2020 14%
 - FP7 13%

(Sources: ec.europa.eu, www.nsf.gov, report.nih.gov)

Our empirical setting: The SINERGIA program

- One of the flagship in the Swiss National Science Foundation (SNSF)'s funding scheme portfolio promoting collaboration among Swiss researchers
 - About 10% of the total public funds awarded in Switzerland
 - Application as a team is a pre-requisite
- Timing
 - One call per year since 2008
 - Decision of awarding the applications is taken within 6 months
- Evaluation process
 - Evaluation based on the scientific quality of the application and on the applicants' research productivity in the last five years
 - An evaluation committee assigns grades from A to D to the applications

Our study sample: Applicants

SNSF provided us with detailed information about successful and unsuccessful applicants



- Coverage period 2008-2012
- 255 applications, 114 awarded
 - Application characteristics
- 775 scientists applying, 430 awarded
 - Scientist's characteristics
- Scientists' publication data retrieved from SCOPUS database

Descriptive statistics: Applications

	Mean	Std. Dev.	Min	Max
N. of co-applicants	4.19	1.59	2	11
Swiss team	0.13	0.33	0	1
Extant co-applicant collaboration	0.37	0.34	0	1
N. of disciplines	3.30	2.16	1	11
Engineering	0.36	0.48	0	1
Biology & Medicine	0.64	0.48	0	1
Awarded	0.45	0.50	0	1
Grade A	0.09	0.28	0	1
Grade D	0.15	0.36	0	1
Amount requested (in million CHF)	1.67	0.76	0.35	6.85

Descriptive statistics: Applications



Descriptive statistics: Applicants

	Mean	Std. Dev.	Min	Max
Age	47.46	8.05	30	69
Female scientist	0.16	0.36	0	1

Potential applicants

Variable	Awarded (469)	Non Awarded (591)	Applicants (1060)	Potential- Applicants (1060)	t-test applicants vs. potential applicants
<i>Researcher's outcomes pre application [t-1,t-5]</i>					
Publication count	30.22	34.34	32.52	32.06	P-value 0.69
Average citations per paper	4.61	4.02	4.28	4.02	P-value 0.11

Diff-in-diffs strategy: Estimation of the application effect



Awarded vs. not Awarded: Control variables

Applicant's characteristics

- Age
- Gender
- Affiliation

Application characteristics

- Grade A and grade D dummies
- At least one female researcher among the co-applicants dummy
- Amount Requested
- N. of co-applicants
- N. of disciplines
- Biology & Medicine dummy
- Travelling distance hours among applicants' affiliations
- Swiss team dummy
- Application year dummy

Applicants vs. potential applicants & applicants awarded vs. non-awarded

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	Probit
VARIABLES	log(publication count)	log(average citations per paper)	log(learning)	Pr(succesful collaboration)
Applicant*Post application	0.52***	-0.32***	0.33***	0.10**
Awarded*Post application	0.034	0.086	-0.018	0.12***
Applicant	0.092**	-0.036	0.38***	0.45***
Awarded	-0.081	0.12	-0.055	-0.029
Post application	-0.36***	-0.21***	-0.59***	0.022
Constant	3.28***	0.82***	3.82***	-
Scientist-application	2120	2120	2120	2120
Observations	4,240	4,240	4,240	4,240
R-squared	0.068	0.118	0.154	0.37
Dummy application year	yes	yes	yes	Yes
Dummy Institution	yes	yes	yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Appendix

- A1) Control sample based on the same discipline
- A2) IV estimation
- A3) Are the new journals cited far away?
- A4) Amount of funds awarded
- A5) Why is RDD not working?
- A6) Who are the co-applicants for the non-applicants?
- A7) Yearly average productivity

A1) Alternative control sample: same discipline

- Alternative samples of non-applicants might be constructed according to different matching criteria
 - Same discipline in [t-1,t-5]. More than 10% of potential applicant articles are published in the same journals as the applicant
 - Publication quantity in [t-1,t-5] (+/-10%)
 - Publication quality in [t-1,t-5] (+/-10%)

A1) Alternative control sample: Same discipline

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	Probit
VARIABLES	log(publication count)	log(average citations per paper)	log(learning)	Pr(succesful collaboration)
Applicant*Post application	0.49***	-0.34***	0.36***	0.16***
Awarded*Post application	0.034	0.086	-0.018	0.13***
Applicant	0.17***	-0.14***	0.11**	0.41***
Awarded	-0.072	0.13*	-0.044	-0.039
Post application	-0.33***	-0.18***	-0.61***	-0.011
Constant	3.24***	0.99***	4.14***	-
Scientist-application	2120	2120	2120	2120
Observations	4,240	4,240	4,240	4,240
R-squared	0.090	0.131	0.144	
Dummy application year	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A2) IV estimation

- Potential endogeneity problem
 - Some time-variant characteristics of the scientists might be correlated with their probability of
 - Applying
 - Being awarded a grant
- In previous literature evidence of no selection bias (endogeneity) between awarded and not awarded (Jacob and Legfren, 2011)

A2) IV approach: Applicants in the network as instrument for application

Network applicant: a dummy that equals one if at least one of the co-authors, or one of the coauthors' co-authors, applied for SINERGIA in the five years preceding the application submission

• Strength

An applicant searches her co-applicants in her professional network. If they already applied there is less chance that they apply again. It becomes more difficult for the applicant to find co-applicants

• Validity

The probability of having SINERGIA applicants in the professional network is not correlated with the unobserved characteristics of the focal researcher that impact on her productivity

A2) Application effect

	(1)	(2)	(3)	(4)	(5)
	IV	IV	IV	IV	firststep
VARIABLES	log(publication count)	og(average citations per pa	per) log(learning) suc	cesful collaboration	Applicant
Applicant	0.58***	-0.43***	0.25	0.47***	
Network applicant					-0.24***
Extant co-applicant collaboration	-0.049	0.048	0.0086	0.46***	0.41***
log(Publication count pre-application)	0.84***	-0.052**	-0.13***	0.0093	0.015
log(Avearge citations per paper received pre-application)	0.067***	0.62***	0.015	0.020*	-0.026*
log(learning pre-application)	-0.016	0.13***	0.81***	-0.0065	0.043***
Constant	0.41***	0.15	0.98***	0.057	0.26***
Observations	2,120	2,120	2,120	2,120	2,120
R-squared	0.533	0.537	0.467	0.554	0.340
Durbin-Wu-Hausman endogeneity test	0.76	0.66	0.44	0.89	
Dummy application year	yes	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A2) Application effect (OLS estimation)

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
VARIABLES	log(publication count)	log(average citations per paper)	log(learning)	succesful collaboration
Applicant	0.52***	-0.36***	0.41***	0.46***
Network applicant				
Extant co-applicant collaboration	-0.027	0.019	-0.059	0.46***
log(Publication count pre-application)	0.84***	-0.052**	-0.13***	0.0094
log(Avearge citations per paper received pre-application)	0.066***	0.62***	0.018	0.020*
log(learning pre-application)	-0.015	0.13***	0.81***	-0.0063
Constant	0.43***	0.13	0.92***	0.061
Observations	2,120	2,120	2,120	2,120
R-squared	0.533	0.539	0.471	0.554
Dummy application year	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A2) IV approach: Grade assigned as instrument for the application awarded:

Grade assigned: a continuous variable from 1 [lowest grade] to 6 [highest grade] that represents the grade assigned by the evaluation committee

• Strength

A researcher obtaining a higher grade has greater chances to be awarded

- Validity
 - Extant studies find that the grade assigned is not correlated with project outcomes (Graves et al. 2011, Gush et al. 2015)
 - The high selectivity of the SINERGIA screening process leads to have a pool of high-profile applicants ⇒ randomness in the grade assignment
 - Project complexity leads to have high uncertainty in the expected results ⇒ promising projects might get a lower grade

A2) Awarded vs. not awarded

	(1)	(2)	(3)	(4)	(5)
	IV	IV	IV	IV	firststep
VARIABLES	log(publication count)	log(average citations per paper)	log(learning)	succesful collaboration	Awarded
Awarded	0.015	0 10***	0.0076	0 15***	
Grada [D=1 A=6]	-0.015	0.12	-0.0078	0.15	0 27***
	0.012***	0.00036	0.0064**	0 0001***	0.27
Age	-0.013	-0.00028	-0.0064	-0.001	0.00035
Gender (female)	-0.056	0.036	-0.12**	0.0071	0.0096
log(Publication count pre-application)	0.75***	-0.084***	-0.16***	0.020	-0.029
log(Avearge citations per paper received pre-application)	0.047**	0.59***	-0.0051	0.011	-0.0055
Extant co-applicant collaboration	-0.013	0.0039	-0.021	0.43***	-0.042*
log(learning pre-application)	0.012	0.18***	0.75***	0.026	-0.017
Swiss team	-0.028	-0.063	0.025	-0.027	0.054
At least one female researcher	-0.016	0.048	-0.0032	0.023	0.015
log(Amount Requested)	-0.035	0.0080	-0.088	0.030	0.011
log(N. of co-applicants)	0.030	0.024	0.00023	0.026	-0.018
log(N. of disciplines)	0.0017	-0.0010	0.072*	0.047**	0.0025
Biology & Medicine	-0.035	0.0025	0.23***	-0.063	-0.021
log(1+distance Hours)	-0.044**	-0.0033	-0.052**	-0.058**	0.0022
Constant	2.26***	-0.41	3.23***	0.30	-0.43
Observations	1,060	1,060	1,060	1,060	1,060
R-squared	0.624	0.621	0.588	0.262	0.735
Durbin-Wu-Hausman endogeneity test	0.57	0.78	0.22	0.54	
Dummy application year	yes	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A2) Awarded vs. not awarded OLS

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
VARIABLES	log(publication count)	log(average citations per pap	er) log(learning)	succesful collaboration
Awarded	0.022	0.099	-0.13	0.10*
Grade [D=1 A=6]	-0.0099	0.0062	0.032	0.012
Age	-0.013***	-0.00025	-0.0063**	-0.0080***
Gender (female)	-0.057	0.036	-0.12**	0.0075
log(Publication count pre-application)	0.75***	-0.084***	-0.16***	0.019
log(Avearge citations per paper received pre-application)	0.047**	0.59***	-0.0058	0.011
Extant co-applicant collaboration	-0.012	0.0029	-0.026	0.43***
log(learning pre-application)	0.013	0.18***	0.74***	0.025
Swiss team	-0.030	-0.062	0.032	-0.024
At least one female researcher	-0.017	0.048	-0.0014	0.024
log(Amount Requested)	-0.036	0.0082	-0.087	0.031
log(N. of co-applicants)	0.030	0.023	-0.0020	0.026
log(N. of disciplines)	0.0016	-0.00096	0.072*	0.047**
Biology & Medicine	-0.034	0.0020	0.23***	-0.064
log(1+distance Hours)	-0.044**	-0.0032	-0.052*	-0.058**
Constant	2.28***	-0.42	3.18***	0.28
Observations	1,060	1,060	1,060	1,060
R-squared	0.624	0.621	0.589	0.262
Dummy application year	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A3) Are the new journals cited far away from the journals cited in t-1,t-5?

Journal Distance Matrix: An example

Distance between journals	Physical Review Letters moving physics forward	ANNALS of PHYSICS	THE EDURAL DURANT OF THE DURANT OF THE DURANT OF THE DURANT OF THE DURANT OF THE DURANT OF THE DURAN
Physical Review Letters moving physics forward	0	1.55	163.39
ANNALS of pHYSICS	1.55	0	123.00
THE BURNAL UNITARIAN UNITARIAN UNITARIAN UNITARIAN UNITARIAN UNITARIAN	163.39	123.00	0

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Distance of the new journals cited



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A3) Are the new journals cited far away?

log(avg. Distance new)		
0.13***		
-0.075*		
4.35***		
2,120		
0.028		
yes		
yes		

*** p<0.01, ** p<0.05, * p<0.1

A4) Amount of funds awarded

	(1)	(2)	(3)	(4)	(5)
	IV	IV	IV	IV	firststep
VARIABLES	log(publication count)	log(average citations per paper)	log(learning)	succesful collaboration	Awarded
log(Amount Assigned [M CHF])	-0.081	0.46	0.096	-0.083	
Grade A					0.19***
Age	-0.015***	-0.0077**	-0.0067	-0.0050**	0.0016
Gender (female)	-0.023	0.19**	-0.074	-0.022	-0.019
log(Publication count pre-application)	0.76***	0.027	-0.16**	-0.0048	-0.028
log(Avearge citations per paper received pre-application)	0.055*	0.60***	-0.031	-0.047	-0.017
log(learning pre-application)	0.038	0.089	0.78***	0.085*	0.057*
Extant co-applicant collaboration	-0.021	-0.12**	-0.045	0.37***	0.035
Swiss team	-0.014	-0.017	0.089	-0.043	0.0081
At least one female researcher	-0.031	0.036	-0.018	0.017	-0.017
log(N. of co-applicants)	0.079	0.015	-0.10	0.16	0.29***
log(n. of collaborators)	0.017	-0.21	-0.13	0.011	0.41***
log(N. of disciplines)	-0.015	-0.059	0.063	0.049	-0.012
Biology & Medicine	-0.037	-0.033	0.19	0.045	0.16***
log(1+distance Hours)	-0.049	-0.024	-0.018	-0.066	-0.017
Constant	1.73***	0.58	2.28***	0.42	-1.38***
Observations	469	469	469	469	469
R-squared	0.660	0.641	0.629	0.238	0.651
Durbin-Wu-Hausman endogeneity test	0.97	0.93	0.89	0.86	
Dummy application year	yes	yes	yes	yes	yes
Dummy Institution	yes	yes	yes	yes	yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

A5) Why is RDD not working?

- The RDD is not suitable in our case
 - Only six classes of grades are available
 - B is our threshold (applications below B are not awarded) but we can not ranked applications obtaining B
 - Applications obtaining B are re-evaluated by the evaluation committee but not-ranked
- We run a robustness check by considering only the applications graded B

A6) Who are the co-applicants for the potential-applicants?

 If the scientist *i* is the potential-applicant matching the scientist *j*, we consider as potential-co-applicants of *i* three scientists matching *j*'s co-applicants





Co-applicants of the potential applicant i

A7) Yearly average productivity: Publication count



*same discipline control sample

A7) Yearly average productivity: Average citations per article-year



*same discipline control sample