ERC grants and peer review: Publication output of successful starting and advanced grants

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Background

- Conflicting evidence on the value of publications and citations as measures of grant success (Catalini et al., 2015, Fortin and Currie, 2013)
- Some studies found a correlation between higher review scores for grant proposals and their respective productivity measured as citations and patents (Li and Agha, 2015; Sandström, 2009; Jacob and Lefgren, 2011)
- Others have failed to directly confirm the value of these outputs as a validation measure of the grant peer review process (Gallo et al., 2014; Fang et al., 2016)

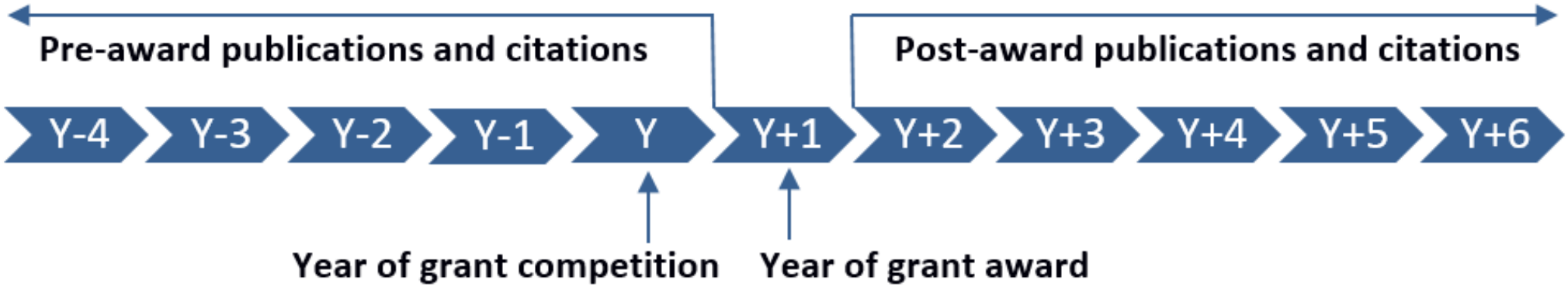
Objective

- To analyse the association of European Research Council (ERC) funding with the bibliometric output of successful grantees.

- Two types of ERC grants from the Life Sciences domain
  - Starting Grants (StG), to support junior researchers (maximum funding 1.5 mill €)
  - Advanced Grants (AdG), for leading senior investigators (maximum funding 2.5 mill €.)
- Both grant types have the same average duration (5 years)
- Same review proccess, using common evaluation standards.

Methods

- Sample: publicly available data on the cohort of 2007-2009 ERC grantees in the Life Sciences domain (N = 355) for the Starting Grant (StG; n = 184) and the Advanced Grant (AdG; n = 171).
- Publications and citations in Web of Science Core Collection and Scopus
- Co-authorship networks



Results

- StG recipients had a significantly greater relative increase in the number of publications after the award.
- There was no difference between StG and AdG recipients in the mean publication cost from the grant.
- The percentage of publications with the grantee as the last author significantly increased for StG recipients and decreased for AdG recipients after the grant award.

Publications (articles and reviews) by successful ERC Starting and Advanced Grant recipients and citations to these publications in Web of Science (WoS) and Scopus 5 years before and after grant award

		Difference pre-post award (median, 95% CI)[a]		P value[b]
		Starting Grant recipients (n = 184)	Advanced Grant recipients (n = 171)	
No. of publications	Scopus	7.0 (6.0 to 8.2)	3.0 (0.0 to 4.4)	<0.001
	WoS	6.0 (5.0 to 8.8)	2.0 (0.0 to 5.0)	0.004
No. of citations per publication	Scopus	−2.8 (−1.0 to −4.7)	−1.1 (−0.1 to −2.7)	0.03
	WoS	−3.1 (−4.8 to −1.7)	−1.6 (−3.5 to −0.4)	0.07
% of publications as last author	Scopus	21.3 (16.4 to 21.3)	−4.1 (−6.3 to −0.4)	<0.001
	WoS	24.4 (16.8 to 30.0)	− 3.9 (−6.7 to −1.7)	<0.001

[a]For the purpose of this study, the grant award year (n) was considered the year of the call for proposals, as published in the respective ERC Work Programmes.

[b]Mann-Whitney *U* test for independent samples.

Results – gender and geographical differences

- There were more male grantees (82% overall), both for the StG (78%) and the AdG (86%)
- There were no **gender** differences for StG recipients
- Female AdG recipients had significantly fewer publications indexed in Scopus than did male AdG recipients after the grant award but more last authorships indexed in Scopus.
- **Higher and lower performing countries** with regard to research excellence (composite EU index):
  - No difference for AdG
  - StG recipients from higher performing countries had a greater increase in their number of publications compared with those from lower performing countries.

Results – collaboration networks

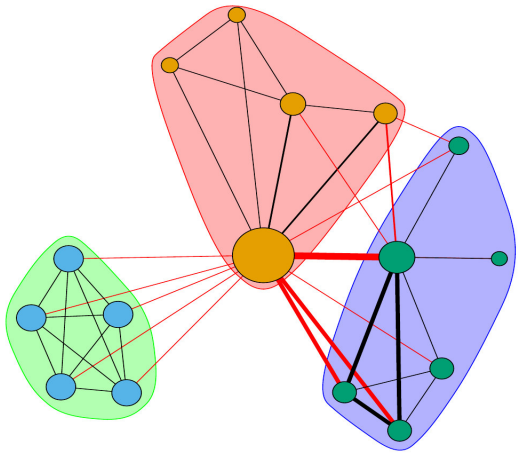
1. **Number of different co-authors** – number of nodes in the network (the size of the research community the grantee is collaborating with before and after the grant)
2. **Number of co-authorships** – number of edges in the network (global amount of collaboration generated by the papers published by the grantee)
3. **Network density** – ratio between the number of edges in the network and the total number of edges if the network was completely connected
4. **Number of sub-communities** – number of densely connected subgraphs (clusters) in the co-authorship network
5. **Network modularity** – this indicator measures how good the previous division into clusters is, or how separated are the different members of the sub-communities from each other.
6. **Grantee eigencentrality** – measure of the influence of the grantee in the collaboration network.
7. **Network centralization** – method for creating a network level centralization measure from the centrality scores of the researchers.

Change in co-authorship network indices (median, 95% confidence interval) for the publications in Scopus of junior (StG) and senior (AdG) ERC grantees

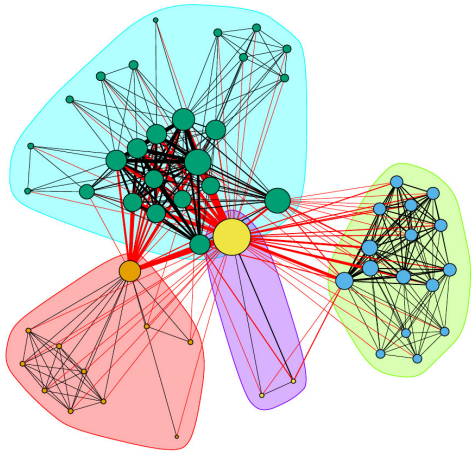
	StG (n=184)	AdG (n=171)	
	Difference	Difference	P[c]
No. of different co-authors	33.0 (23.0, 40.0)	37.5 (27.0, 54.0)	0.150
No. of co-authorships	178.0 (110.0, 292.0)	**403.5 (245.0, 718.0)**	0.021
Network density	**-0.076 (-0.092, -0.061)**	-0.011 (-0.016, 0.0)	<0.001
No. of communities	**1.0 (1.0, 1.0)**	0.0 (0.0, 1.0)	0.016
Network modularity	**0.091 (0.066, 0.114)**	0.026 (0.010, 0.402)	<0.001
Grantee centrality	-0.003 (-0.045, 0.017)	**-0.036 (-0.057, -0.007)**	0.041
Network centralization	**0.083 (0.064, 0.103)**	0.012 (-0.001, 0.023)	<0.001

Results – collaboration networks

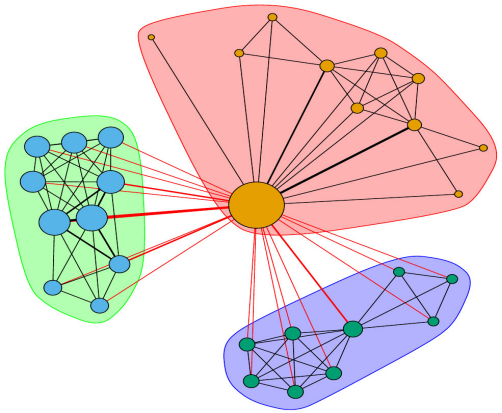
- Both junior and senior grantees increased the size of the community within which they were collaborating in the post-award period
- The amount of collaboration generated by publications grew in the post-grant period and significantly more for senior grantees
- A decrease in the network densities in the post-award period was significantly more pronounced for junior grantees.
- Post-award collaboration networks were also more structured. Senior grantees had higher modularity values (over 0.5) but juniors showed a greater increase.
- The relative importance of the grantees within their community reduced in the post-award period, mainly for senior grantees.



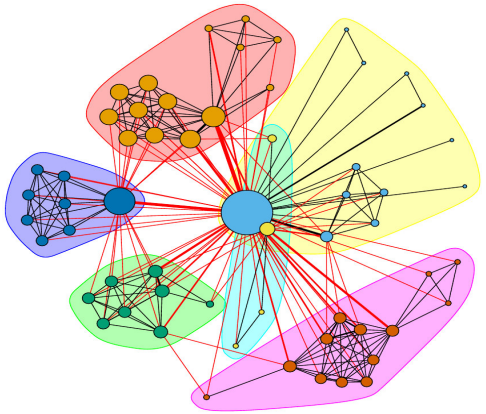
Pre-award co-authorship network (**StG** grantee)



Post-award co-authorship network (**StG** grantee)



Pre-award co-authorship network (**AdG** grantee)



Post-award co-authorship network (**AdG** grantee)

Limitations

- The lack of a control group of unsuccessful ERC grant applicants
- Impact of other grants and collaborations on productivity
- ERC grant as a part of a greater collaboration network
- Insufficient power for conclusions about gender

Conclusions

- European Research Council funding to StG recipients was associated with increased numbers of publications and last authorships on these publications. AdG recipients did not significantly change their publication output.
- Collaboration network analysis could be a valuable tool to assess grant success, particularly for researchers who were already highly productive before the grant award, such as those competing for advanced ERC grants.
- Funding agencies should consider making their grant peer review process open to meta-research. Data sharing should not be restricted only to research results (Taichman et al., 2016) but to the whole research enterprise, including peer review.