STI Conference
Paris, 6 – 8 September 2017

**Public funding of transnational research:
evidences from network analysis**

Emanuela Reale and Antonio Zinilli
emanuela.reale@ircres.cnr.it - antonio.zinilli@ircres.cnr.it

AIM OF WORK AND RESEARCH QUESTION

Participation of countries in transnational research programmes is driven by the decisions of national funding agencies -either ministries, research councils, sectoral agencies or innovation agencies.

In this work we want to investigate the linkages of funding agencies in European countries participating in transnational EU research programs, and how the creation of the mentioned linkages changes in the different years.

Research questions:

- What factors influence the policy decisions to create linkages with other agencies by participating through funding mobilization to transnational research programs?

- Do the factors change in the different years?

ASSUMPTIONS

The questions are relevant to understand the characteristics of networking among organizations allocating funding for transnational research, thus revealing to some extent the underlining logic of integration between countries.

We assume that funding agencies at national level are strongly affected by:

a) the research policy objectives funded by the government at national level, which reflect the national policy orientation toward integration and collaboration;
b) the quality of the research in the different fields, which represent the strength of the local research performers

THEORETICAL BACKGROUND

National context should continue to play a very relevant role as to the governance of RTDI transnational funding programs. (Stampfer, 2012).

Programmes reveal different logics of national funding to transnational research. Coordination allows to make the integration model more flexible and acceptable to National States (Lepori, Reale, Laredo, 2014)

National States by large delegated to independent funding agencies the management of national participations to transnational programmes: delegation allowed to achieve greater homogeneity among national participants, decoupling the decisions to participate from the level of resources to be committed (Lepori, Reale, Laredo, 2014)

The programming function is developed by the national research-funding organisations, which then act as intermediary entities between policy makers and performers (Barré et al., 2013). Research Councils emerge as key strategic actors balancing between different logics of integration and broadening the space of autonomous negotiations in given fields and objectives (Lepori, Reale, Laredo, 2014)

Nedeva (2013) outlined a permanent tension between global research fields and national research spaces, that can be relaxed when on the one hand research fields restrict their global character, and on the other hand research spaces would be 'expanded beyond national boundaries'

ERA-NET SCHEMES

ERA-NET programs are coordinated transnational program based on national funding, which receives an integration of EU funding (from 2000)

Deriving from a bottom up initiative or by top down planning in some research area. ERA-NET have an important role of coordination that is played by research funding organizations and by the national performers and the existing networking activities (Barré et al., 2012)

Flexible means to align 'the different requirements of the targeted knowledge fields or problem area" (Edler, 2012)

Successful mean 'to foster cooperation between, and coordination of, national research activities through the linking of national research programs. The scheme also created the conditions for opening up of national programs to non-residents in some cases. At the same time, perceptions of benefits associated with transnational research cooperation were positively influenced.' (Amanatidou et al., 2011)

DATA

ERA-NETs programmes are analysed using data collected in the JoREP 2.0 database (one of the facilities of EUFP7 RISIS project).

JoREP 2.0 stores descriptive information on the characteristics of research programmes, on RFOs managing the different programmes and on the volume of funding channelled through these programmes.

Programmes: 47 ERA-NETs

Geographical coverage: EU28 + CH, IL, NO, TR.

Reference years: from 2012 to 2014.

METHODOLOGY

- A network analysis approach where the actors/nodes are the agencies and the edges/links between them are the funding towards the same program.

- Into ERA-Net context there is the possibility that an agency invests in more programmes in the same year. For this reason in our case the matrix is not an binary matrix, but an indirect matrix whose edge weights are count.

- We used an Exponential Random Graph Model (ERGM) with count edges (Krivitsky, 2012). A sort of snapshot for each considered year (three separate ERGMs).

- A dynamic model as SAOM (Stochastic Actor-oriented Model) cannot be applied, because the relationships are repeated within the same year. Moreover, weighted networks are not allowed in SAOM (Snijders et al., 2010b; Ripley & Snijders, 2010).
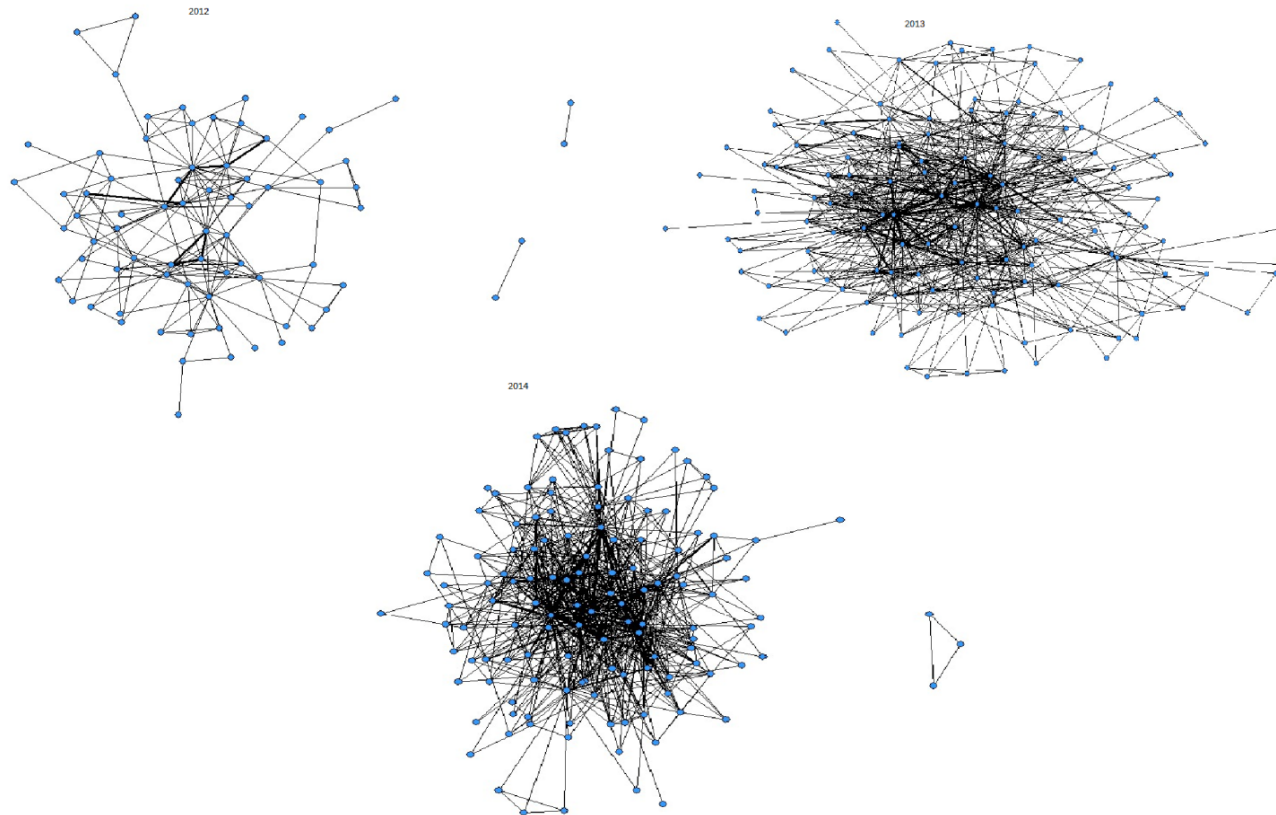
VARIABLES

- **Entropy**. is a measure of the diversity of socio-economic objectives (NABS). It is 0 when an agency invests in one socio-economic objective and increases when invests in more objectives. Entropy has been normalized by dividing for the total financed programmes

- **GERD** as % of GDP (source: EUROSTAT). We have divided this variable in three categories with values:
1 -> Low GERD;
2 -> Medium GERD;
3 -> High GERD;
We have carried out this transformation to avoid collinearity problems with the other variables

- **H-Index**. Number of articles produced in a country (h) that have received at least h citations (Source SCOPUS). This variable has been normalized by dividing for the total of researchers in the country and then standardized (rescaled to have a mean of zero and a standard deviation of one). Despite its limitations H index can be considered a proxy of the academic excellence of a country

- **Agency**. 1 if the agency is a Research Council and 0 otherwise;

- **Citations by country**. Citations/citable documents (source: Scimago Journal & Country Rank);

- **Patents**. The ratio between total patents and total population (resident and non-resident) for each country considered (source: OECD). The variable has been standardized;

- **Language**. Official language in the country.

- **Currency**. This is a dichotomous variable with value 1 if the agency is in EURO area, 0 otherwise.

DESCRIPTIVE STATISTICS

Network descriptive analysis and network visualizations

Year	Nodes	Edges	Weighted Density (Standardized)	Avg. Degree	Avg. Distance (Standardized)
2012	82	396	0.06	4.8	2.922
2013	134	1622	0.09	12.1	2.335
2014	130	1738	0.10	13.4	2.264

ESTIMATES

ERGM for count value estimations for each year

Variables	2012 β (s.e.)	2013 β (s.e.)	2014 β (s.e.)
Nonzero	0.34(0.40)	0.08(0.15)	-0.06(0.13)
Sum	-3.838(0.51)***	-2.72(0.20)***	-3.81(0.21)***
Medium Gerd/Gdp	-0.253(0.14)*	-0.12(0.07)*	-0.03(0.08)*
High Gerd/Gdp	-0.184(0.15)	-0.36(0.07)***	-0.03(0.07)*
Currency	0.160(0.11)	0.35(0.06)***	0.15(0.06)***
Agency	0.304(0.11)***	0.43(0.06)***	0.86(0.06)***
NABS Heterogeneity (Entropy)	0.99(0.14)*	1.35(0.07)***	1.24(0.07)***
H Index	-0.12 (0.05)***	-0.13(0.04)***	-0.12(0.03)***
Patents	-0.12 (0.05)***	-0.14(0.04)***	0.04 (0.02)
Absdiff H Index	-0.002 (0.09)	-0.04(0.04)	-0.05(0.04)

The use of the 'Citation by country' variable does not produce different results with respect to H Index
No relevance of the 'Language' variable

RESULTS

- The connections among agencies and the density of linkages in ERA-Net programs increase over the years

- The agencies investing in more objectives (as detected by NABS) tend to form more links than the agencies with a limited number of policy objectives. In the different years collaborative ties are created by agencies with the same 'degree of entropy'

- The agencies which belong to countries with low investment in R&D tend to form more ties than those with high or medium R&D investment

- The agencies belonging to country with a high H Index (or citations by country) have less networking activities than others. The "Patents" variable is also negative meaning that the nodes with a high number of patents are less likely to have connections than those with a low number of patents

- The agencies who are in the EURO area tend to form more connections

- Research Councils agencies have a higher probability to form ties than other agencies

CONCLUSIONS

Networking of the different agencies in the ERA-Net programs is mainly driven by the scientific recognition of the national research and by the heterogeneity of the research objectives. High level of the former factor reduces the likelihood to create linkages, high level of the latter improves it.

Thinking in terms of national research spaces (Nedeva, 2012) the agency decision to expand the research at supra-national level using ERA-NET might be driven by the need to pursue national policy objectives and to improve the scientific recognition (pushing factors). Different balancing can be thus envisaged in case of different combinations of the two factors in research fields.

As to the programming function (Barré, 2013), results confirm the observations about the special position of Research Councils in coordinated transnational programmes. However, the EURO zone emerges as a characteristic influencing the formation of linkages between countries in transnational research

Results are subject to the limitations affecting the data but could be considered as signals for further investigations of factors affecting networking of transnational research based -at least in part on EU funding.