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Title:
Networks Dynamics among co-active researchers

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Conference track
Indicators on academic patenting

Research subject and hypothesis
Studying simultaneously scientific publications and patents provides a powerful entry point for understanding the linkages between science and technology. It can inform various debates on the social utility of knowledge production, in particular in its industrial and economic dimension. Co-activity, defined as a researcher joint production of scientific articles and patents of invention, is an interesting focus for studying how scientific ant technological research networks connect. Co-activity is therefore a good locus for studying the ways scientific and technological knowledge production are being articulated with these academic inventors acting as brokers.

Building on Breschi and Catalini's approach (2010), this study analyses the research networks linking academic scientists working in an open science environment and involved in the private technology domain. As the study afore mentioned, our study combines data on scientific co-authorship with data on patent co-invention, at the level of individual researchers in a science-intensive technology area: heterogeneous catalysis.

In this study, we test, in the first place, various hypotheses on co-active researchers, using a finely disambiguated hybrid (i.e. publications and patents) data set: are inventors top publishers in their field? from a dynamical perspective, do patents application compete with articles publication?

Then, we introduce the collaboration network to understand if scientists are more likely to become inventors when exposed to co-activity in their immediate social neighbourhood.

Methodology
This research identifies at a finely grained level the scientific and technological collaborations set up by a group of highly productive scientists in heterogeneous catalysis research. This identification has been carried out through an expert-based process. A first list of the 100 top scientific authors working on catalysis has been set up using the simple "cataly*" lexical query for searching the Elsevier Scopus and the Thomson Reuters Web of Science (WoS) databases. This initial group of "scientific powerhouses" from the catalysis area has been classified through an expert-based

process for isolating a sub category of 16 researchers active only in heterogeneous catalysis – hereafter called "the top 16 researchers".

Two data sets have been initially produced and then combined; the first dealing with scientific publications, the second with patents. The top 16 researchers' total publications have been identified using the Thomson Reuters Web of Science database (on a 1970-2010 time period and cataly* as lexical query) and analysed for isolating all the co-authors. The top 16 researchers' total priority patents have been identified using world patent database Patstat (on a 1970-2010 time period and the only cataly* as lexical query) and analysed for isolating all the co-inventors.

The publications database is the union of 16 individual selections of papers within the WoS combining the researcher's name, the cataly* filter and a disciplinary and institution check (e.g. biology papers have been excluded). The patent database is the union of 16 individual selections of patents within Patstat combining the researcher's name, the cataly* filter and a country and institution check. Labour intensive check has made possible to produce an harmonized single data base where researchers' variable names as they appear in publications and patents (e.g. Smith G. and Smith, GN) have been matched.

Existing results

The total of 5218 publications identified generates a total population of 4598 authors; i.e. researchers identified as co-authors for at least one of the top 16 researchers' publications. The total of 320 patents generates a total population of 463 inventors; i.e. identified as co-inventors for at least one of the top 16 researchers' patents. The total population of 4825 researchers collaborating with the top 16 includes 233 coactive ones (i.e. top 16 + 217) : i.e who have both published and patented. This co-active group represents 5% of the authors population but 50 % of the inventors population.

These three data sets (publications, patents, combined) have been compiled as social networks using the Gephi open source software. A first comparative analysis of publications and patents networks has shown that technology is invented locally whereas scientific publications are co-authored more globally. Moreover, the network of institutions involved in inventive activities reveals an interesting feature for the heterogeneous catalysis domain: corporate entities have developed mainly exclusive collaborations with the top 16 researchers. The distribution of these coactive collaborators varies greatly around the different top 16 researchers. Some managed to foster intense coactive links whereas some other power houses from the domain appear to stick to more classical academic publication profiles.

Expected results

In this study, we adopt a two-fold approach to empirically tackle the dynamics of co-activity in science.

Our first idea is to describe the characteristics of the prototypical academic inventor considering streams of individual activity at the ego-centred level.

But as this individual approach does not tell the whole story, we then introduce the collaboration network to understand if scientists are more likely to become inventors

when exposed to co-activity in their immediate social neighbourhood. In this perspective, patenting is considered as a diffusing pattern within the broad collaboration network. From a static point of view we compute the correlation between co-active nodes in the aggregated collaboration network. But to get a better picture of this social influence, we also consider the dynamical collaboration network and measure the likeliness for a scientist to apply for a patent based on his past collaborators activities.

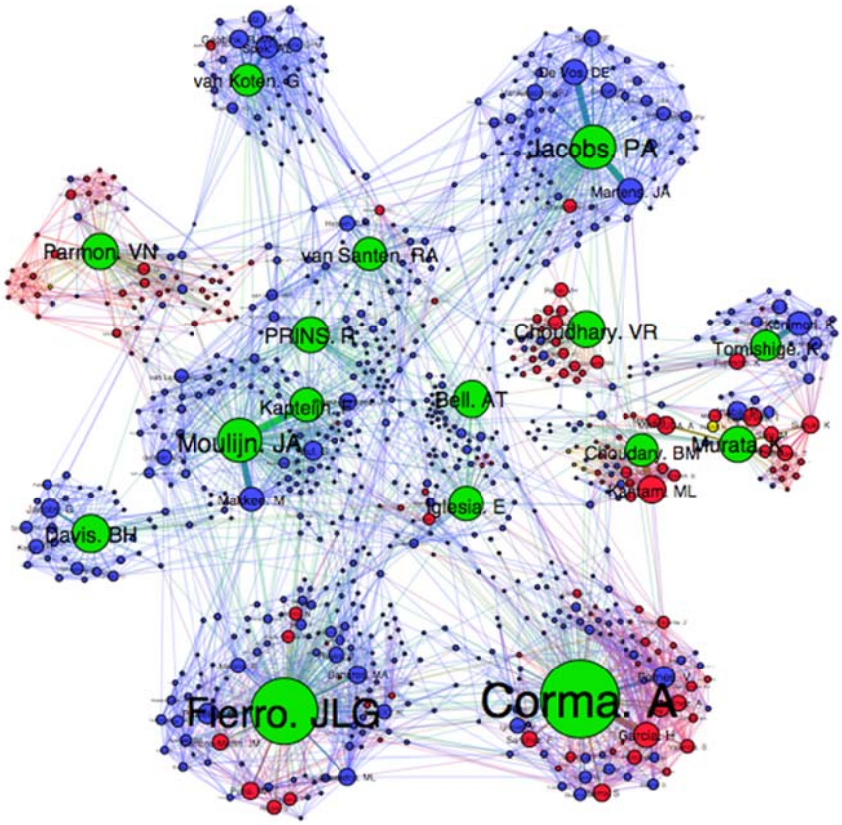

Fig. 1: Top 16 researchers' global network, i.e. including both types of collaboration (authors and inventors)

Selected references

- Lissoni F., Academic inventors as brokers, Research Policy, 39 (7) (2010)
- Breschi S, Catalini C, Tracing the links between science and technology: An exploratory analysis of scientists' and inventors' networks, Research Policy, 39 (1) (2010)
- Carayol N, Matt M, Does research organization influence academic production? Laboratory level evidence from a large European university, Research Policy, 33 (8) (2004)
- Foray, D., Lissoni, F., University research and public–private interaction. In:
- Rosenberg, N., Hall, B. (Eds.), Handbook of Economics of Technical Change, North Holland/Elsevier (2010)
- Newman, M.E.J., The structure of scientific collaboration networks. Proceedings of the National Academy of Science USA, 98, 404–409, (2001)