

A preliminary study of knowledge dynamics: The case of composite materials in aeronautics.

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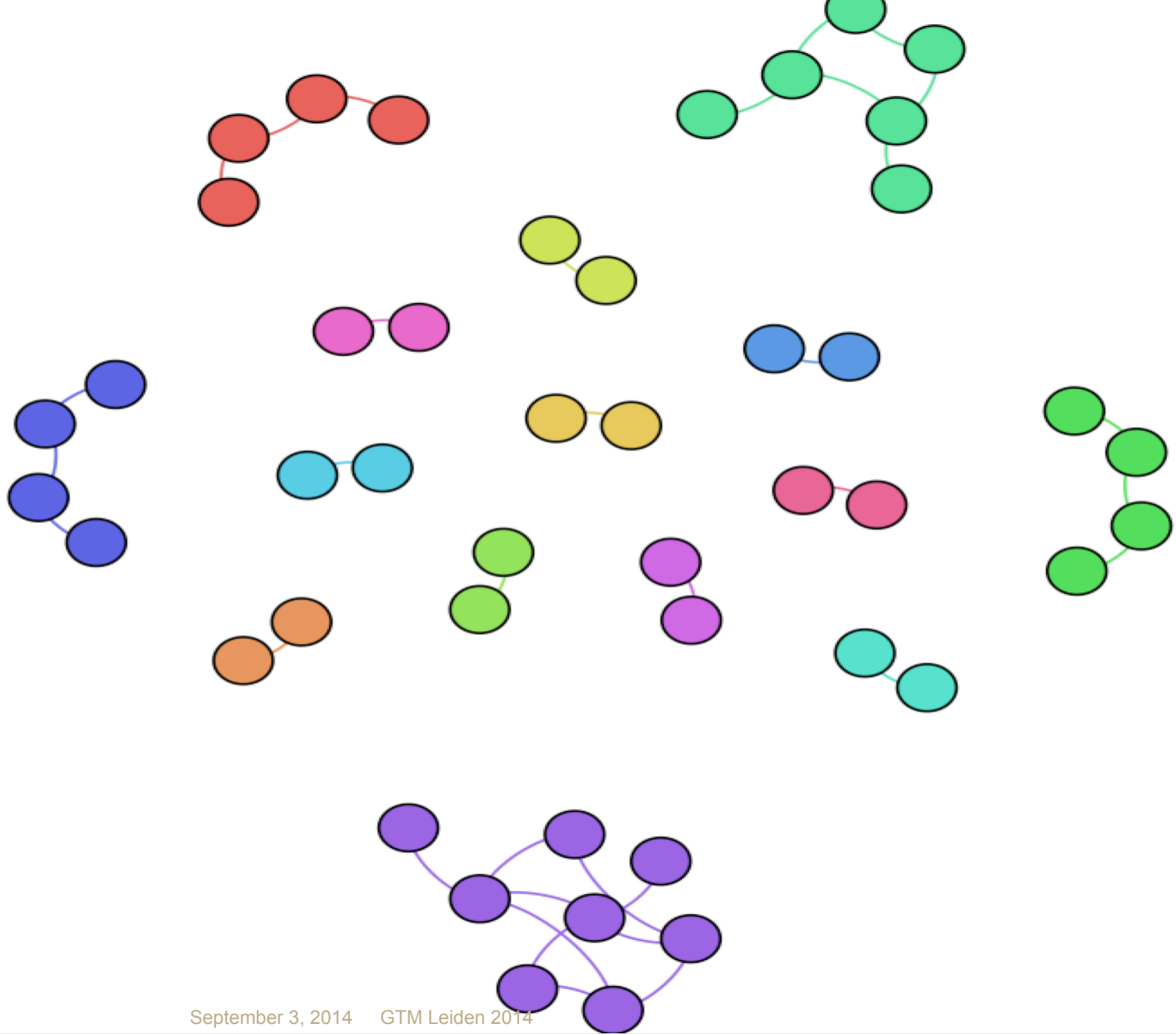
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- › Understand the evolution of an R&D network
- › How does it evolve and why ?
- › What kind of structure does it have ?
- › How did the major aircraft manufacturers incorporate the technology?

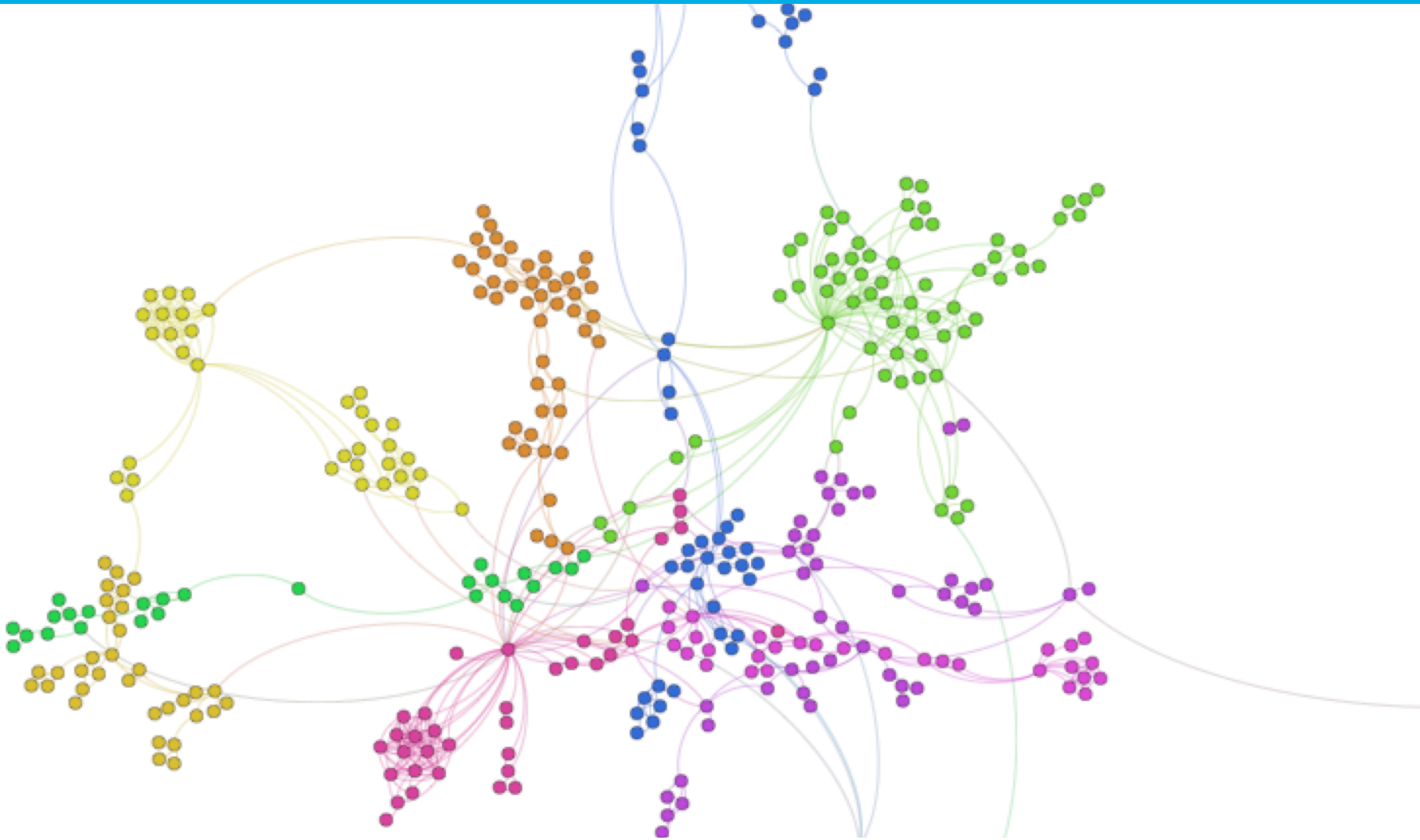
- › In order to generate an R&D network we used patent and publication data
- › We used Orbit for patent data and Scopus for publication data
- › We used Scopus rather than WOS because Scopus has a larger search base. Especially when it comes to conference papers.
- › Our query focused specifically on SCM using IPC codes, concepts and keywords
- › We started our analysis in 1980 because that's the point where we observe significant patent deposits
- › We end up with 9.000 patents and 12.000 publications over the 35 year period

Do firms cooperate for knowledge ?

- › Yes, by analyzing firms that deposit alone we are able to identify which technology a firm masters.
- › 28% of all patent used IPC codes that are not used during alone deposits.
- › In the remaining 72%, 45% of IPCs are exclusively used during collaborations, never when they deposit alone.
- › Observed collaboration hence imply that they were initiated for the purpose of knowledge.

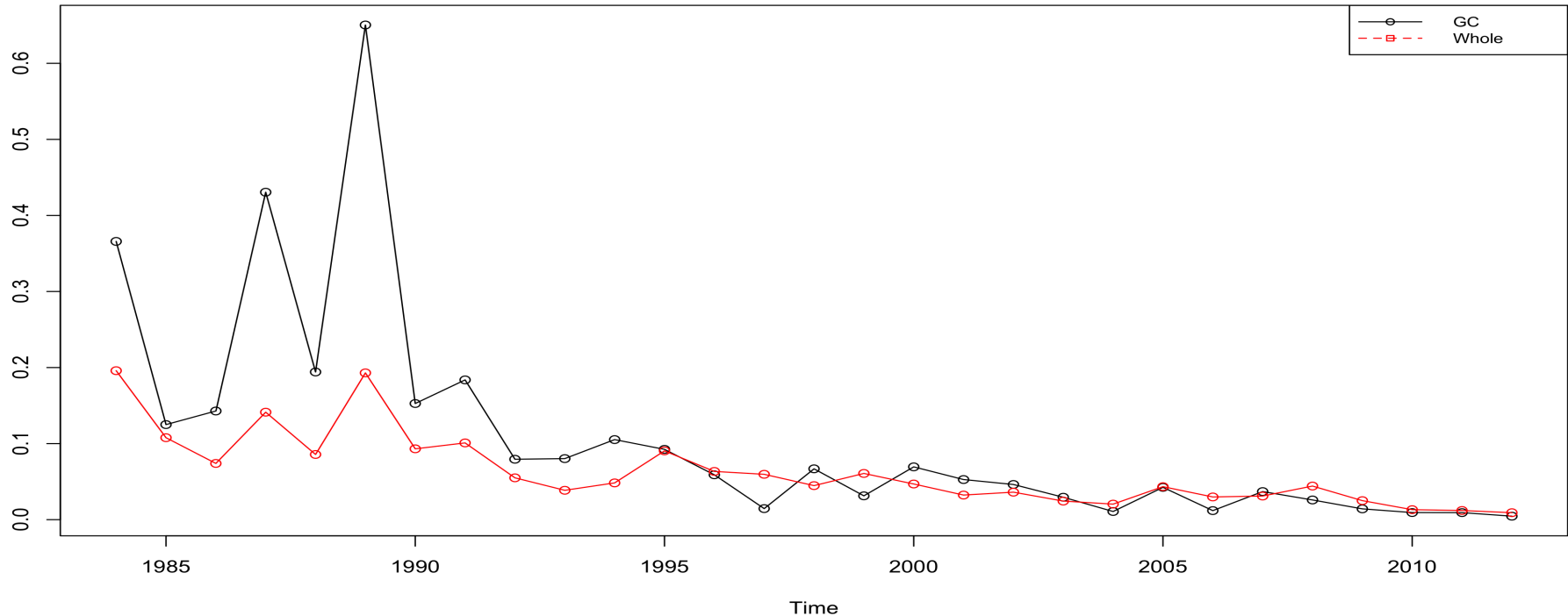


Complete network



Network evolution

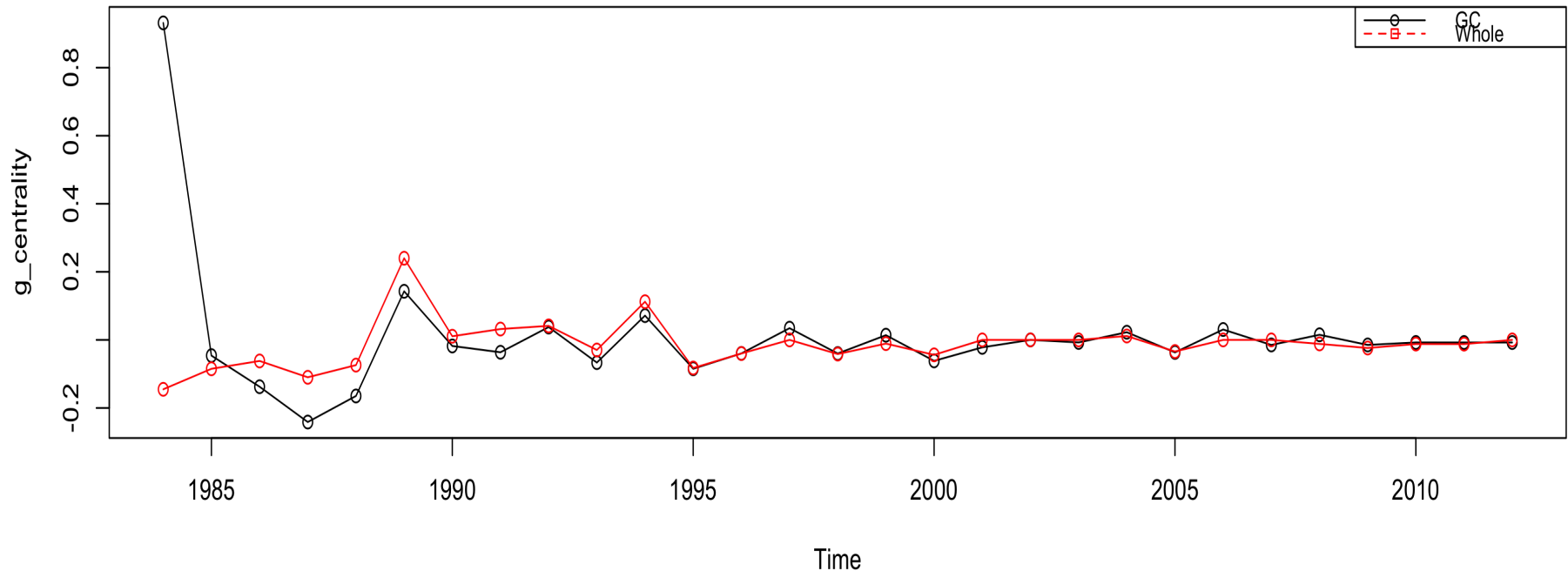
Evolution of the number of nodes



- › Stabilization of the network begins in 1995
- › Date at which aircraft manufacturers start integrating the technology into their aircrafts

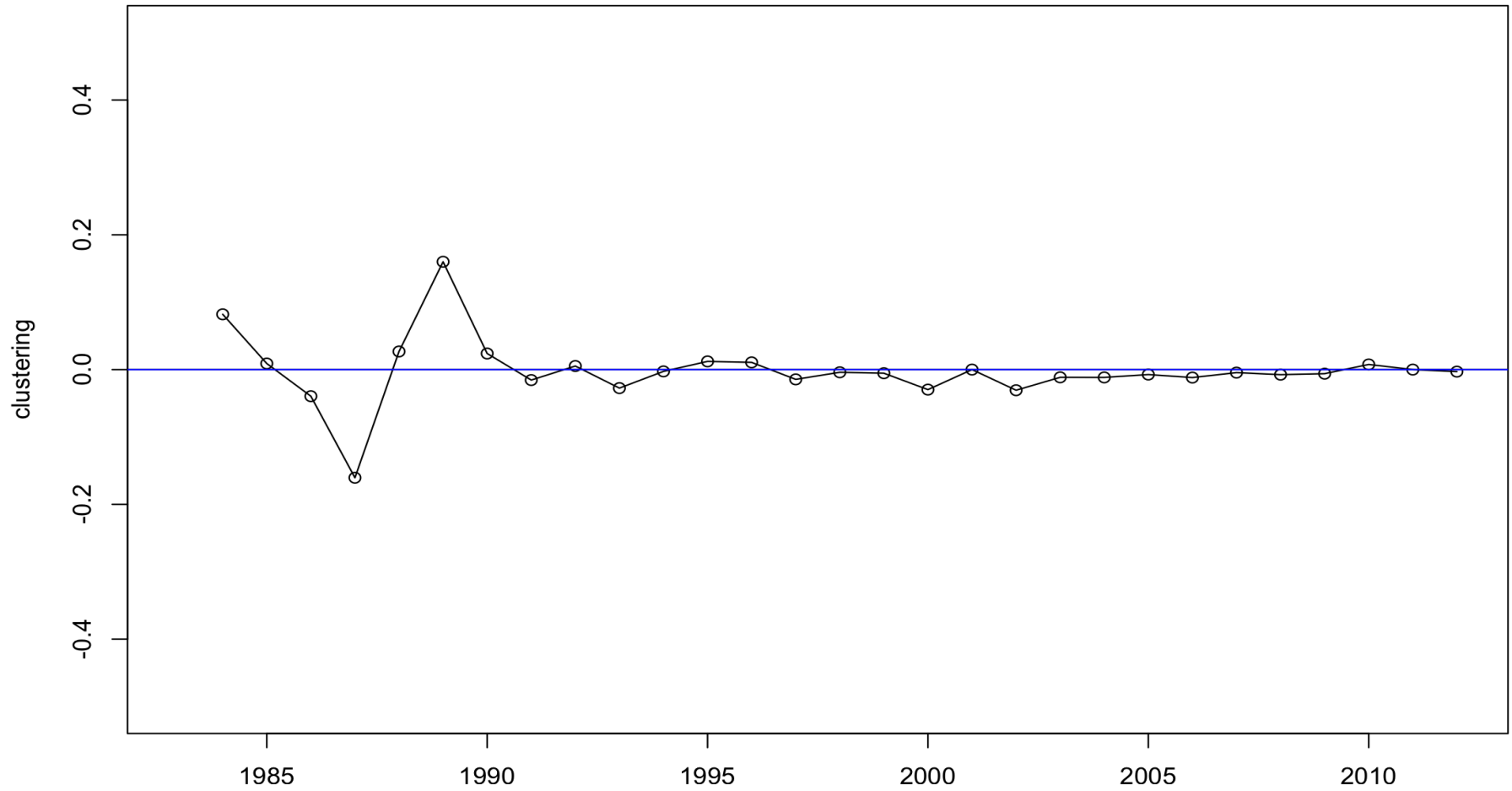
Centrality

Evolution of the centrality coefficient

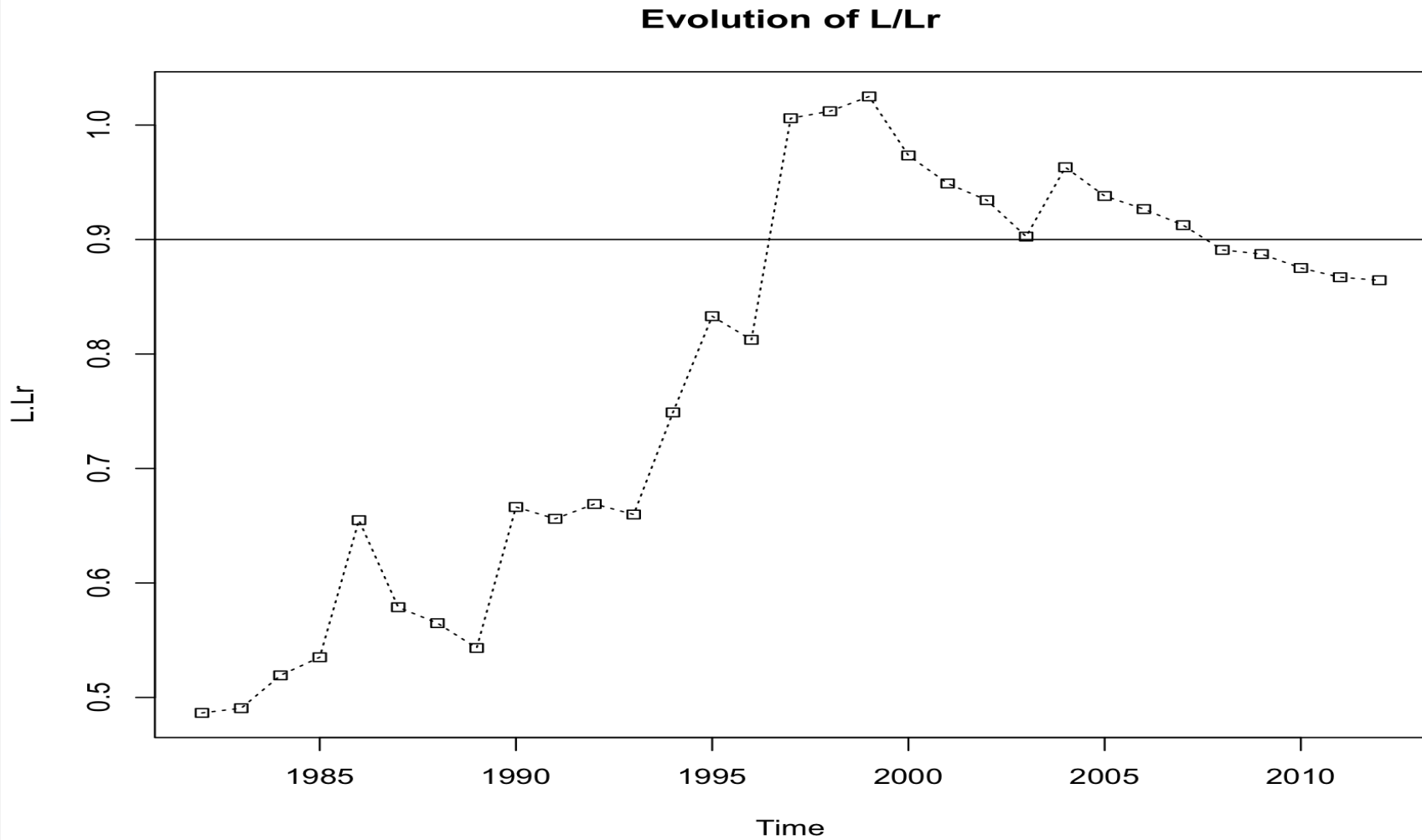


- › Convergence towards a low centrality which is typical of the sector.

Clustering



But is it a small world ?

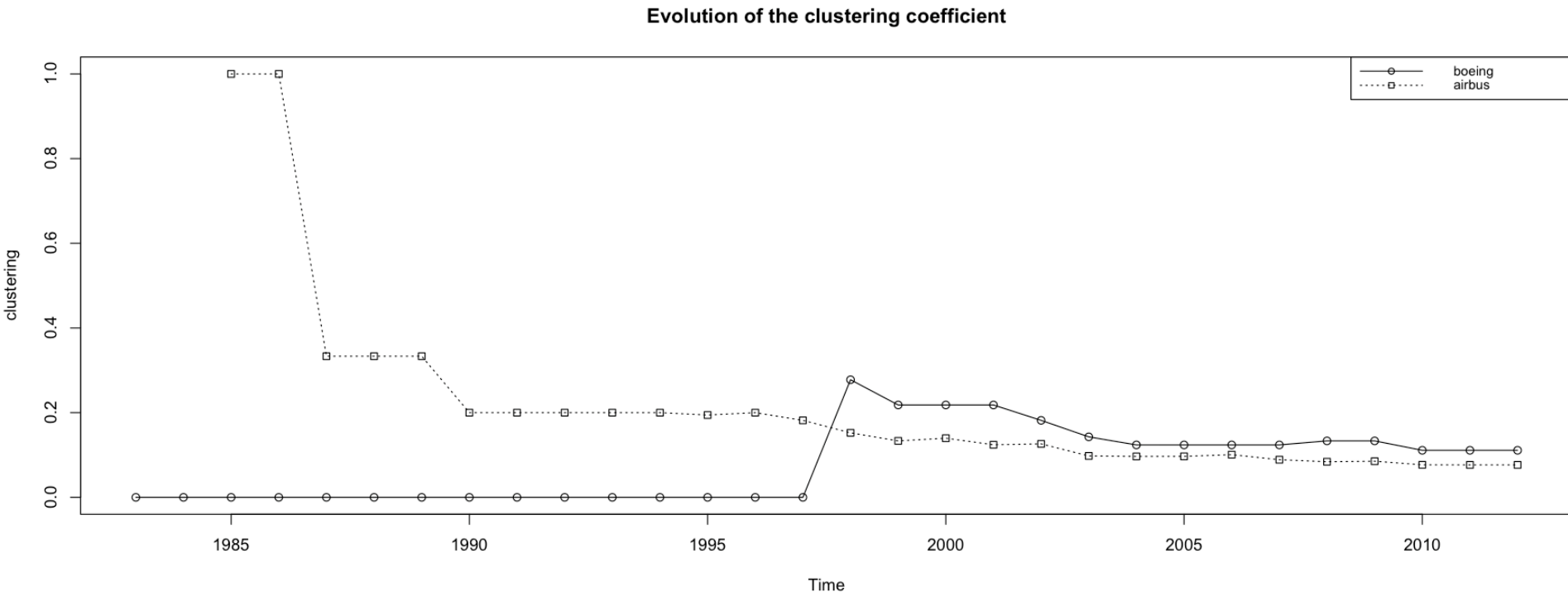


Conclusions of the Macro analysis

- › The network evolves to a small world by the interconnection of clusters.
- › We observe two major phases in the evolution of the network.
- › After the high variation of the network indicators firms start to patent on their own rather than by cooperation.
- › Explaining why the network is no longer a small world after that period.
- › Shows that the knowledge has transferred.

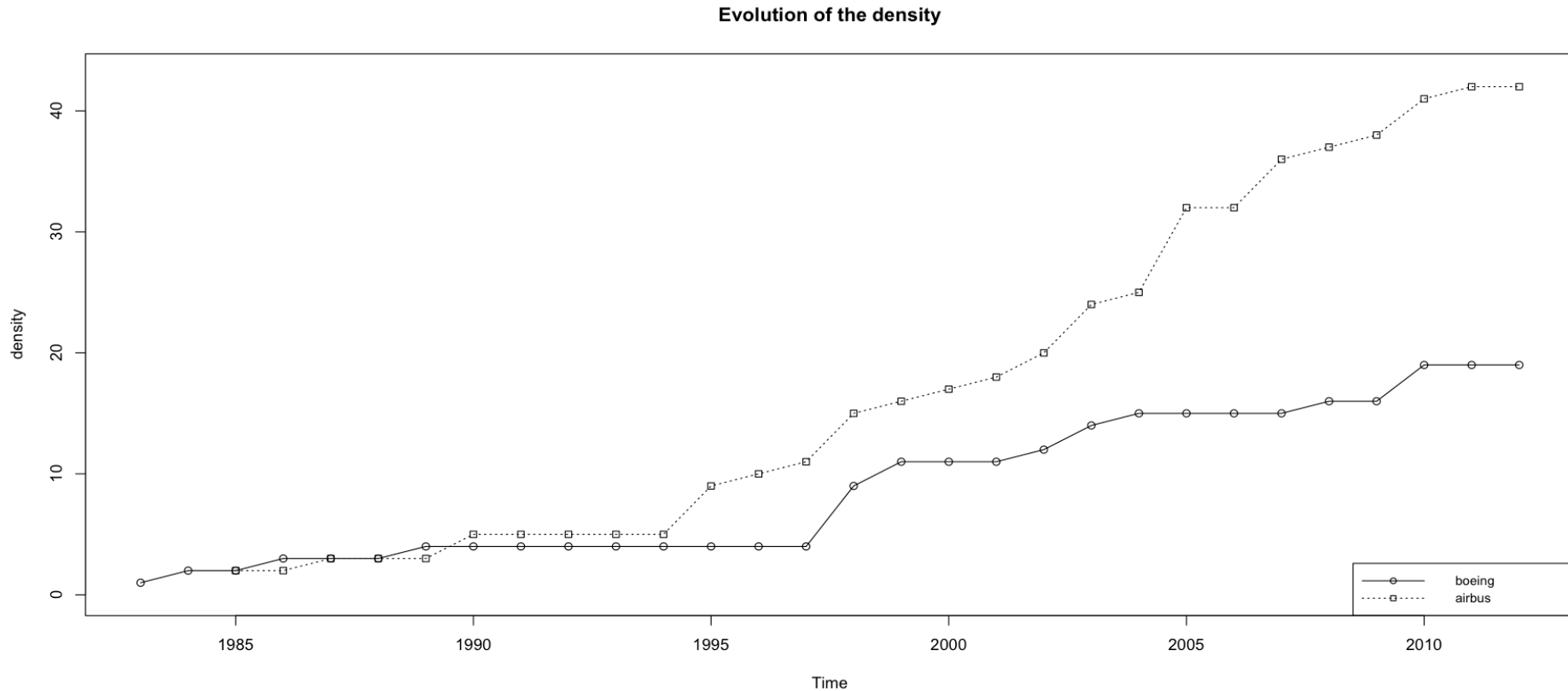
- › An airplane is a multi-technology product, the aircraft manufacturers hence have to incorporate many different technologies in order to assemble their airplanes.
- › They can only absorb knowledge once it is operational .
- › Let's have a look at their evolution in the network, which should reflect the technology life-cycle.

How did they incorporate the technology ?



- › From 1998 onwards, Boeing drastically increased its number of cooperations to absorb the developed knowledge. Resulting in an increase of clustering

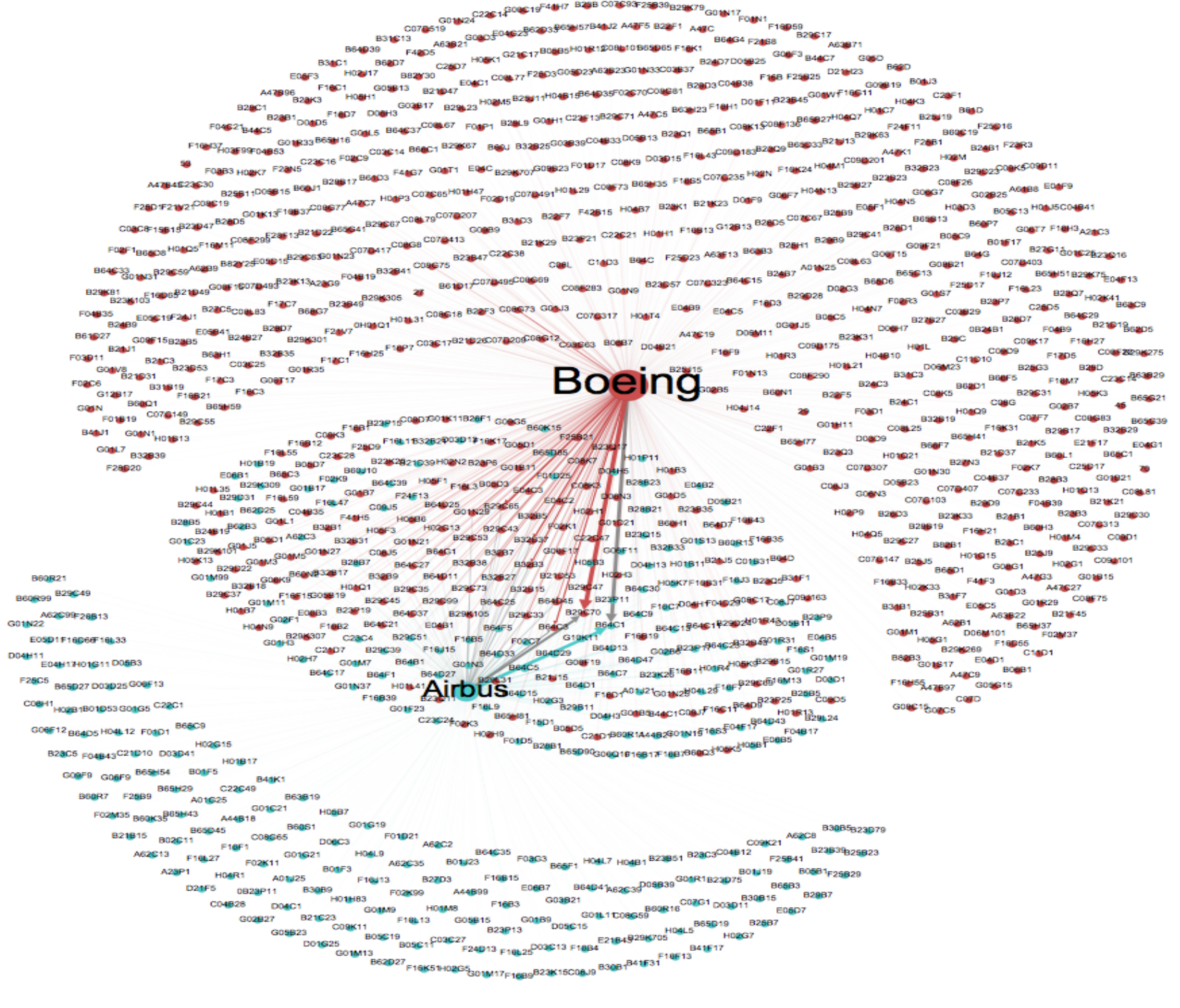
Collaboration behavior



- › Airbus has a preference for working with firms it has worked with in the past (preference for strong links, social lock-in).
- › Boeing has preferred looking for new partners
- › Let's see how these different strategies worked out for both firms:

Boeing

Airbus



Conclusions of Meso analysis

- › The dynamic network of IPC codes shows that Airbus is becoming a follower behind Boeing
- › Different strategies can amount to similar positions inside a network
- › The benefits in terms of knowledge absorption are however defined by the choice of partner

› Thank you for your attention