

# Coronary Angioplasty and Healthy Innovation Systems

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## QUESTIONS

High level policy debates in health driven by the ageing population and the paradox of health care innovations: innovation is cost reducing per intervention but not so in the aggregate.

- How does innovation take place and how does it diffuse? And how do innovation systems emerge?
- What is the role of public and private institutions? Who are the key intermediators?
- Are there unanticipated consequences?
- What kind of general policy instruments facilitate innovation system building?

# Methodology

- Large-scale and multi-technique analysis of one problem area (probe)
- Secondary literature reviews, clinical reports and policy documents.
- Descriptive statistics of global scientific research, inventive activities and clinical practice
- Empirical Network Analysis of citations, co-authorships, geographical origin and institutional affiliation of authors/inventors.
- Data: ISI and USPTO

## Citation Networks

Papers	11240	→	94442
Patents	5136	→	22095

+ FDA Interventional Cardiology products dataset.

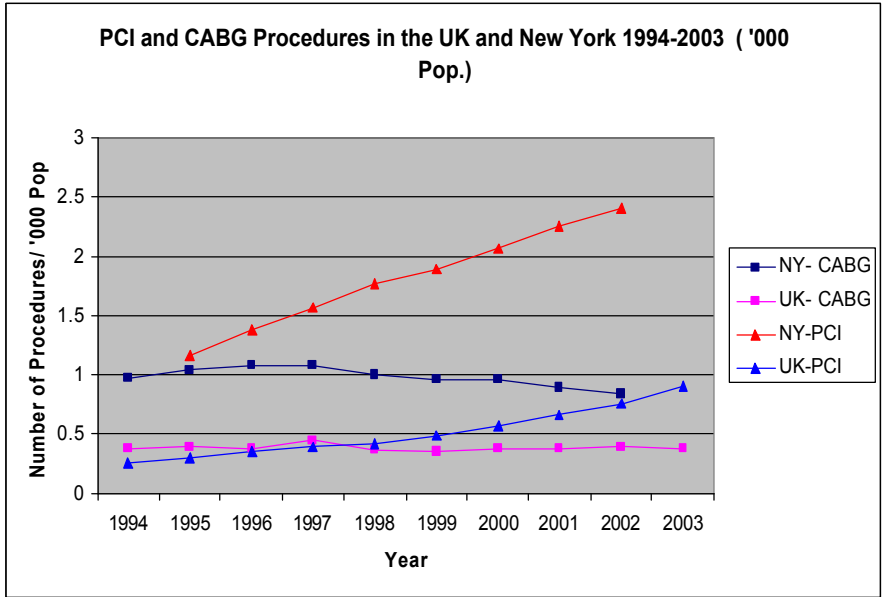
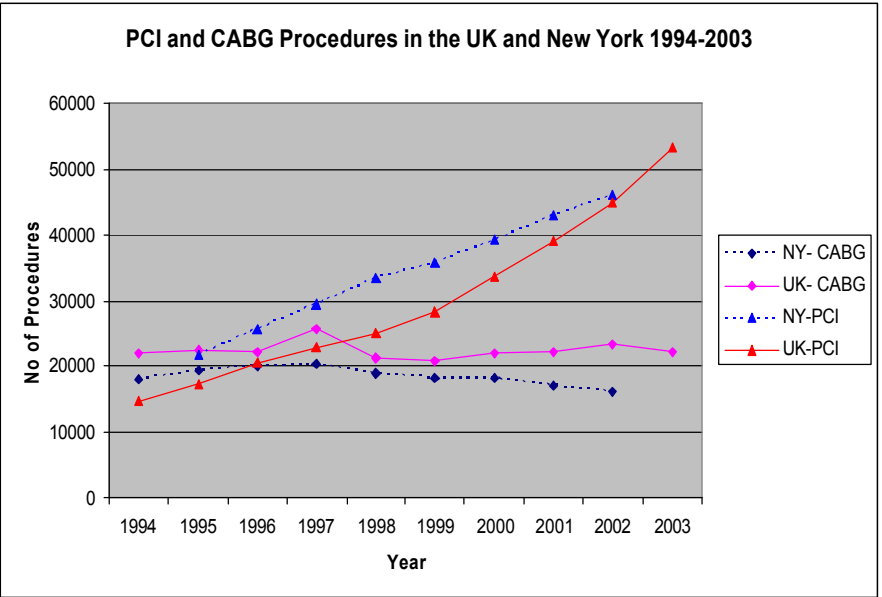
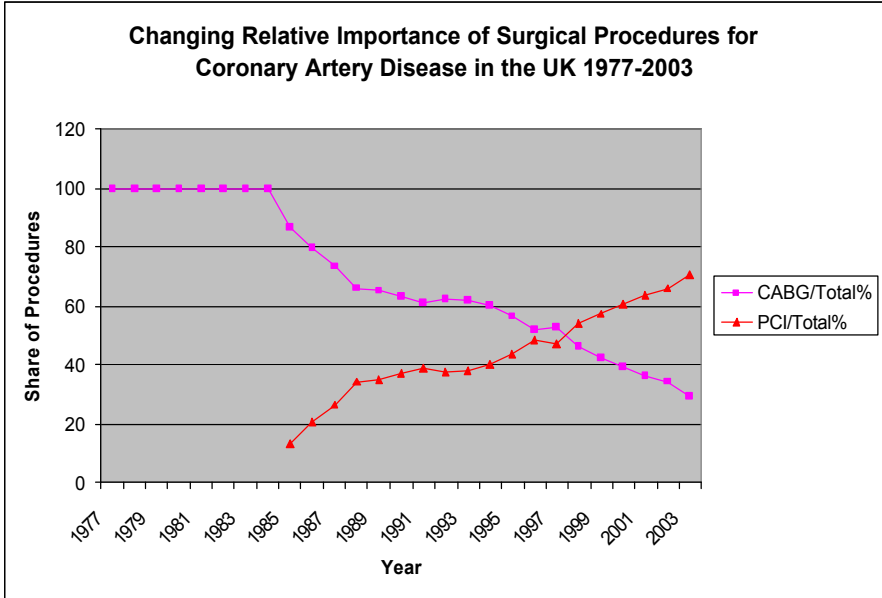
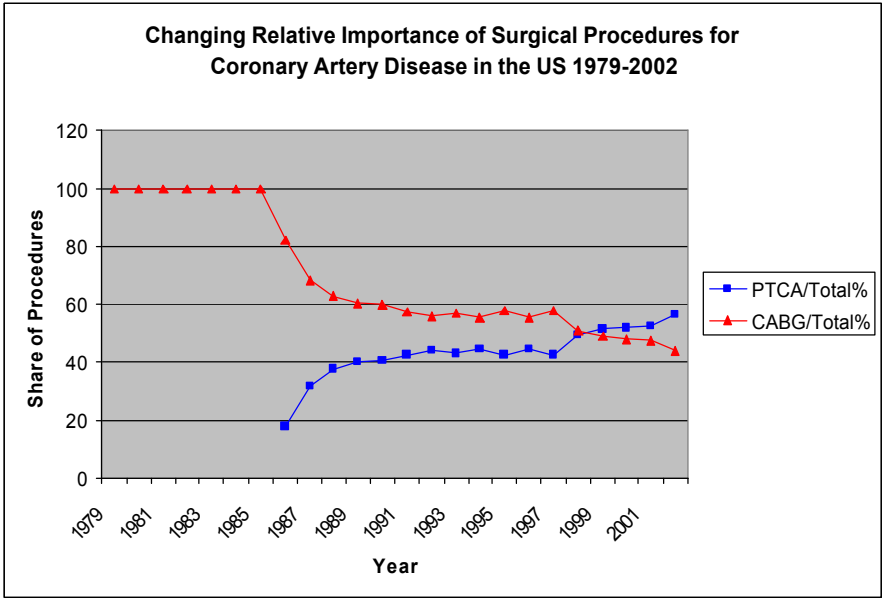
- Clustering algorithms embedded in Pajek to structure and visualise large networks
- Expert Interviews in UK and US.

## • **The Medical Problem: Coronary Artery Disease**

- causes severe disability and more death than any other disease, including cancer, in affluent societies.
- medical conditions associated with it are angina, ischemia, unstable angina, myocardial infarction, arrhythmias, heart failure and sudden death.

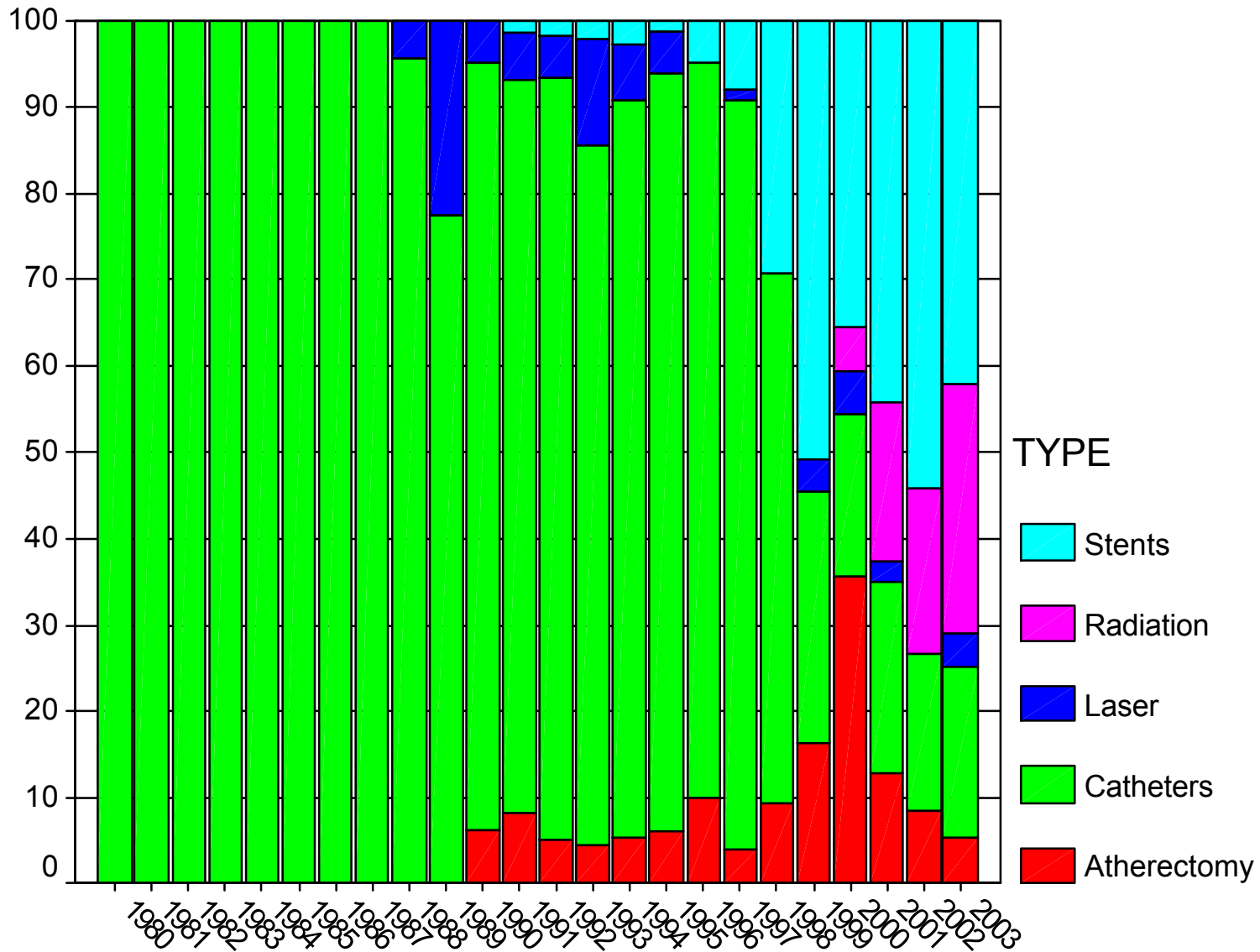
## **Treatment Options:**

- Before 1960s: nitroglycerine, rest and hope
- Late 1960s: coronary artery by-pass surgery
- Late 1970s: percutaneous transluminal coronary angioplasty (PTCA); one of the most significant medical advances in medical practise over the last thirty years



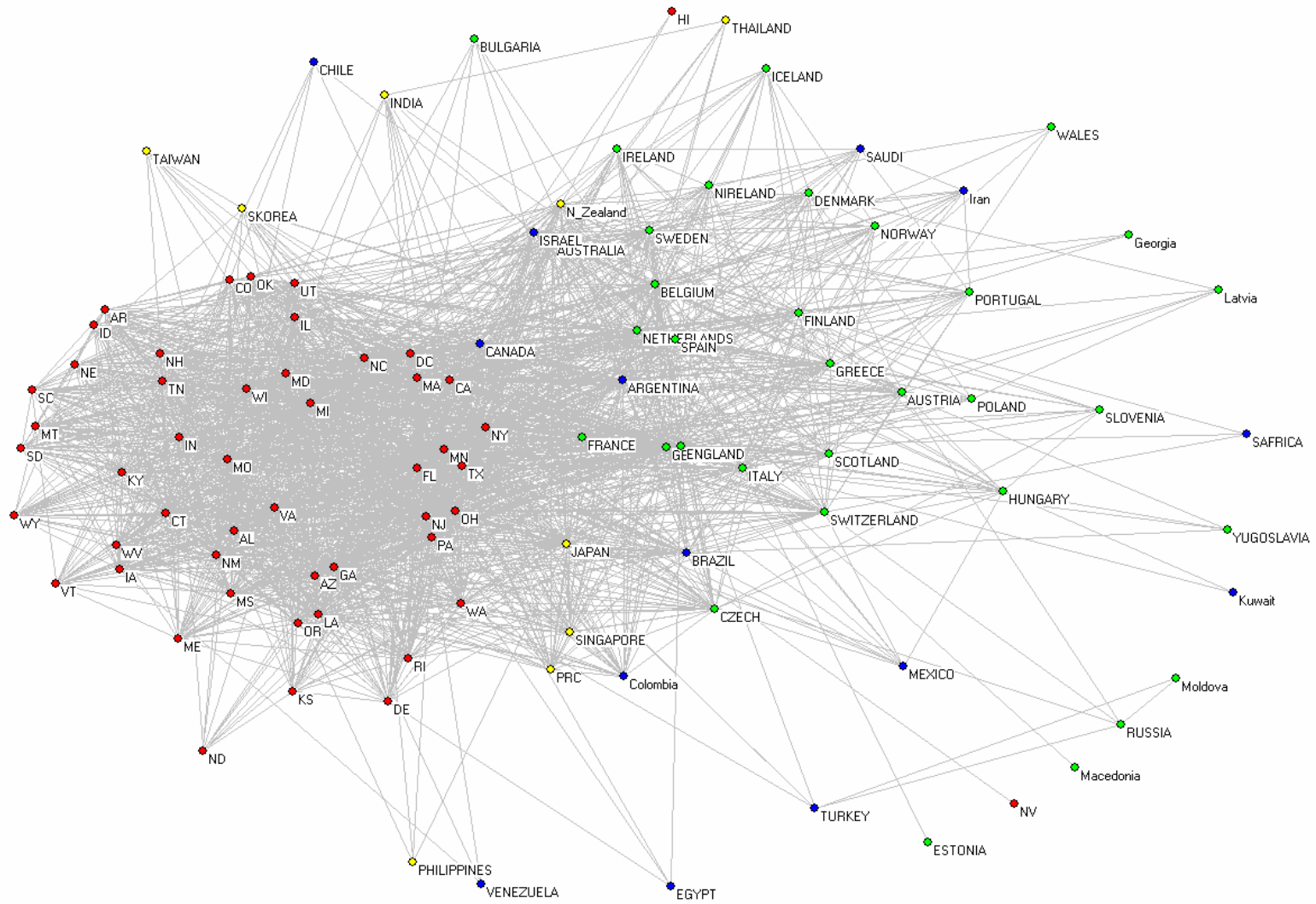


# Changing Relative importance of (Percent) of Coronary Angioplasty Product Approvals by FDA 1980-2003





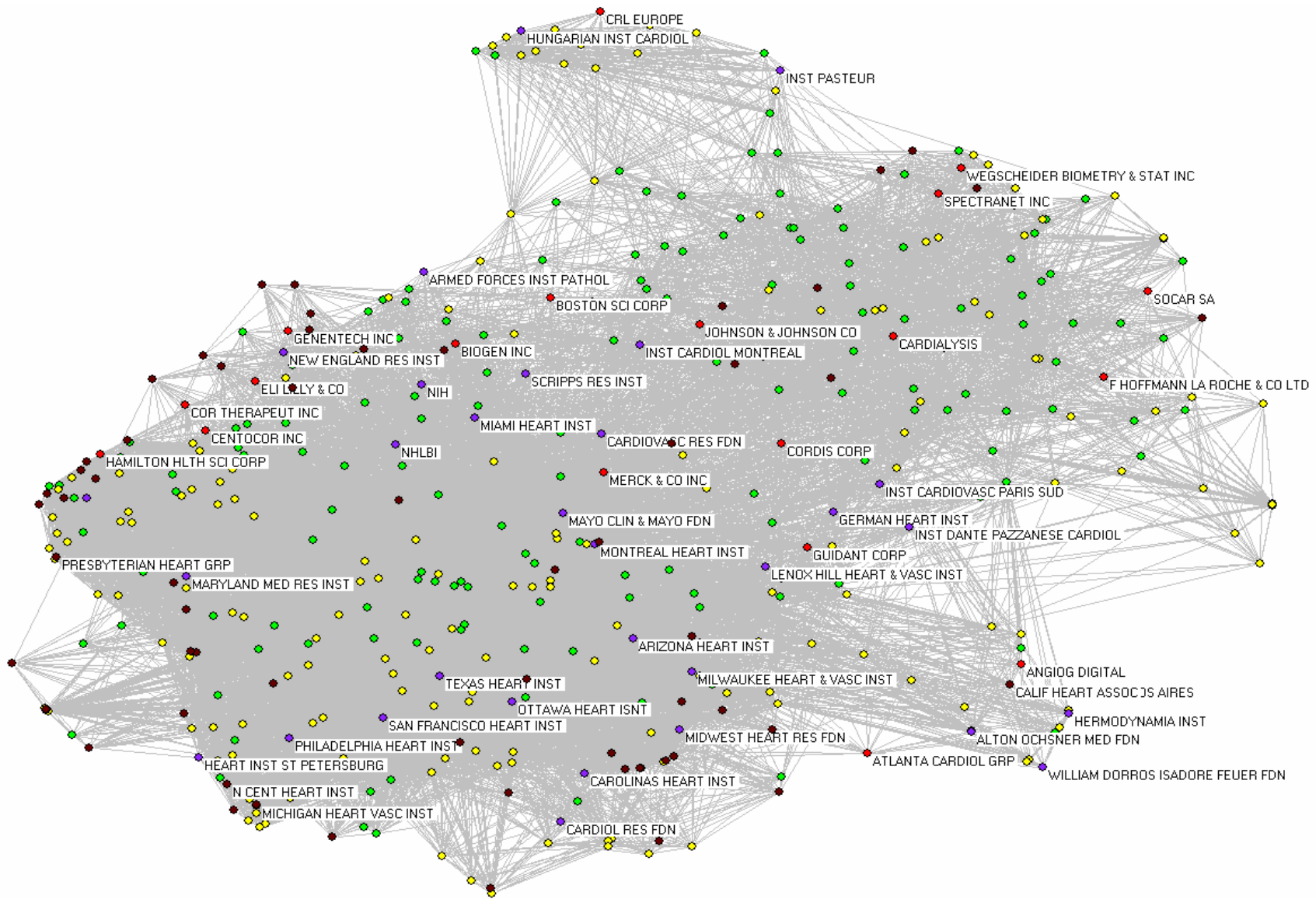
# The Cross-Country Network Associated with the Development of Interventional Cardiology



## Institutional Variety in Coronary Angioplasty

<b>Institutional Classification</b>	<b>No. of Addresses</b>	<b>%</b>
University and University Hospitals	17115	55.0
General Hospitals	8269	26.6
Firms	2560	8.2
Foundations/Institutes/ Government	2277	7.3
Other	905	2.9
TOT	31126	100.0

# A Cross Section of Institutional Collaborations in Interventional Cardiology



## Understanding Innovation in Medicine:

- A science push or bench to bedside model of medical innovation is unsatisfactory.
- The development of medical know-how is characterised by
  - 1) Systematic Feedback between knowledge and practice
  - 2) Dynamic interaction between Epistemic, Organisational, Institutional and Cultural Factors.
- Innovation processes are ***systemic, involving multiple actors in specifically instituted contexts*** – need to know how boundaries change and the nature of the connections.
- Innovation systems emerge for a purpose, namely to solve problems. The idea of ***problem sequences*** is the central concept around which we can build an understanding of how innovation processes are instituted
- Innovations are rarely if ever uniquely circumscribed events and outcomes. They are better seen as ***trajectories*** of improvement sequences in which devices or procedures are progressively refined and extended in their scope of application.

- In PTCA we see a **mix of market and non-market modes** of inventing and innovation spread across public and private spheres of action, that have evolved according to specific dynamic processes.

- Should policy instruments be geared to those that facilitate collaborative research, incubate University/ Research Hospital ideas and in general to create connections that will not otherwise arise spontaneously?

Problem: You cannot predict which innovation systems will form or who the actors will be; this implies an obvious corollary, that the connection between instruments and their effects will be 'loose' with outcomes that may be unanticipated.

- Policy Coordination: When innovation systems transcend national boundaries they are influenced by the different policy jurisdictions. Competition between nation states to have key elements of innovation systems within their national ecologies raises the possibility that policy conflict could stymie innovation system formation. This moves innovation policy coordination higher up the policy agenda.