POLITECNICO
MILANO 1863

BANCA D'ITALIA

Characterization of complex and dynamic economic networks

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PHD EXECUTIVE - XXXV CYCLE (1st year)

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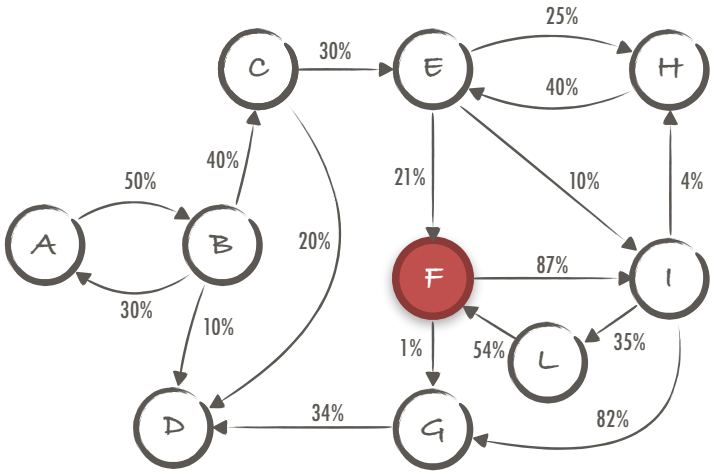
Company network

What?



Why?

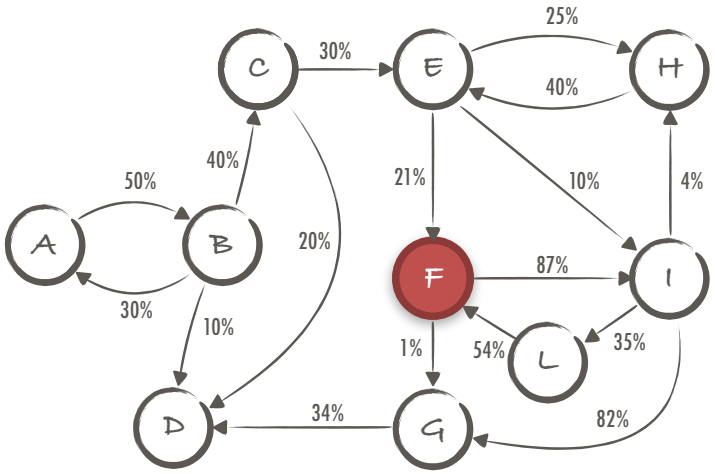
1. REVEAL **POWER**
   (a) finding **controllers**
   (b) studying the **structure** of Italian market
   (c) studying **dispersion** of control
   (d) global **shareholding** analysis

2. DETECT **COLLUSION** AND DO **FORENSICS**
   (a) support **anti-money laundering**
   (b) detecting **ultimate beneficial owners**

3. EVALUATE **RISKS**
4. MODEL **PROPAGATIONS** (E.G., OF SHOCKS)
5. KNOW REAL **CASH FLOWS**

Company network

What?



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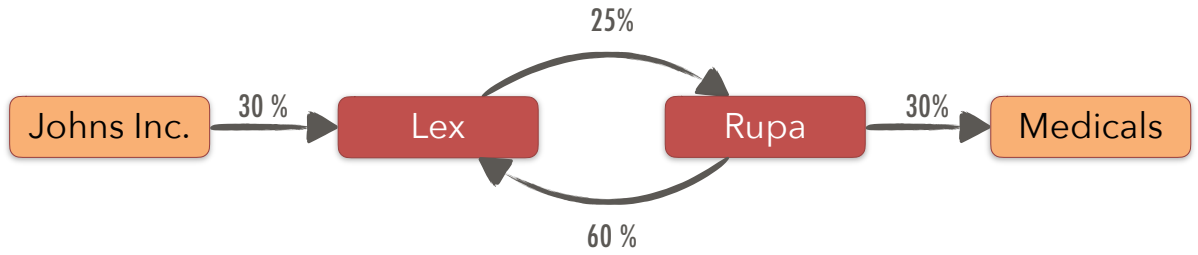
SCC reduction: make the graph simpler

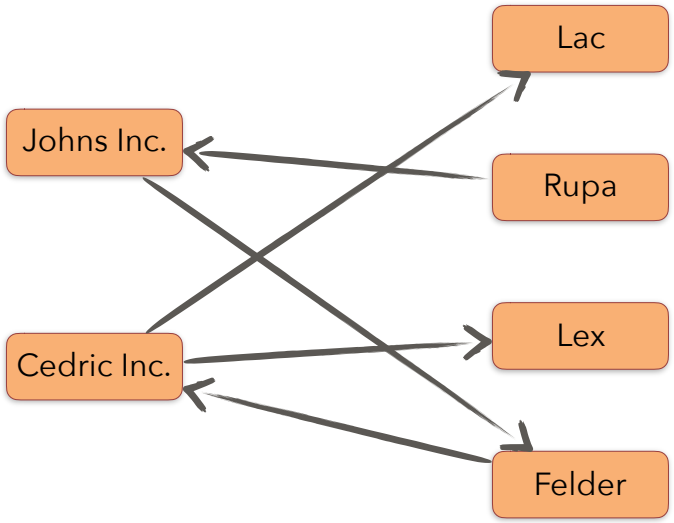


Lex **owns** 25% of Rupa
Rupa **owns** 60% of Lex

Lex **owns** 15% of itself
Rupa **owns** 15% of itself

Johns Inc. **owns** 35,3% of Lex
Johns Inc. **owns** 2,65% of Medicals

Control Bipartite Graph: all-pairs control algorithm



- Compute the control **all-pairs**
- Create the bipartite graph considering **only first-level control relations**

Explainable Control: how can a company control another one?

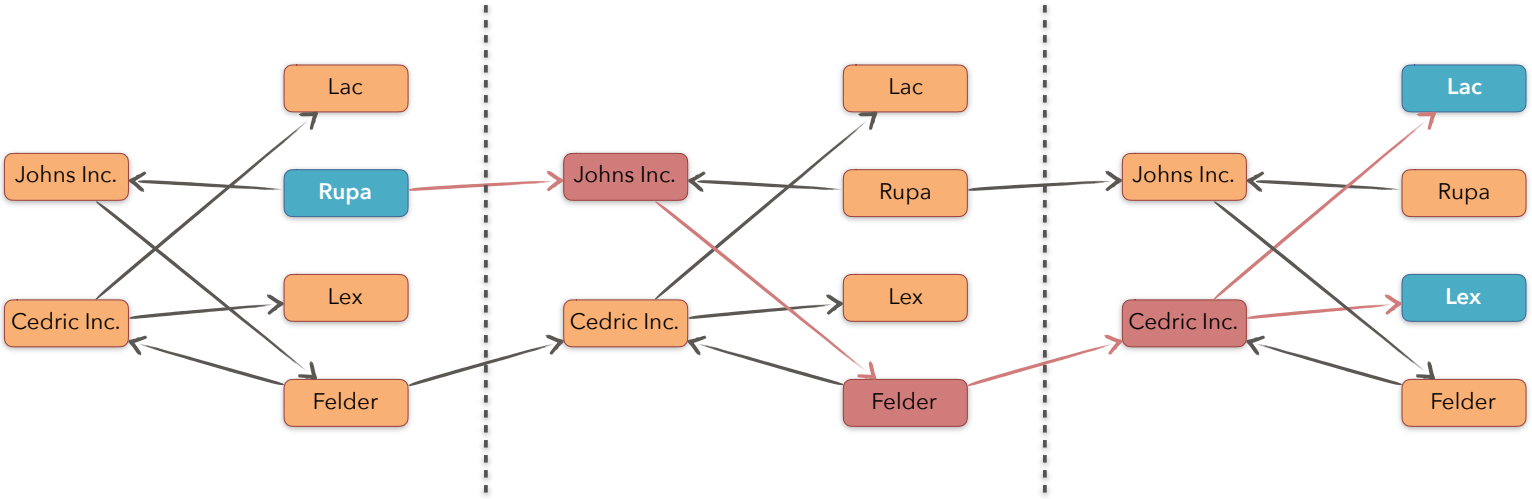
SCC reduction

Control Bipartite Graph

Explainable Control (future)

Ultimate Beneficial Owner

Frequent Graph Updates



Ultimate Beneficial Owner: who is the farthest controller of a company?

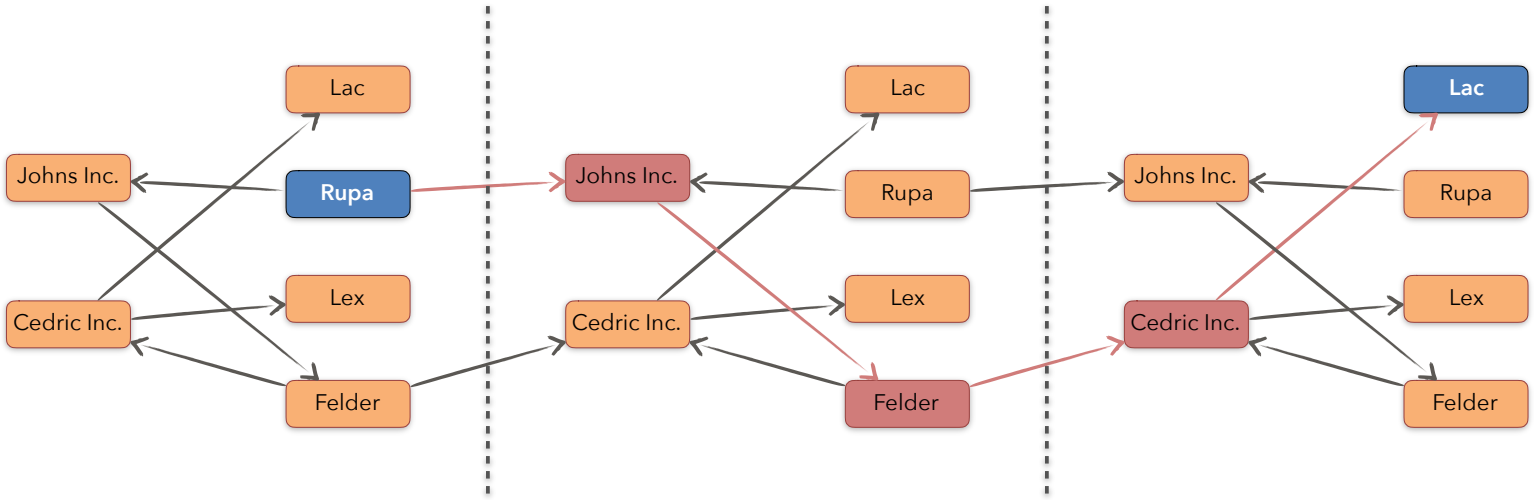
SCC reduction

Control Bipartite Graph

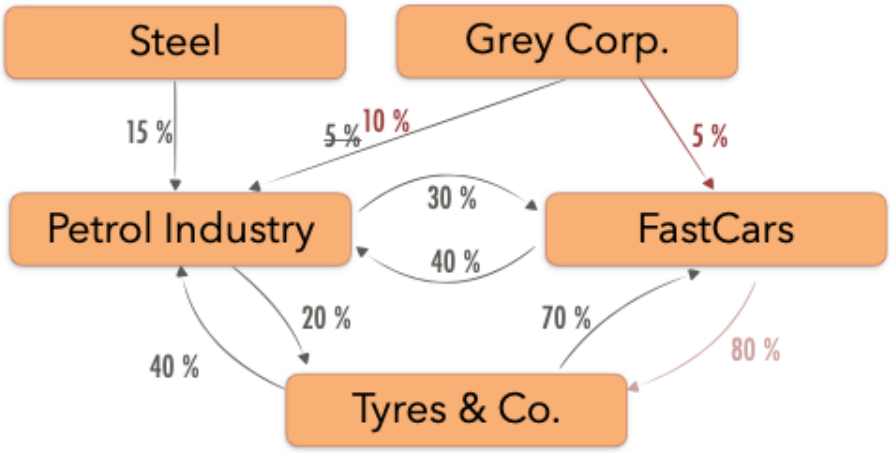
Explainable Control

Ultimate Beneficial Owner (future)

Frequent Graph Updates



Frequent Graph Updates: fast re-computation



- Graph updates can occur and they can be:
  - Δ^{+}: add edge/node
  - Δ^{-}: delete edge/node
  - Δ^{U}: update ownership

- **Minimize** the **re-computation** of:
  - all-pairs ownership
  - all-pairs control
  - control bipartite graph

Thank you
for your attention!

Questions?