

Occupation networks: Career path dynamics and poverty traps

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Motivation

- How can network structure inform individual career path decisions?
- How can network dynamics inform economic policy decisions?

Road map

- Related work
- Data acquisition
- Network construction
- Exploratory structural analysis
- Poverty traps

Related work

- Occupation networks
 - [Lungu, Zamfir, Mocanu 2013]
- Labor flow networks
 - [Guerrero, Axtell 2013]
- Poverty traps
 - [Azariadis, Costas 2005], [Bowles, Durlauf, Hoff 2006]

Data sources



~1,000,000 resumes
Avg. Nat'l salary estimates

~40,000 skills



6,000,000 job descriptions

Resume data



HTML document

Work Experience

Marketing Manager

Time Inc -
New York, NY

August 2010 to Present

Marketing Manager for the Health brand of Time Inc. dedicated to developing custom integrated marketing program ideas and lead generation of integrated RFP response proposals.

â— Successfully managed coordination with art director and sales executives to generate new business through development and implementation of promotional materials including one-sheets, mailers, and booklets.

â— Tasked with researching and developing 2012 brand initiatives including custom franchises, event sponsorships, relevant partnerships, and social media programs.

â— Design and implementation of trade strategies, including exhibition shows, advertising, promotions, event sponsorships, and e-mail campaigns.

â— Manage proprietary and syndicated research initiatives and projects by working closely with Time Inc Research and Insights department to analyze research data and develop compelling marketing stories.

Marketing Coordinator

PR Group -
New York, NY

June 2009 to July 2010

Directly involved in the marketing, sales, and public relations efforts for start-up technology company that provided advertisers with proprietary technology to allow them to more efficiently target their online advertising.

â— Managed the relationship with PR Group to execute public relations and press strategy to build brand awareness.

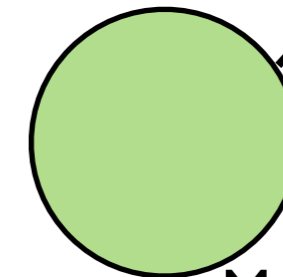
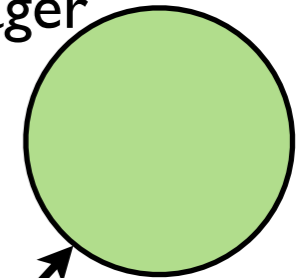
â— Developed case studies and assisted with public relations programs, a new corporate website, social media campaigns, and other marketing initiatives as part of company launch.

â— Generated custom client proposals and sales collateral, performed account research to integrate custom advertising opportunities and bring in new business.

â— Managed and implemented reporting systems to better track and respond to client requests and provide back-up data for sales and executive team.

<title>Marketing Manager</title>

Marketing Manager



Marketing Coordinator

**Reverse
chronological
order**

Skills



Skills & Expertise *beta* > Statistical Modeling

Search Skills & Expertise

Related Skills

- Logistic Regression
- Statistical Consulting
- CHAID
- Bayesian
- Bayesian statistics
- Non-parametric
- GLM
- Response Modeling
- Mixed Model
- ARIMA
- Linear Regression
- Statistical Computing
- Predictive Modeling
- Cluster Analysis
- Linear Models

Statistical Modeling ▲ 1% y/y

Primary Industry: Research

A statistical model is a formalization of relationships between variables in the form of mathematical equations. A statistical model describes how one or more random variables are related to one or more other variables. The model is statistical as the variables are not deterministically but **stochastically** related. In mathematical terms, a statistical model is frequently thought of as a pair (Y, P) where $Y...$

[More on 'Statistical Modeling' at Wikipedia »](#)

✓ Listed on your profile Edit Your Skills

Statistical Modeling Professionals

- Nitin Sareen**
Vice President at Citigroup
Experience in some of the best Analytics companies in setting up and managing analytical consulting groups in the...
- Bill Kahn**
SVP Analytic Capabilities--American International Group

Related Companies

- Mu Sigma**
Management Consulting, Greater Chicago Area
★ Follow
- Fractal Analytics**
Management Consulting, San Francisco Bay Area
★ Follow
- SAS**
Computer Software, United States
★ Follow
- Inductis**
Management Consulting, Greater New York City Area
★ Follow
- Capital One**
Financial Services, Washington D.C. Metro Area
★ Follow

[More companies...](#)

Job descriptions



Systems Engineer (Avionics)

Save Job Rate Job Report Job

Apply Now

Share Job With Others

Like 0

+1

Tweet

Share

Share

Location: Newport News, VA Area Code: 757 Telecommute: no Travel Required: 25%

Skills: Systems Engineering

Pay Rate: \$88K - \$95K Tax Term: FULLTIME CON_IND CON_HIRE_IND Length:

Date Posted: 9-10-2013 Position ID: 297404 Dice ID: 10220985

Skills

International Communications Group, Inc (ICG), located in southeastern Virginia, is the industry leader in the design, development and manufacture of next generation communications systems and solutions for the General Aviation and Air Transport industries. Integrated, dependable and secure, ICG's avionics provide a comprehensive communications solution that can be customized for any size airframe or application.

We are currently seeking candidates for the position of **Systems Engineer**.

Systems Engineers have the responsibility to work with both internal and external customers to capture and validate requirements and to lead the system design across the engineering team.

They must possess strong communication skills (both verbal and written) and act as the focal for avionic project design and development activities.

System Engineers work closely with the engineering and program leadership to ensure project design and development is managed in a successful manner. They must understand the full product development life-cycle to aid the engineering managers in guiding a team through those activities. They should have a very strong background in requirements development/capture and validation. They are responsible for the certification of the system and coordination across the hardware and software development activities of a project.

Candidates should understand DO-178B, DO-254 and process driven development environments. Necessary skills include: DOORS, Subversion (SVN), MS Project and other MS Office Products.

Bachelors and/or Advanced Degree in Engineering or related technical field with 4+ years of experience in avionics systems and subsystems engineering and integration.

Experience

Education

Data extraction

Systems Engineer (Avionics)

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Filters

n-grams

n = 1,2,3,4

Skills

Communication, system design

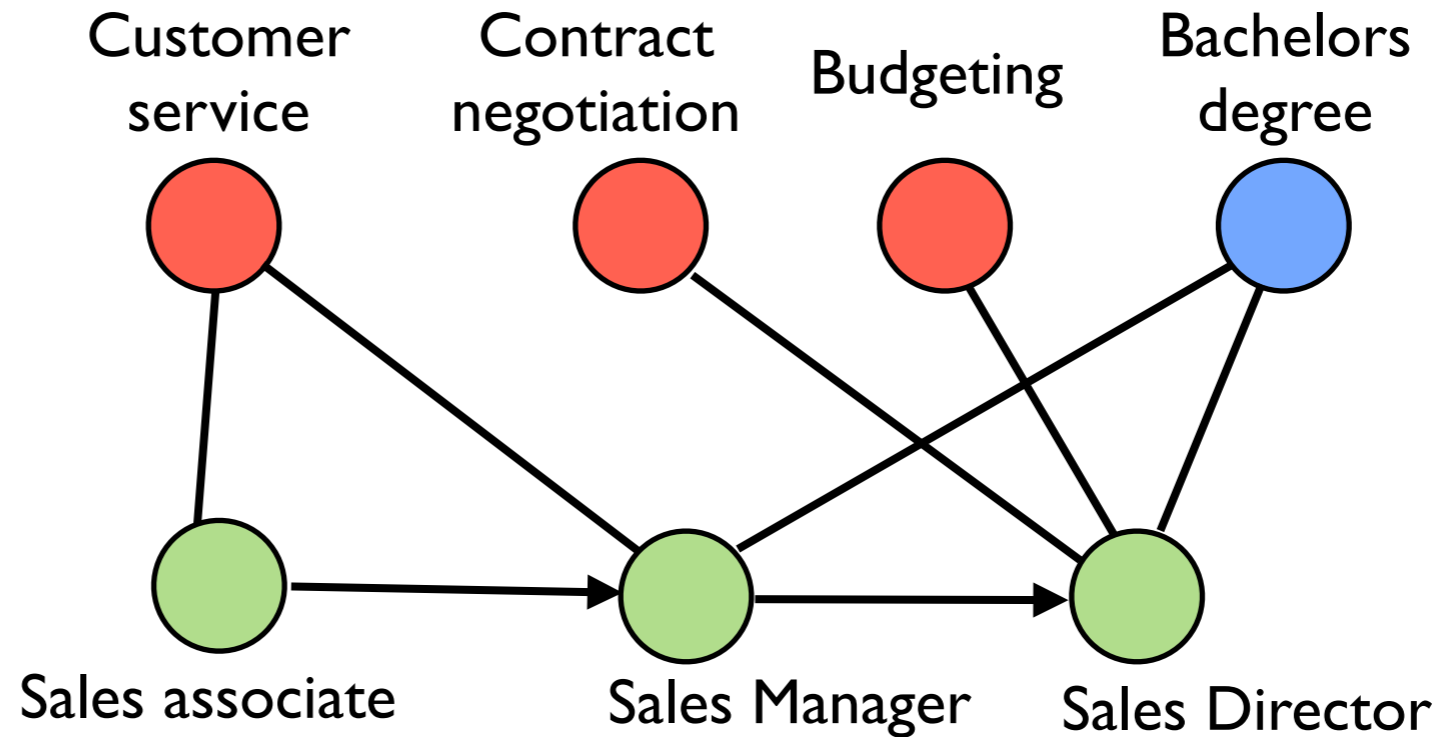
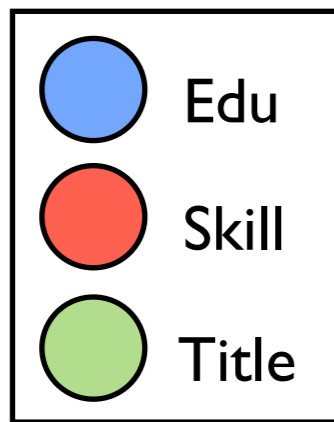
Edu

Bachelor's degree

Exp

4 years

Data model



Selection biases

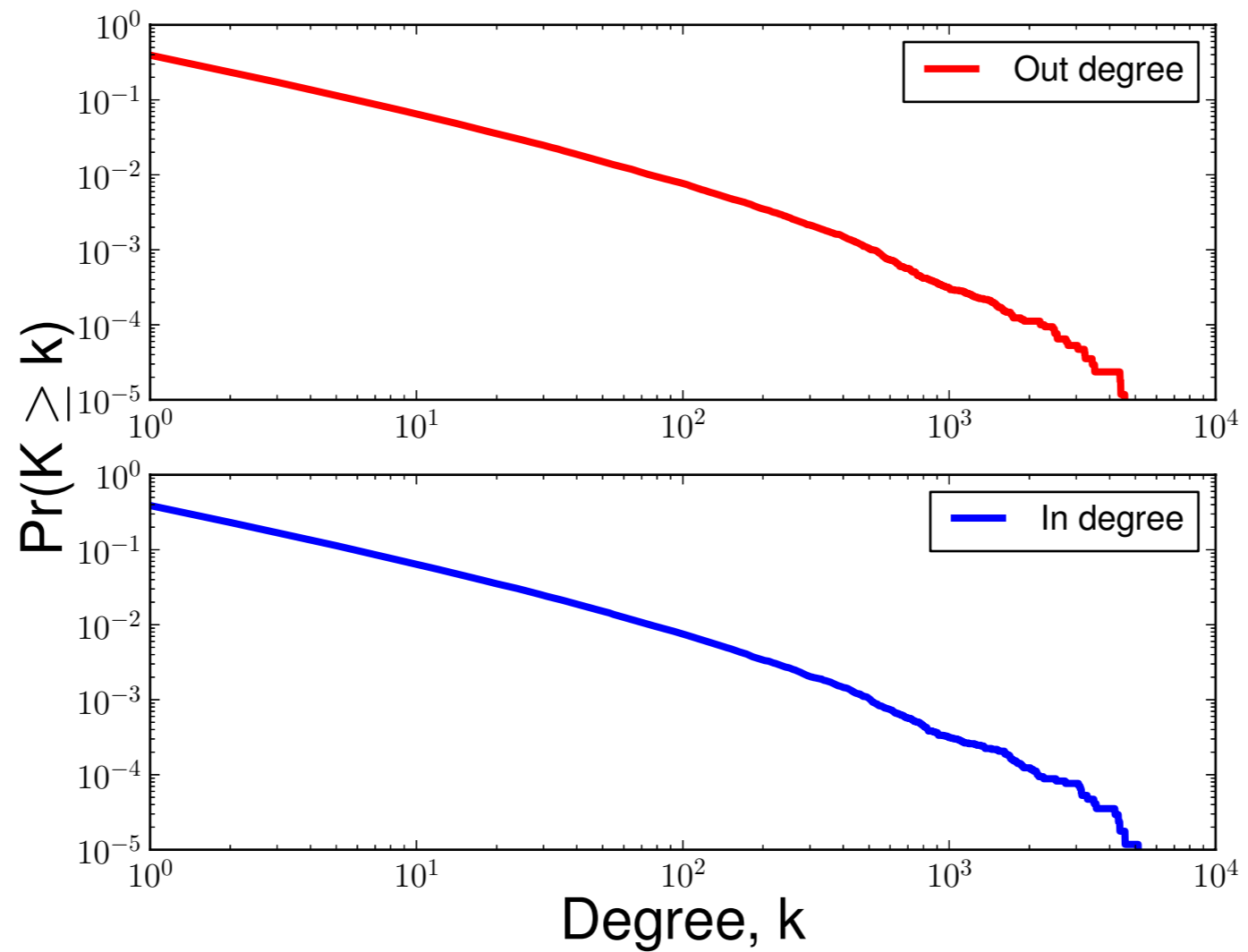
- People searching for a position
- Economic conditions
- Access to Internet
- Knowledge of indeed.com

Network structure

Network statistics

- Nodes: 169,840
- Edges: 956,735
- Avg. in-,out-degree: 5.6

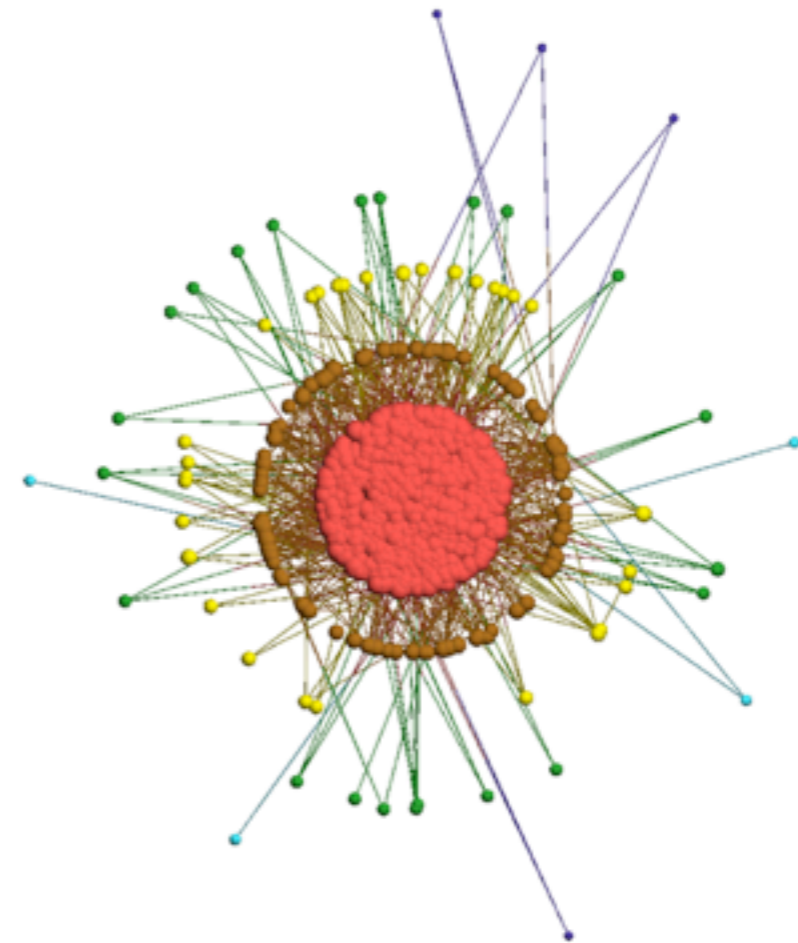
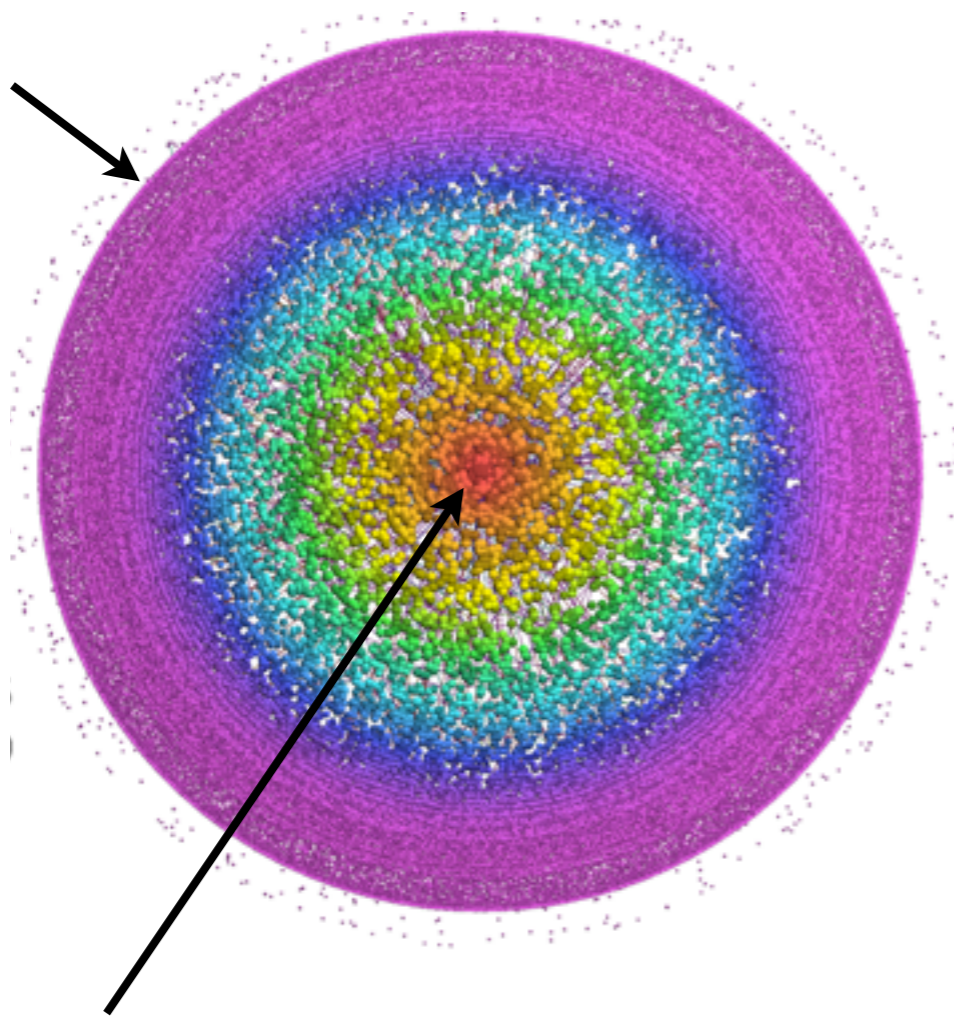
Degree distributions



K-core visualization

Occupation network ER random network*

Low k



High k - which nodes are high degree?

*http://lanet-vi.soic.indiana.edu/images/fig/ER_1000c_colored_w-bgn_k-cores.png

Degree centrality

Title	Out degree
administrative assistant	5174
customer service representative	5122
manager	4567
owner	4365
sales associate	4312
cashier	4185
assistant manager	3559
office manager	3491
supervisor	3295
receptionist	3140

Degree centrality

Title	In degree
owner	4759
administrative assistant	4559
manager	4401
customer service representative	4373
sales associate	3512
project manager	3440
office manager	3235
supervisor	3219
cashier	3035
assistant manager	2788

Popular skills

Procurement

Customer service

Reporting

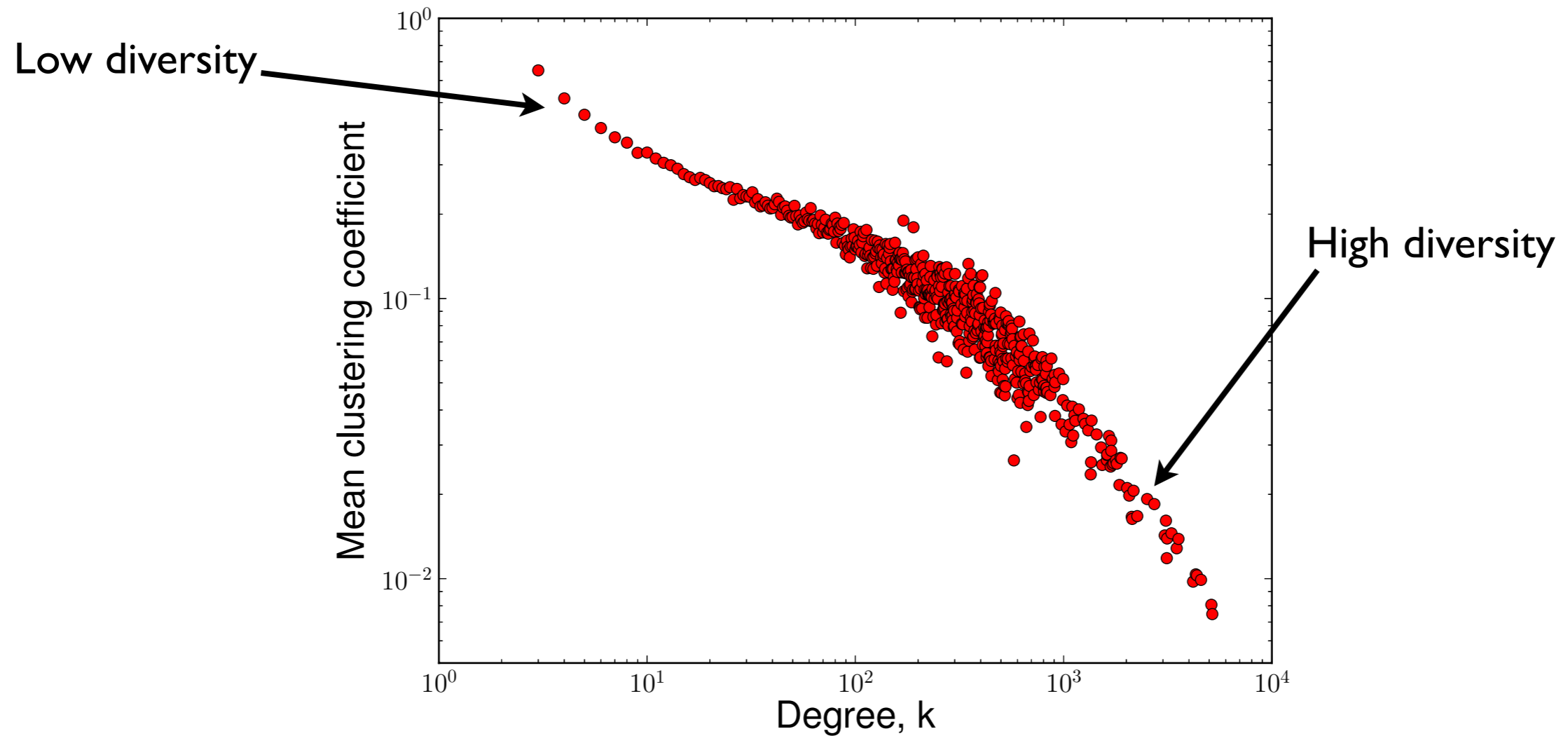
Business

Conflict resolution

Communication

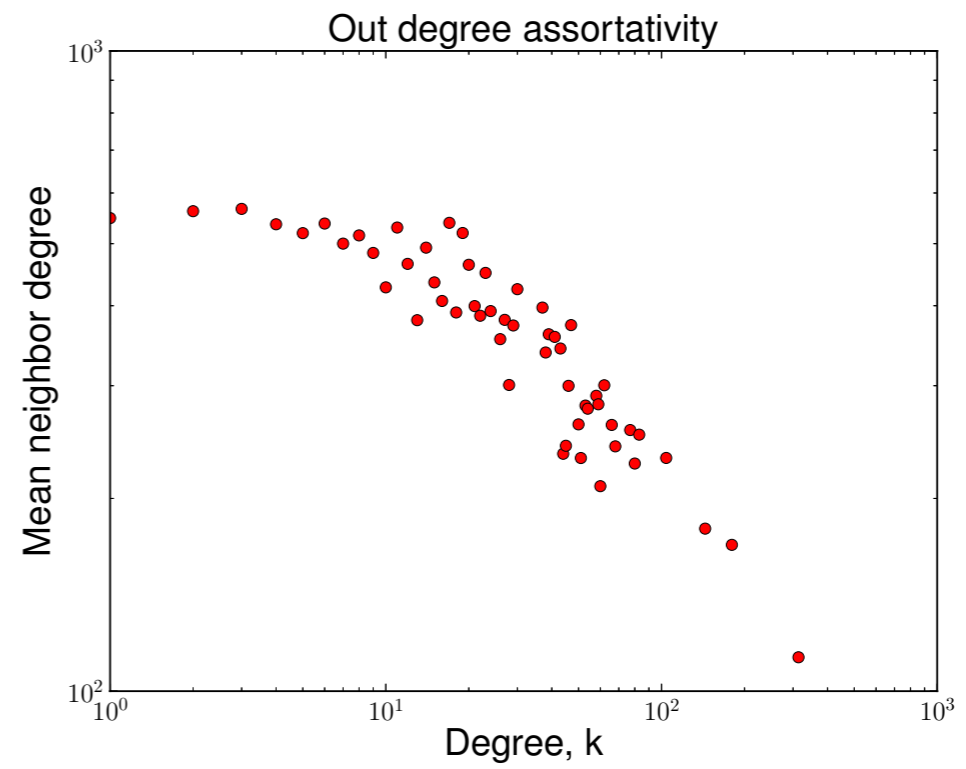
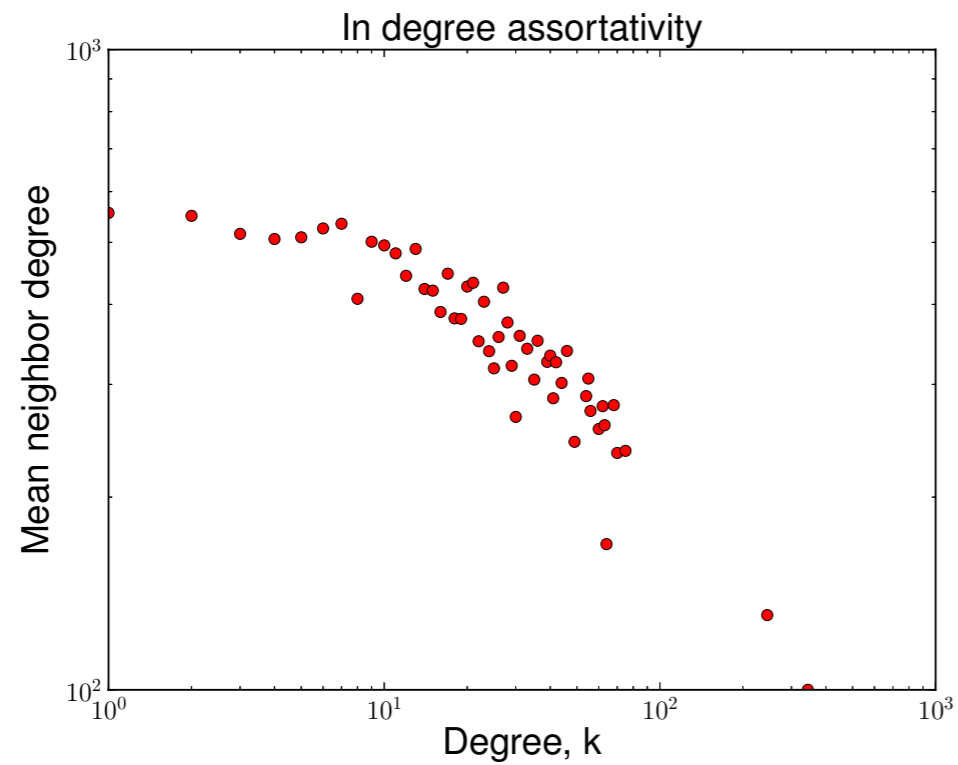
Sales

Diversity

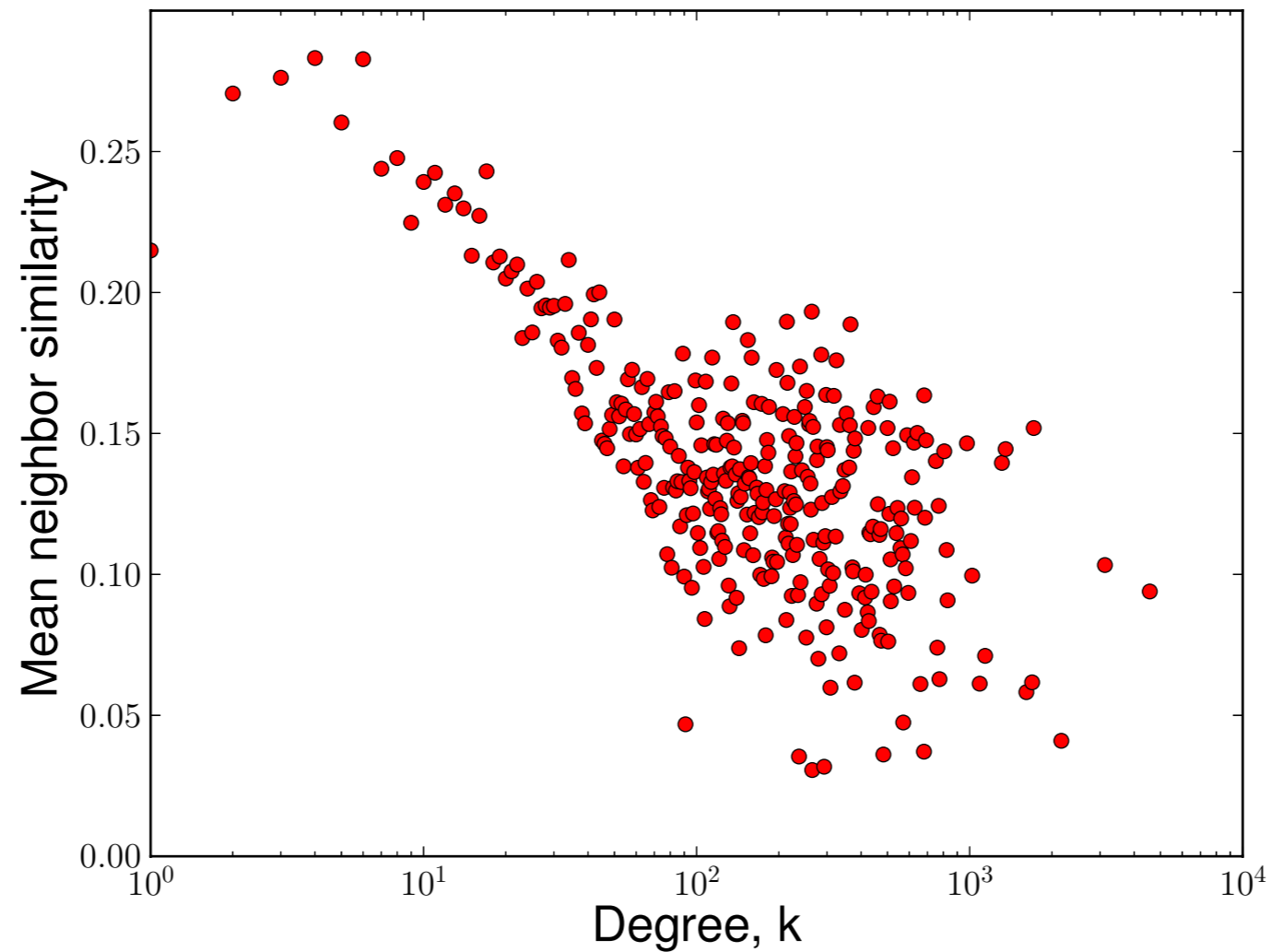


$$C = \frac{\text{closed triplets}}{\text{connected triplets}}$$

Degree assortativity



Skill assortativity



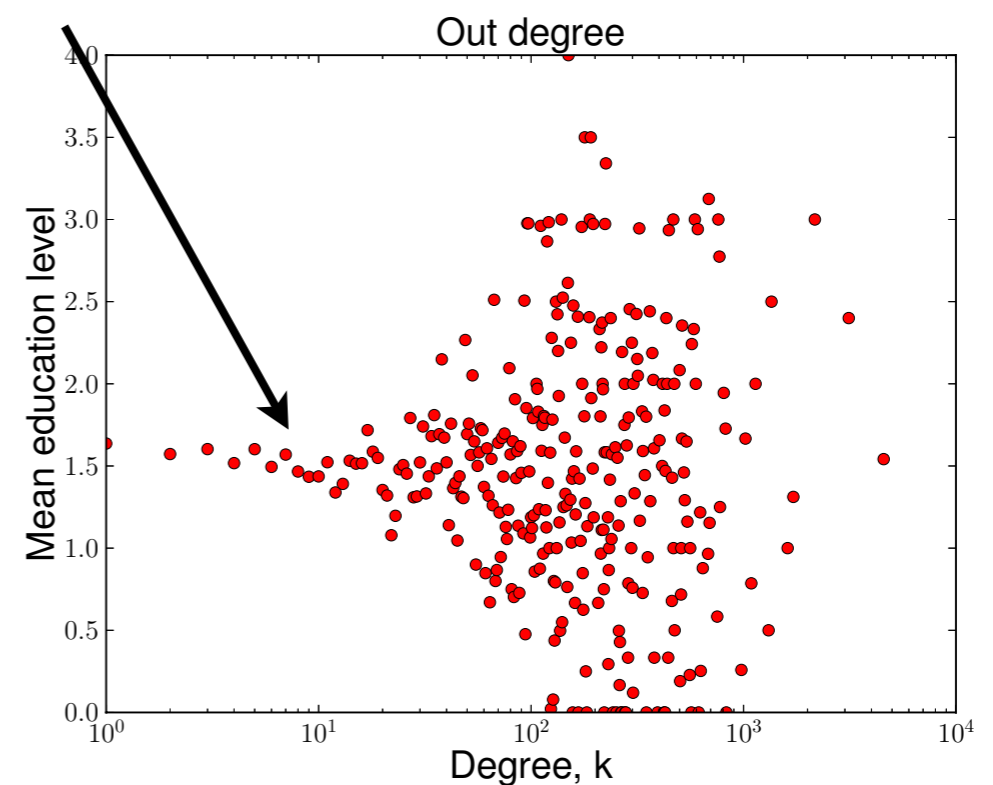
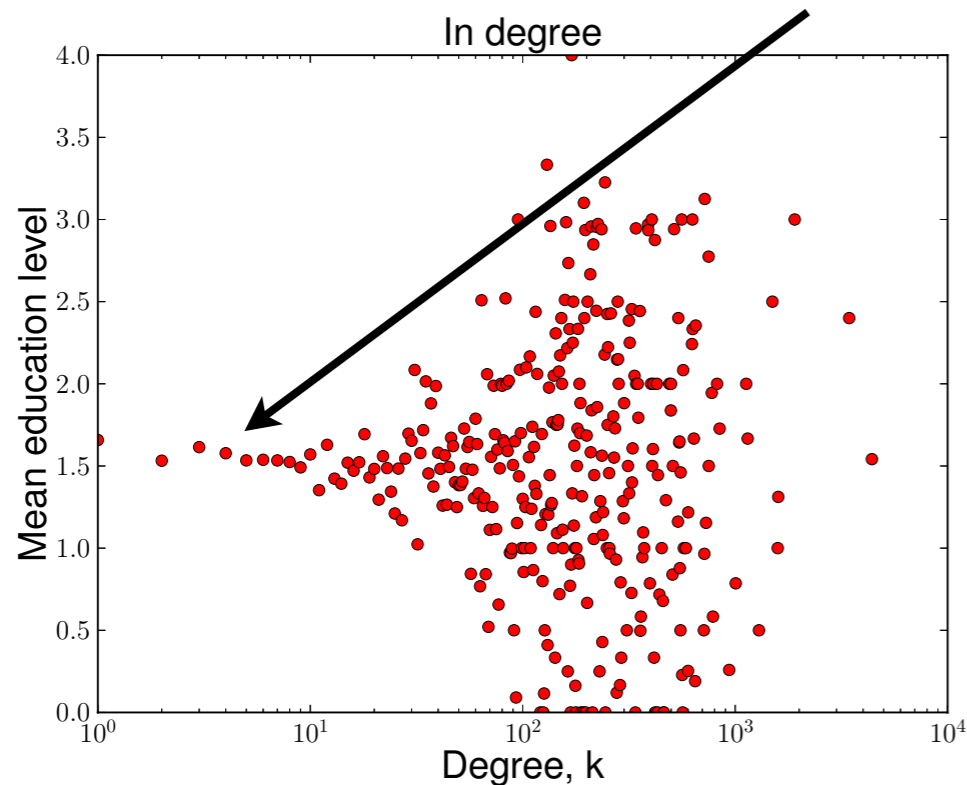
$$\text{Jaccard similarity} = \frac{\{\text{skills}_a\} \cap \{\text{skills}_b\}}{\{\text{skills}_a\} \cup \{\text{skills}_b\}}$$

Education assortativity

Education coding

0: High school, 1: Associates, 2: Bachelors,
3: Masters, 4: Doctorate

Associates and Bachelors



Career planning

- High degree nodes: soft skills
- Low degree nodes: specialized skills, form tight groups
- As degree increases, skills carry over less

Poverty traps

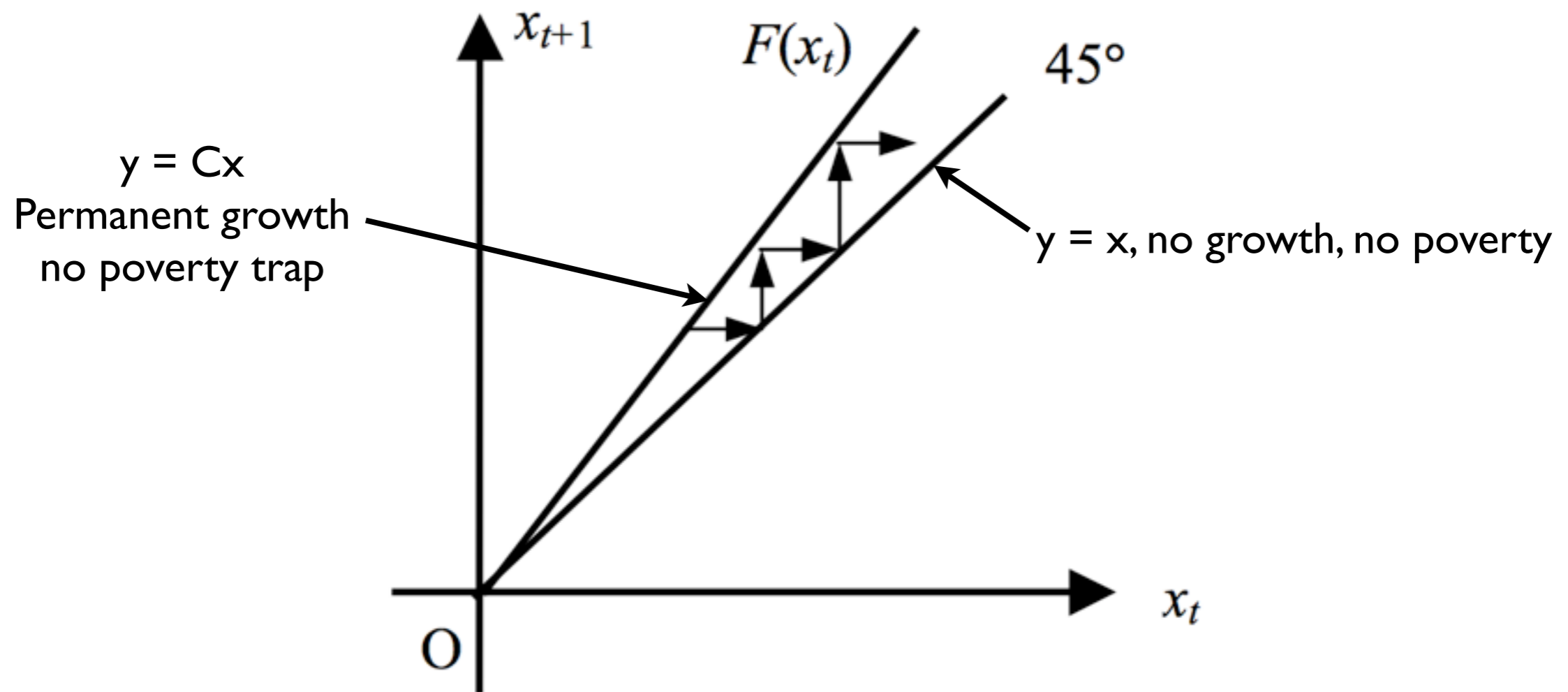
“Any self-reinforcing mechanism which causes poverty to persist” [Azariadis, Stachurski 2005]



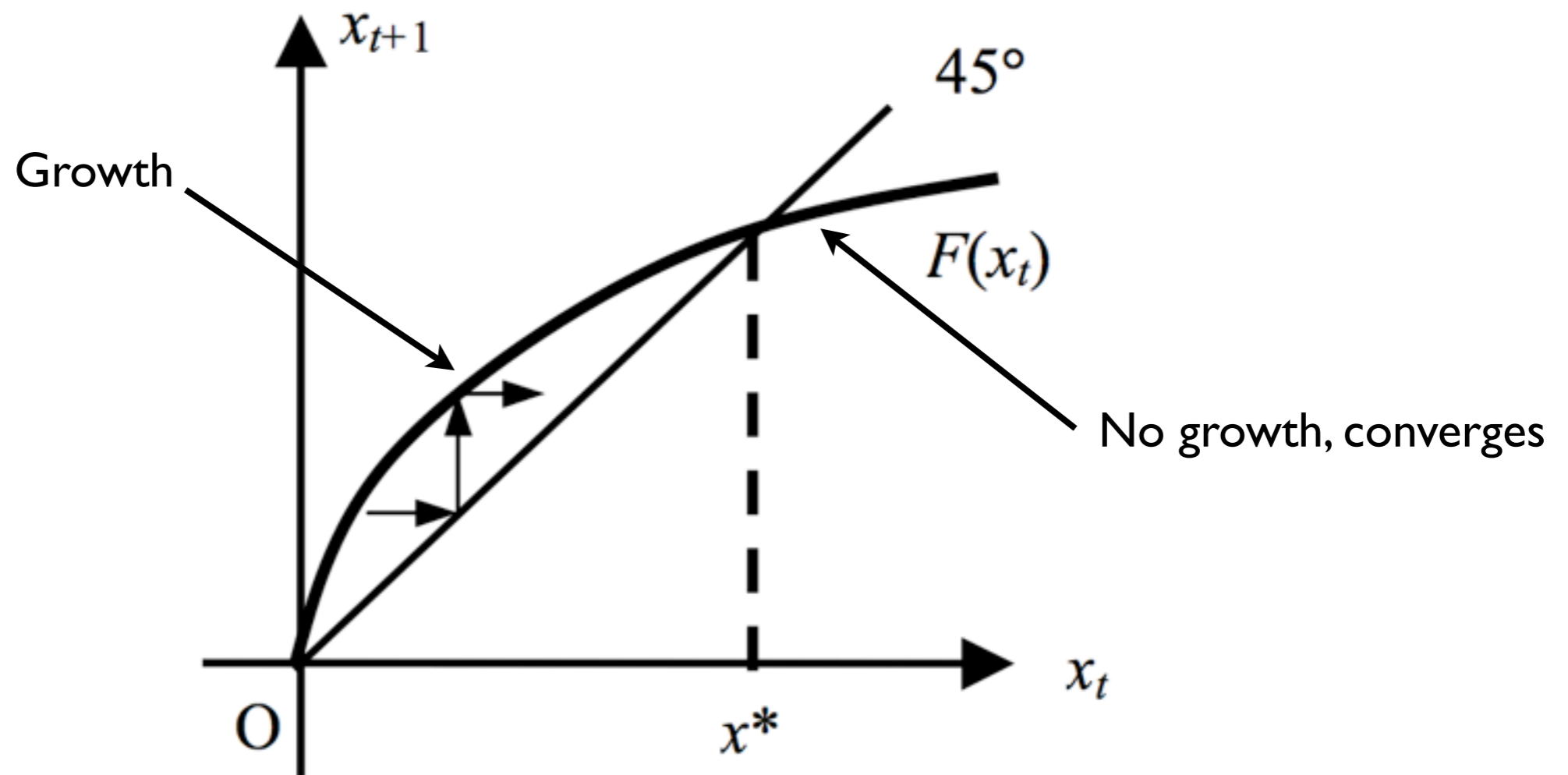
Sources

- Social - kin system, group norms
- Environmental - poor living conditions
- Institutional - corrupt government
- Many more...

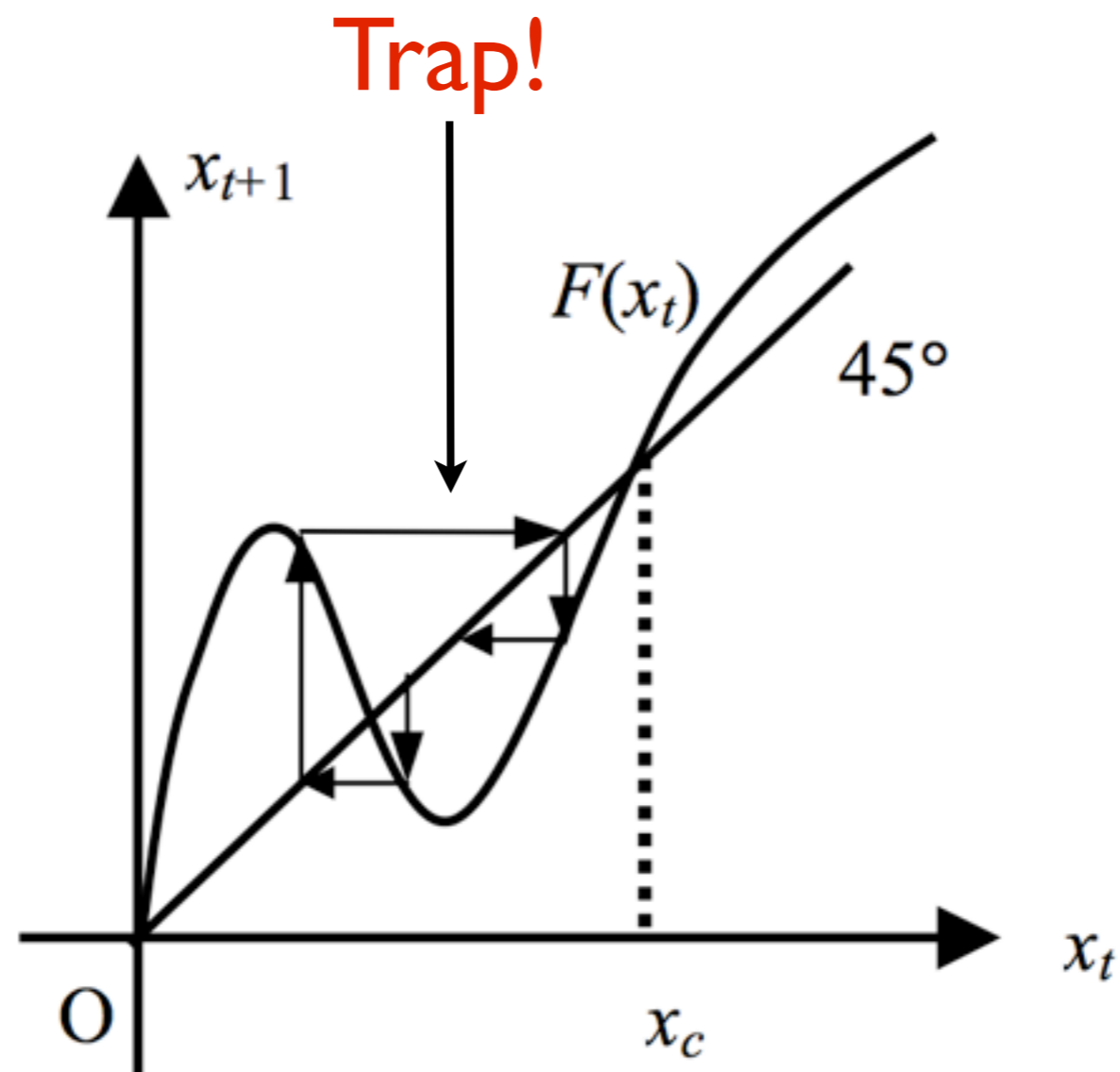
Poverty traps



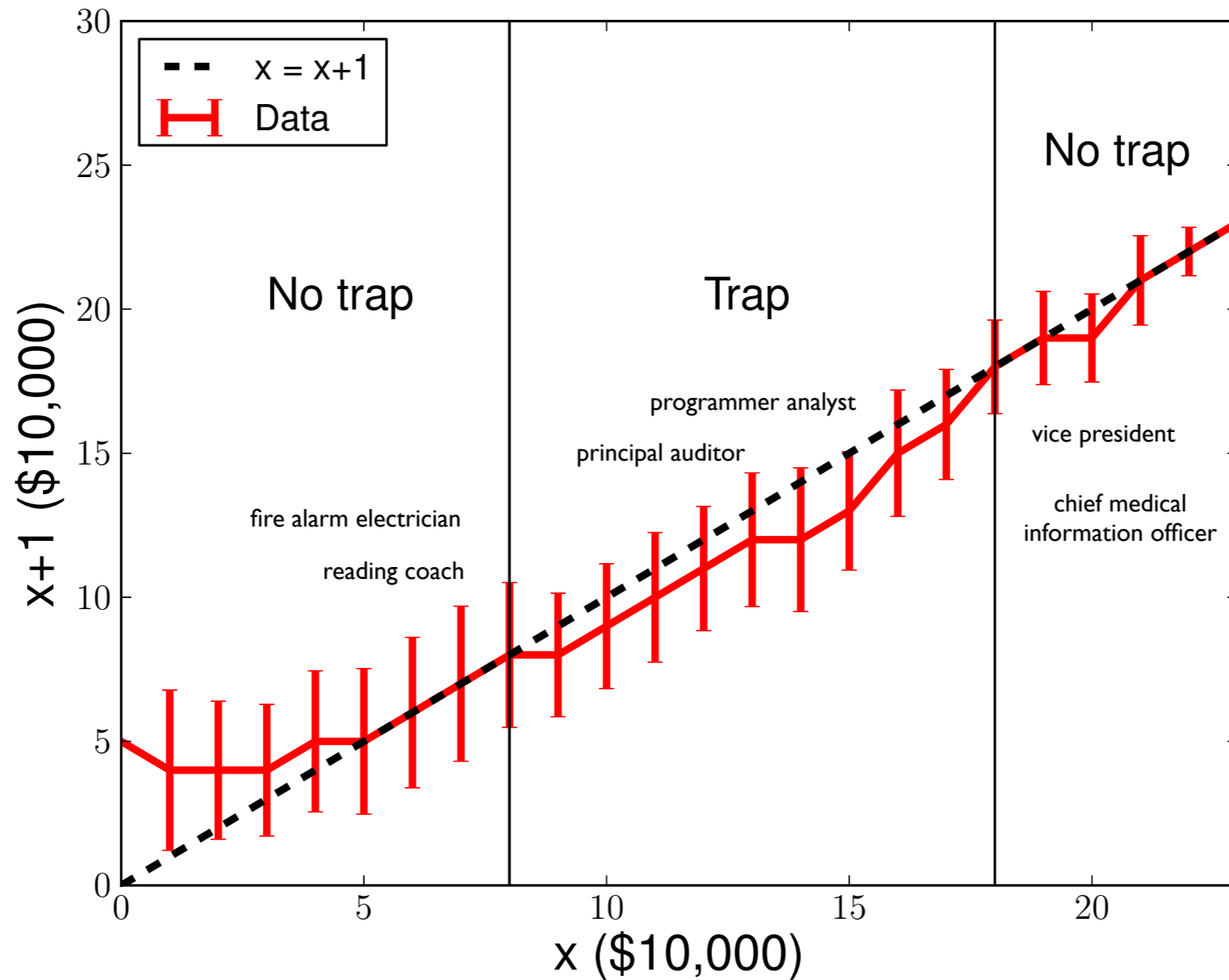
Poverty traps



Poverty traps



Poverty traps

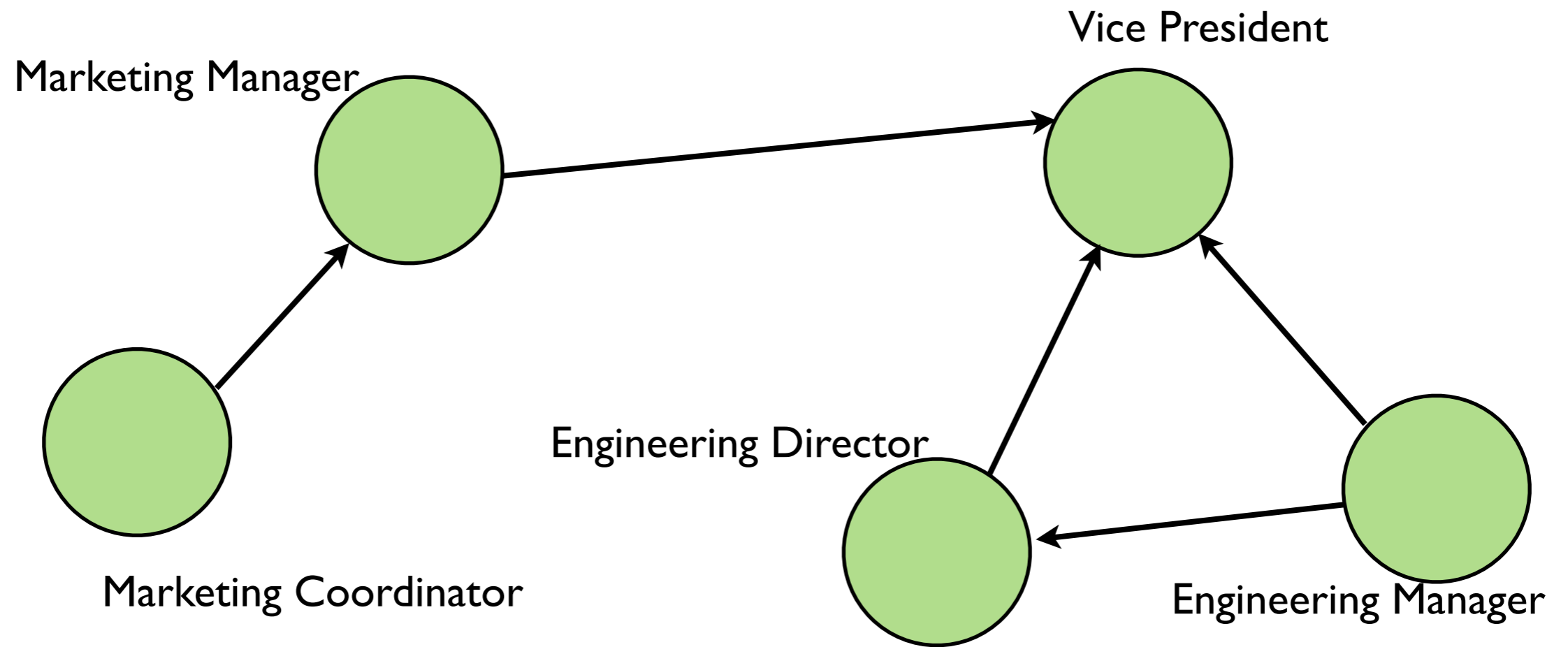


Next steps

- Robustness
- Long term behavior

Conclusion

- High degree nodes lead to many opportunities
- Low degree nodes require specialized skills and tend to cluster
- Poverty trap analysis suggests high salaries stay high



The end

Thanks for listening.

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