The Unreasonable Growth of Network Platforms

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Re[incontri] di Fisica Partenopea
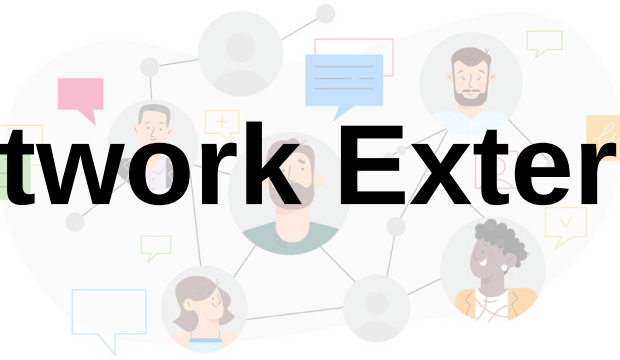
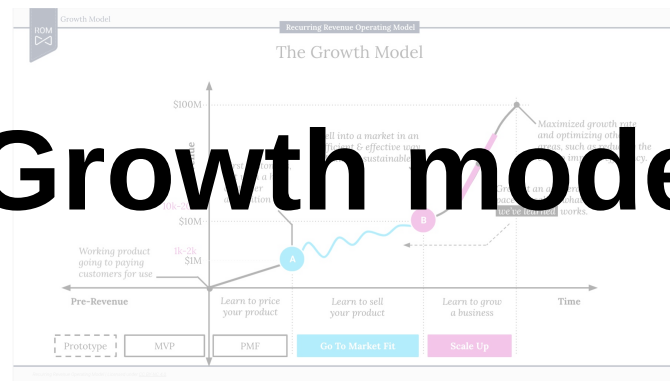19-22 December 2024

Napoli, Italy

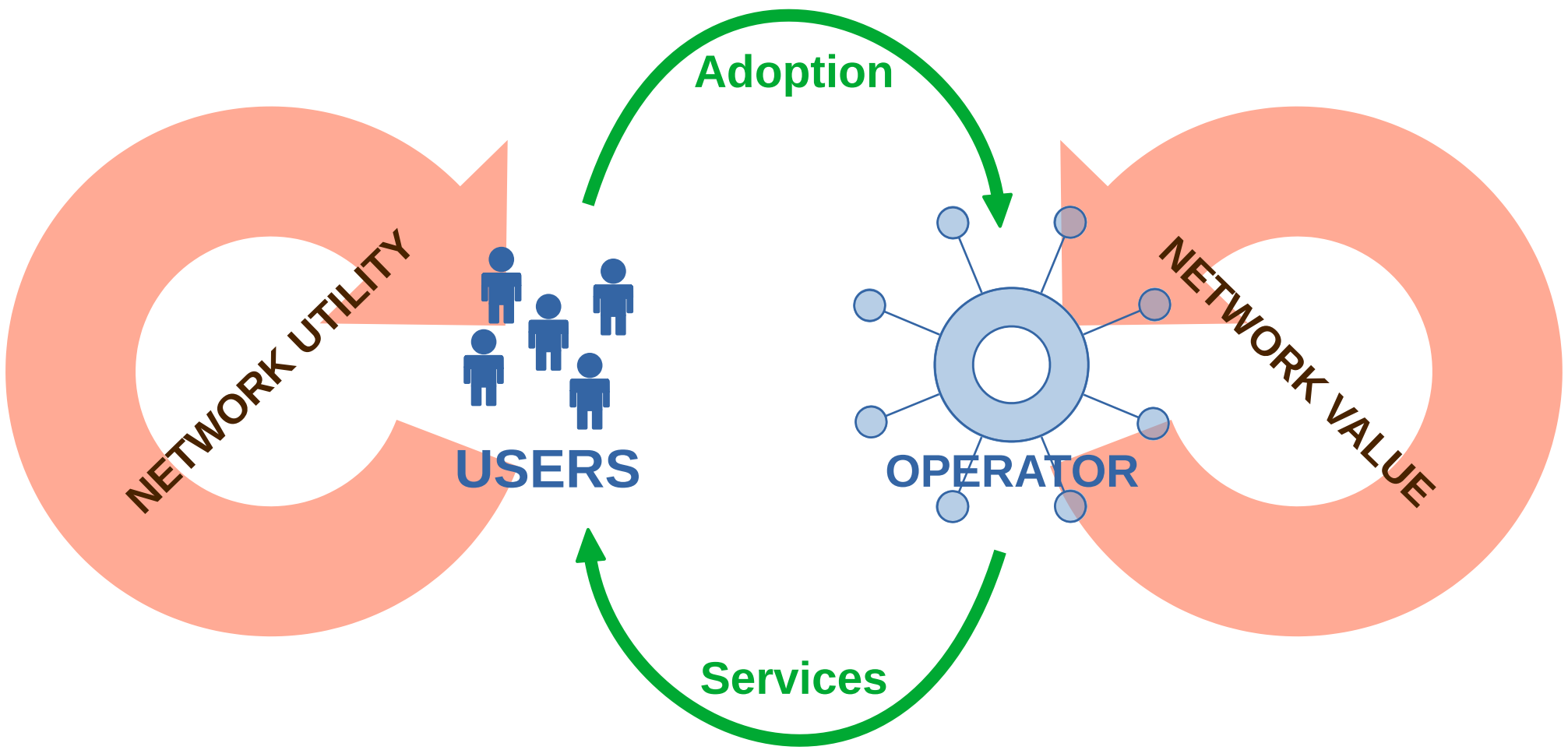INFN

Overview

- **Network Externalities**

- **Network Platforms**
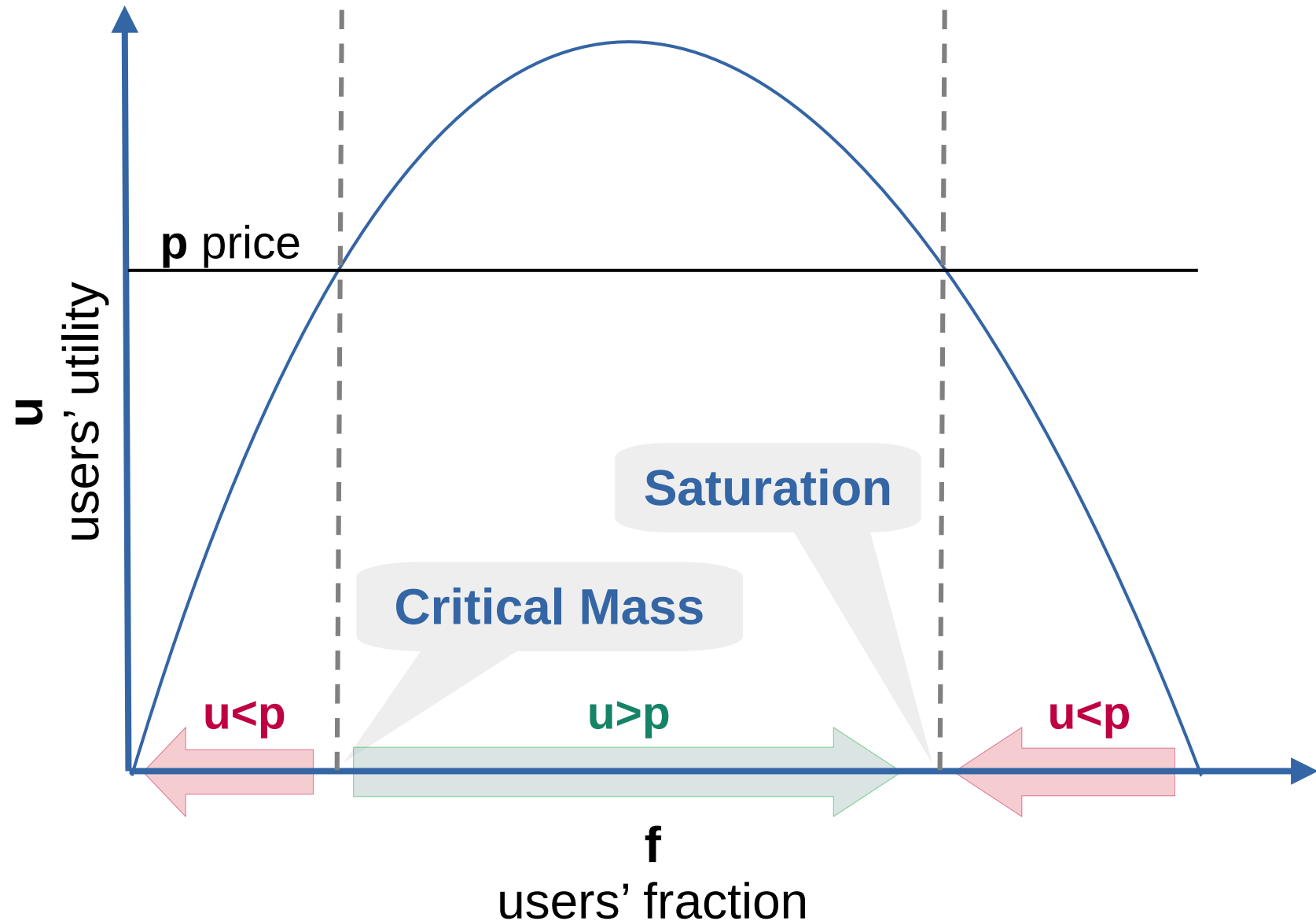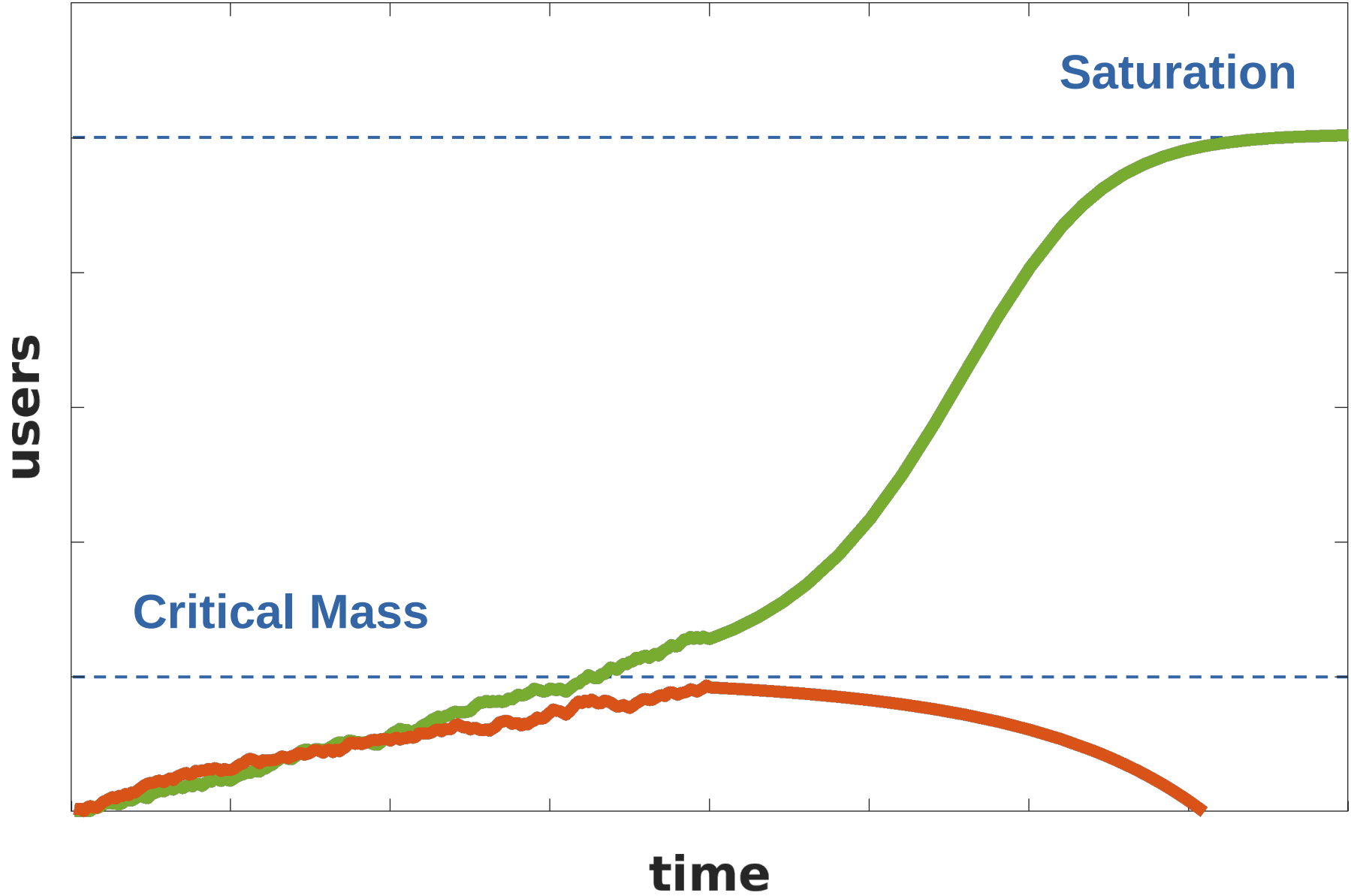
- **Growth models**

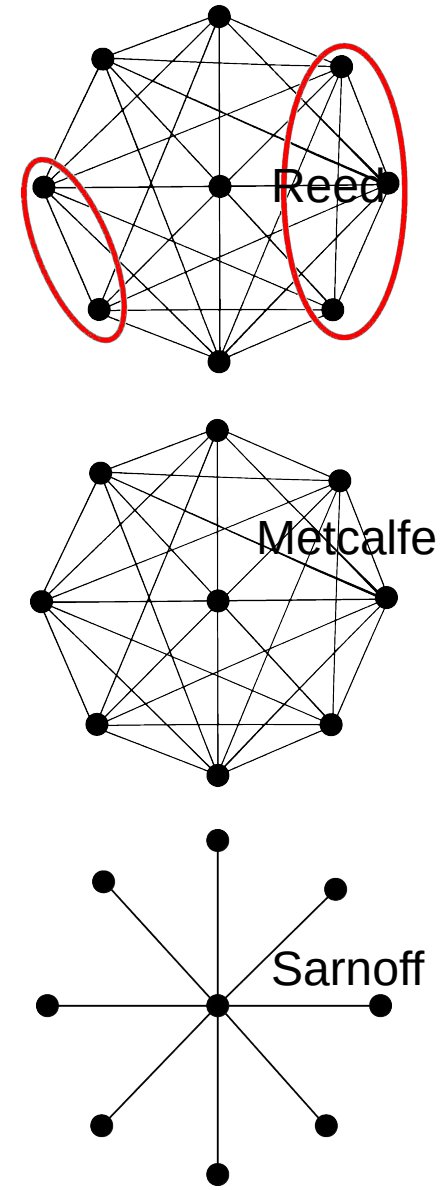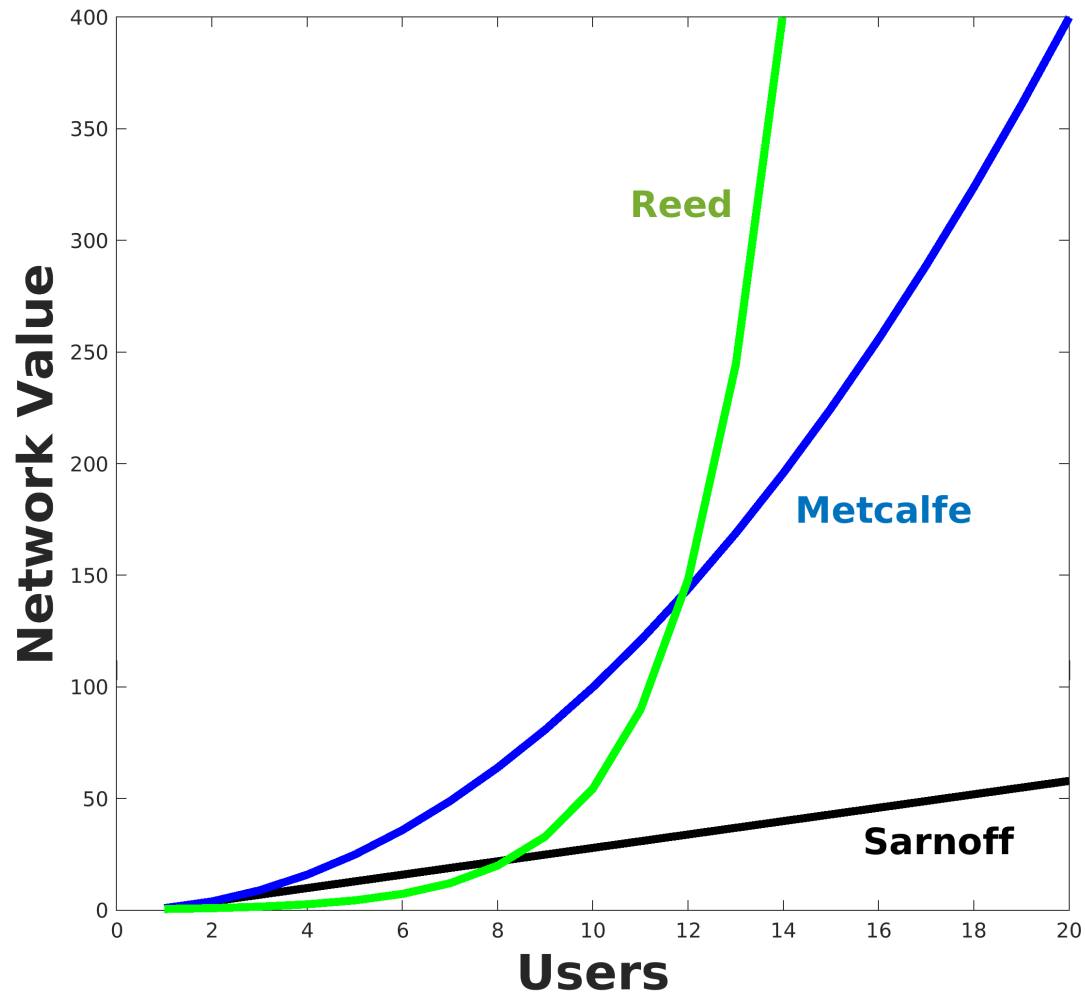# 1 : Network Externalities

Network Effect

J. Rohlfs"A theory of interdependent demand for a communications service."
The Bell journal of economics and management science (1974): 16-37.
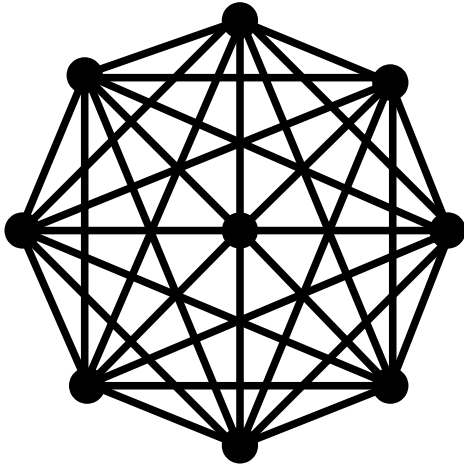
Critical mass

Network Value

Metcalfe's law & competition

- User's **"Network Utility"** is _proportional_ to the number of other users that he can reach
- Operators' **"Network Value"** grows quadratically in the number of users

	Users	Network Value
Network 1	10	100
Network 2	5	25
Net 1 + Net 2	15	225

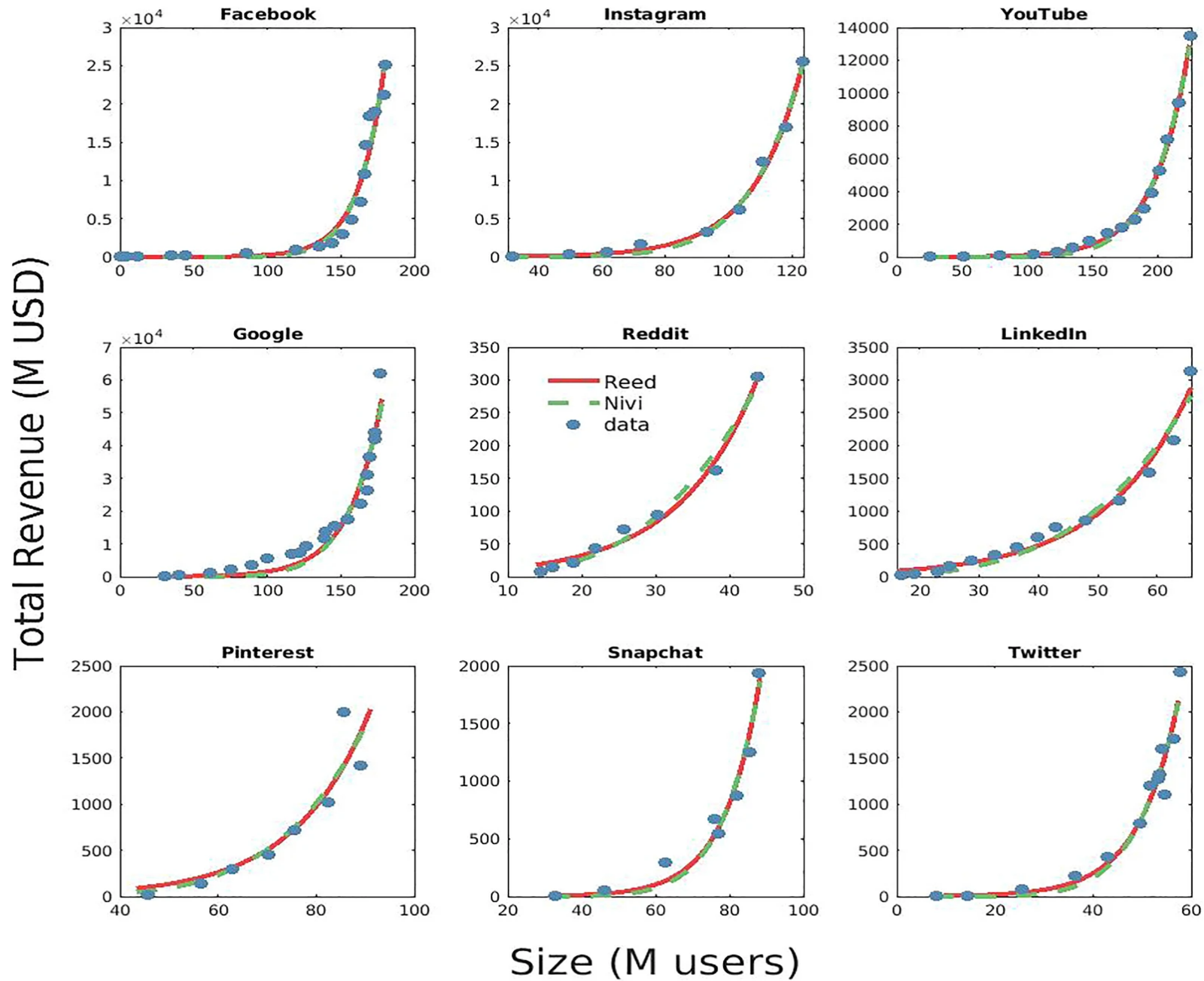Metcalfe, B. Metcalfe's law after 40 years of ethernet. _Computer_ **46**, 26–31 (2013).
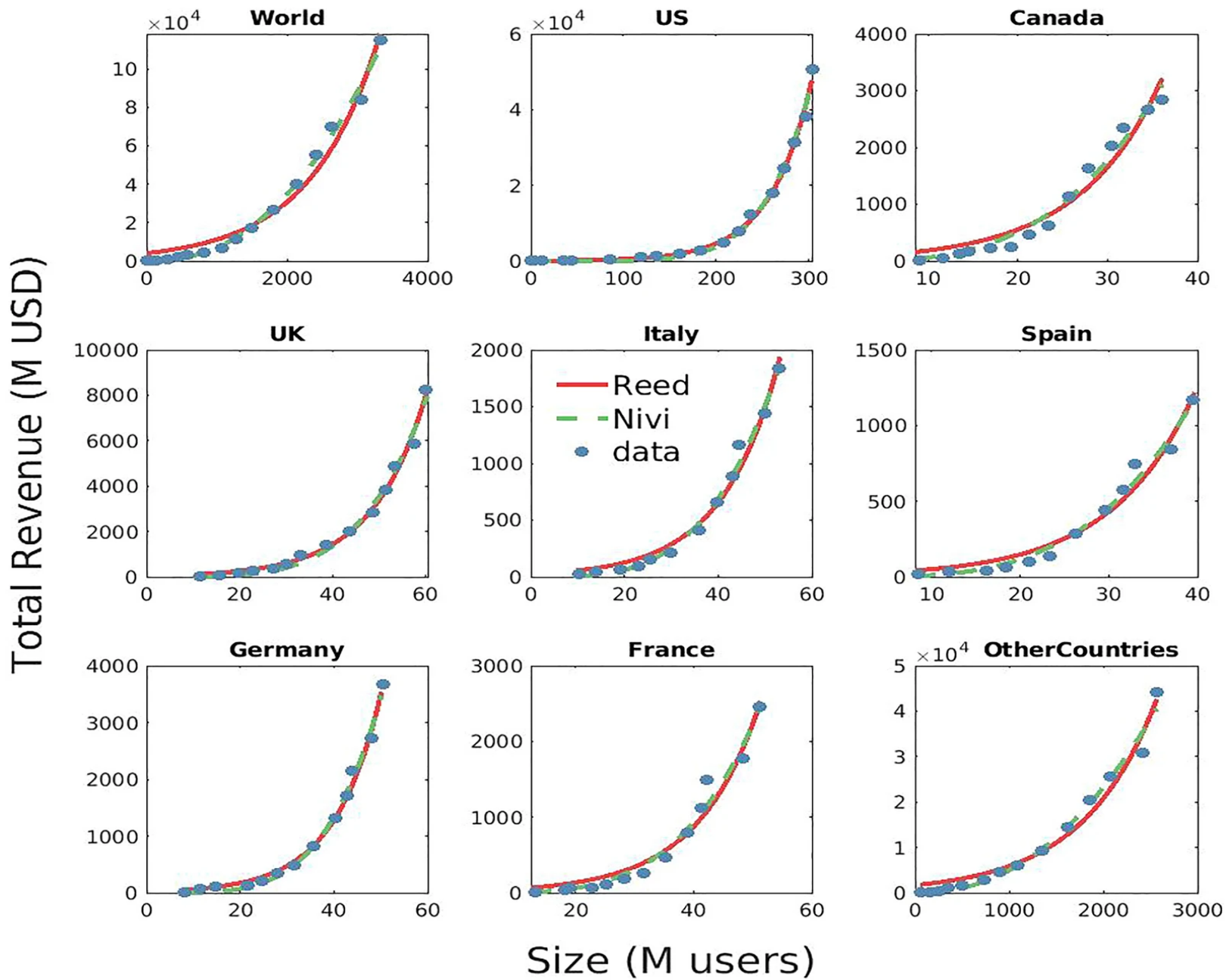
2 : Network Platforms
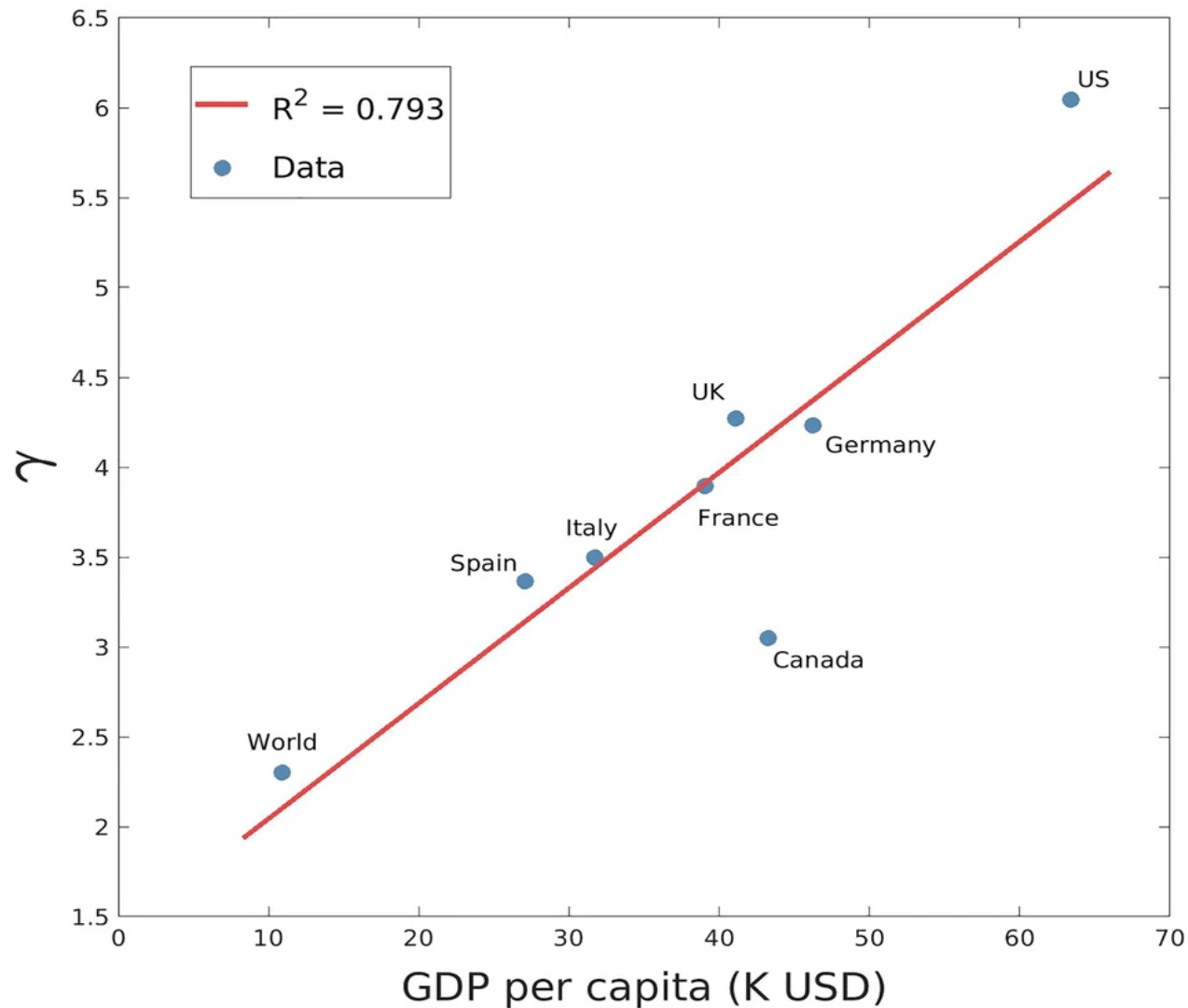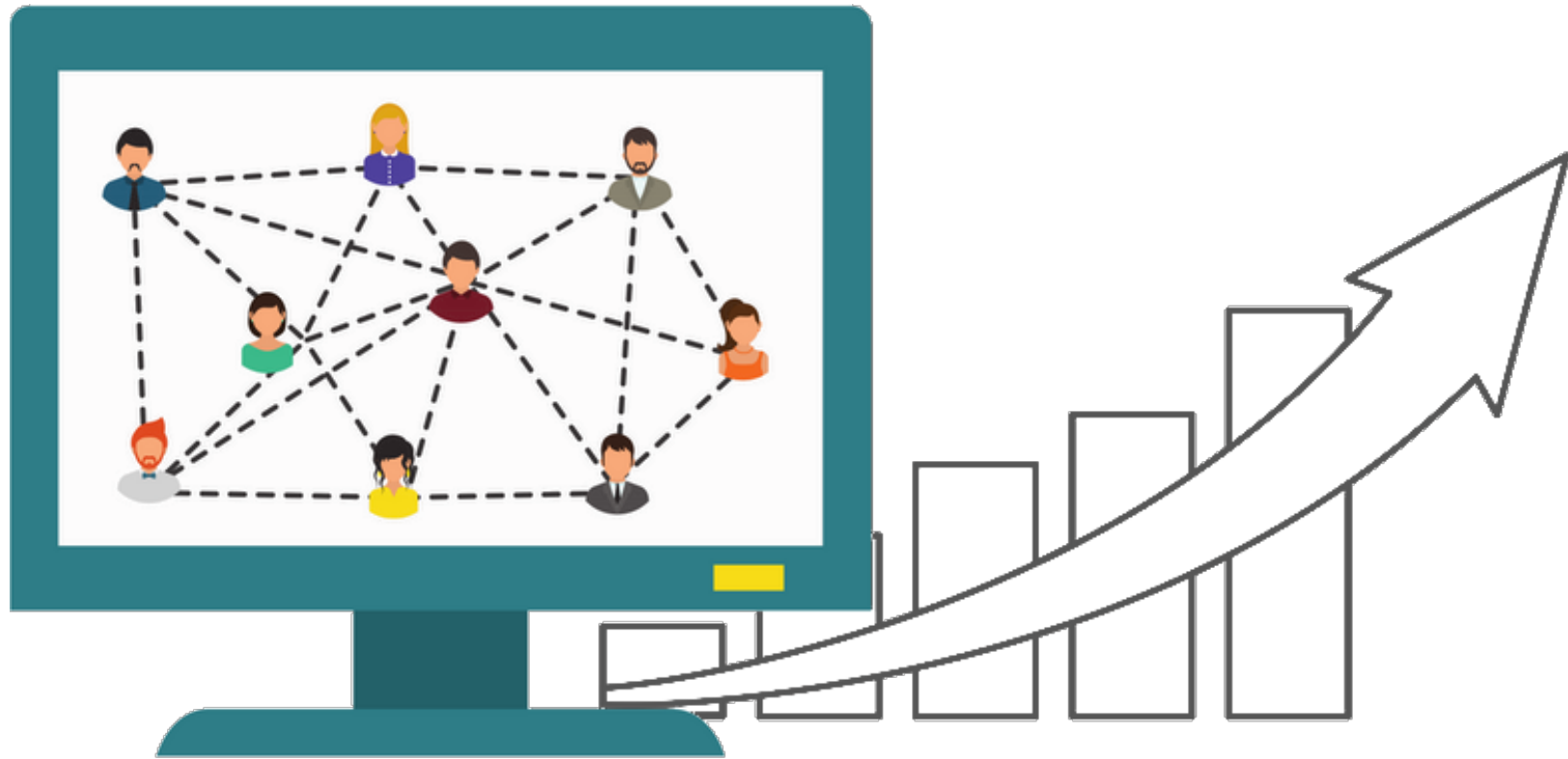
US Market
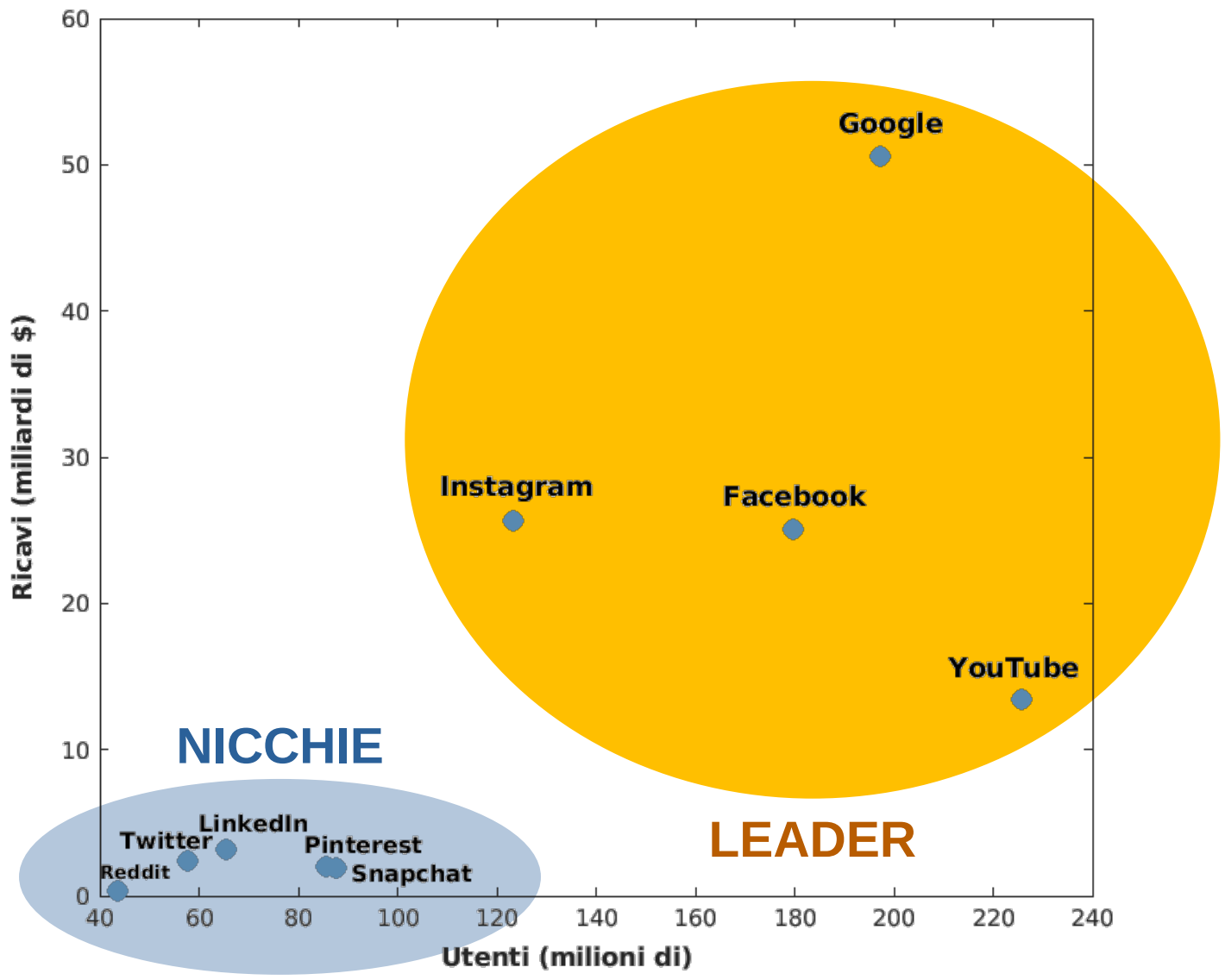
US Market

FB in the World

FB in the World

γ relates to the growth speed of the Network Value

3 : Value & Groups

Users are "monetized" as Groups

Users = 5
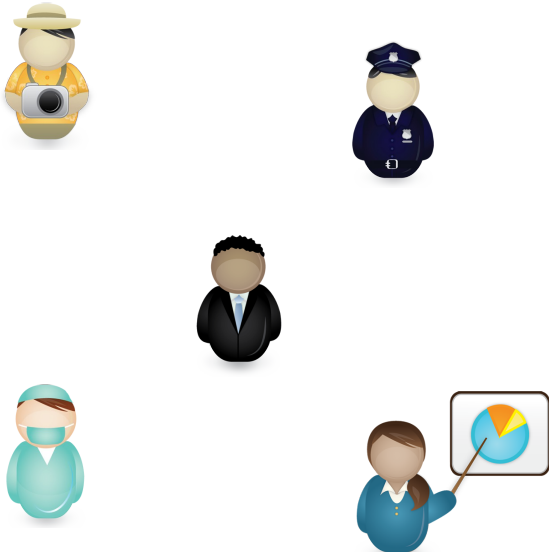
Groups = 3
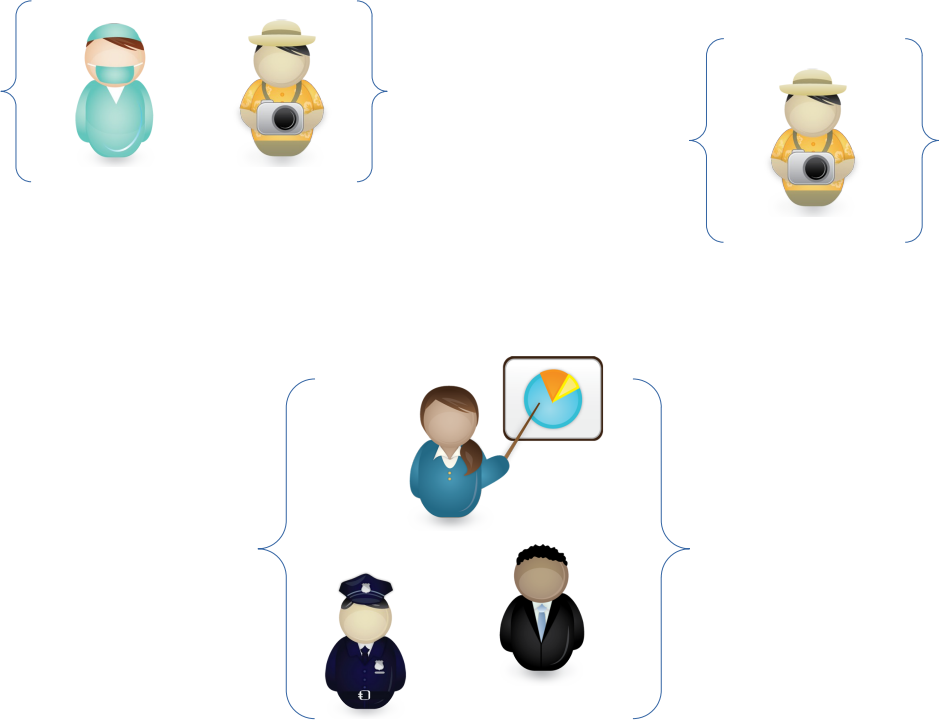
New Users create (some) New Groups

Groups = 3

New user
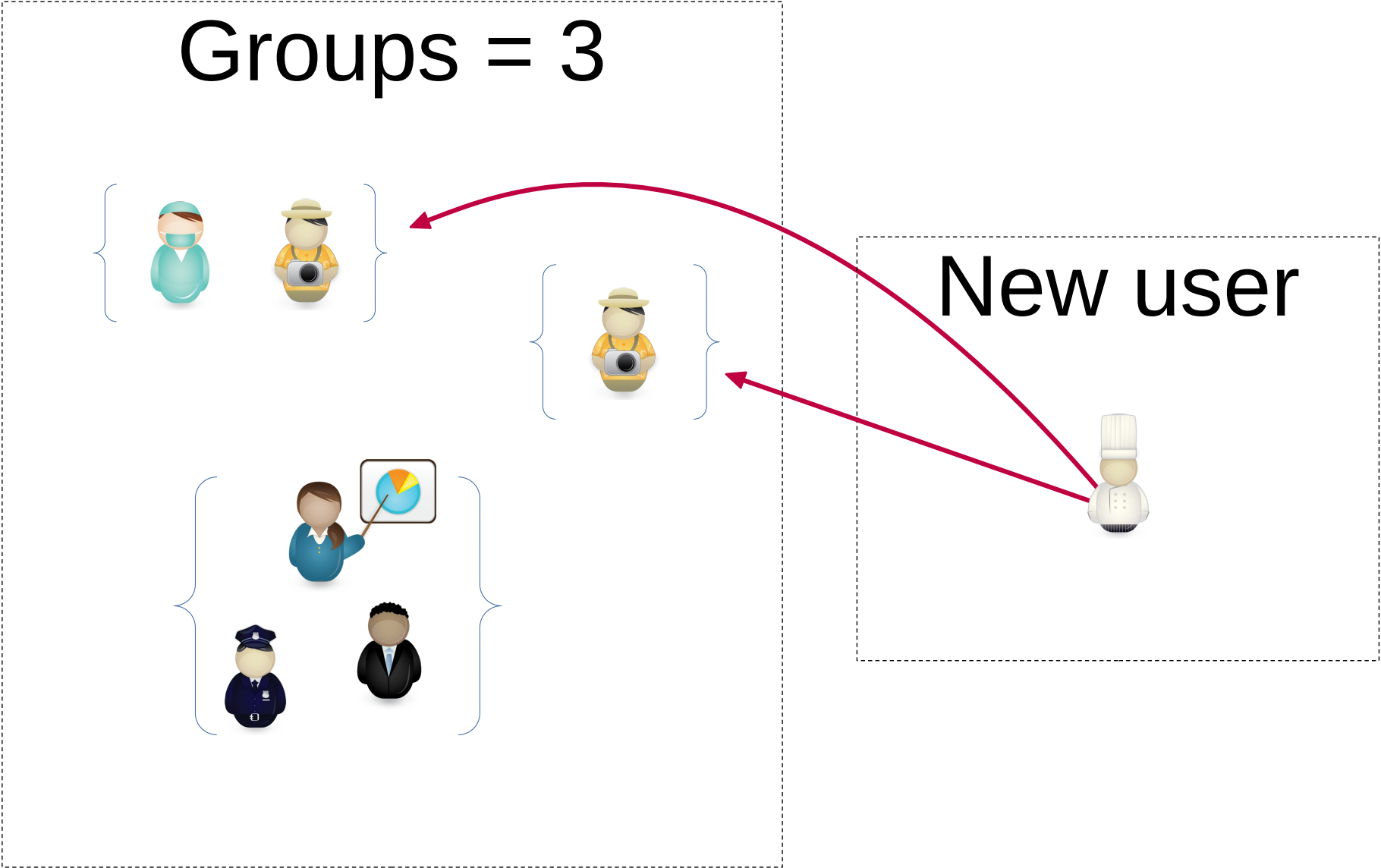
of groups grows super-linearly
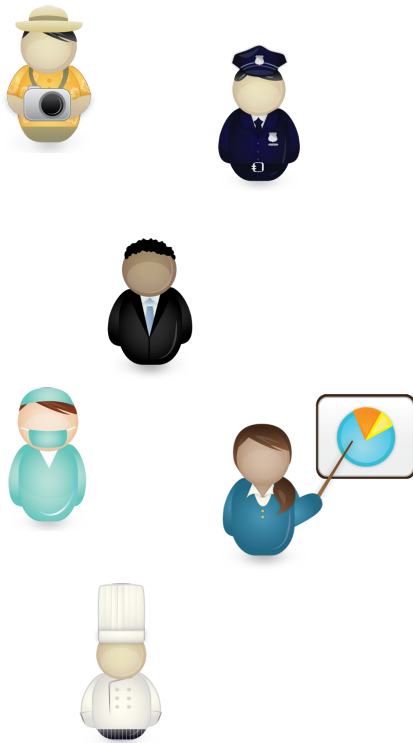
Simplified model

ω_s^n = number of groups with s members

$p(s,n)$ = probability that a user forms a new group by joining a group of size s

$$\omega_{s+1}^{n+1} = \omega_{s+1}^n + p(s,n)\,\omega_s^n$$

$v(s)$ = value of a group with s members

$$V(n) = \sum_s v(s)\,\omega_s^n$$

The explosive value of online platforms

Group-Forming Networks : "small" nodes are clustered, also by means of personalized algorithms, and may be targeted and/or sold
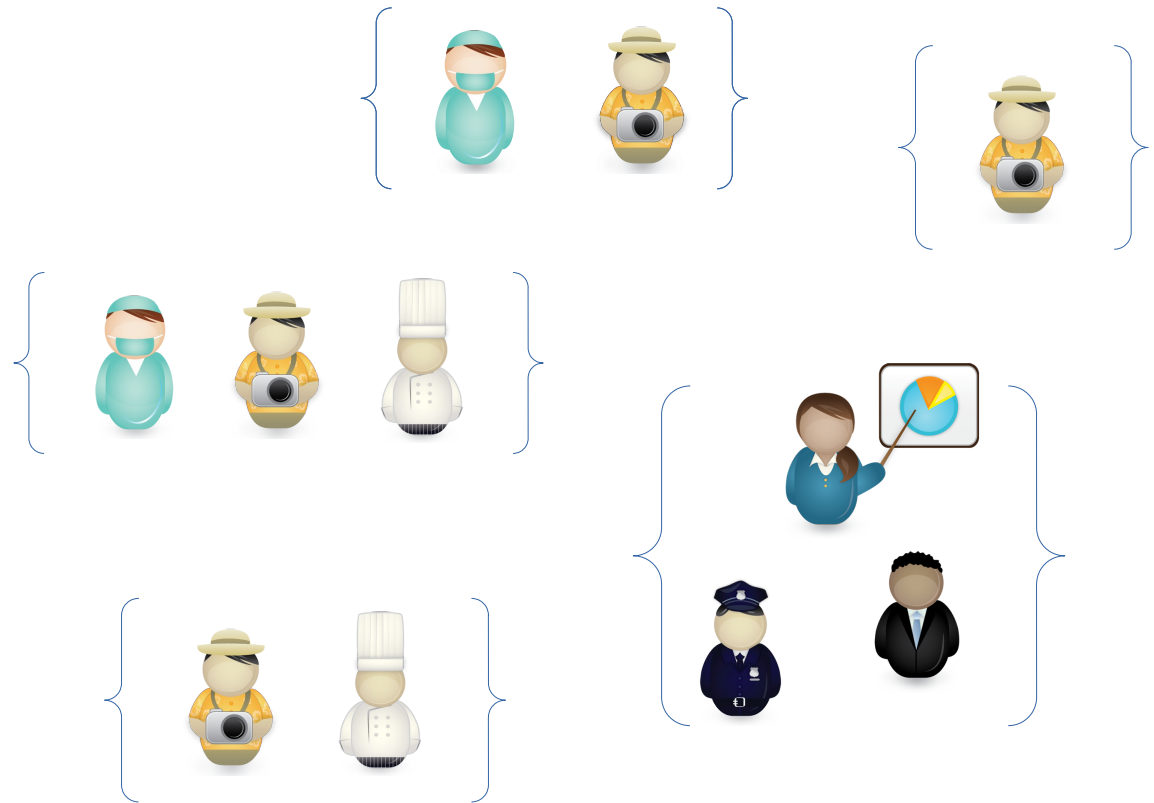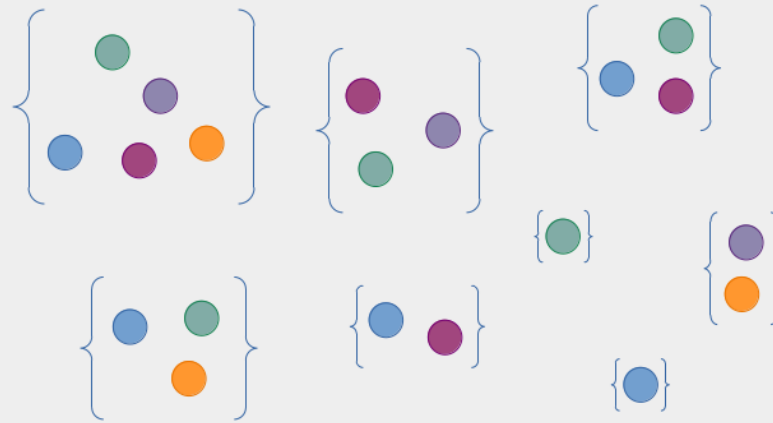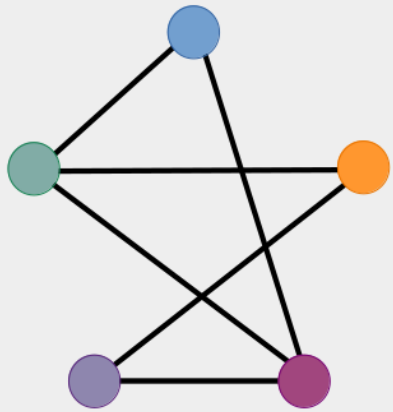
GFNs (e.g., social networks) have multiple connections and often bidirectional relations

Results:

- The *number of groups* Ω_0 grows with the *number of users* **N** in a strong non-linear fashion
- The *network value* **V** is proportional to the *number of groups* Ω_0 times the value of a *representative group of size* **S**
- The *scaling laws* for **S** depend on the details of the group-forming process

Nivi	Zipf	Reed
• $\Omega_0 \sim N^{\gamma}$	• $\Omega_0 \sim e^{\sqrt{N}}$	• $\Omega_0 \sim e^{N}$
• $S \sim \ln(N)$	• $S \sim \sqrt{N}$	• $S \sim N$

A Scala, M Delmastro "Modelling the growth of the Network Value" (November 20, 2023) Available at SSRN

Conclusions

Explosive Growth in Revenues: explosive growth patterns in group advertising revenues deviate from traditional economic growth models

Emergence of Sectorial Monopolies: explosive growth leads to sectorial monopolies impairing market competition and needing new antitrust measures.

Consumer engagement and Advertisers: the strategies employed by network platforms to leverage group advertising thrive on a symbiotic relationship between platforms and advertisers.

Policy Discussion and Regulatory Challenges: we need to rethink existing regulatory frameworks and policy-making strategies to fostering competition and innovation while mitigating potential monopolistic risks

This research has been supported by

THANKS !!!