

# AN OVERVIEW OF DIGITAL ECONOMY

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EE406: Contemporary Economic Issues

Semester 1/ 2021

Faculty of Economics, Thammasat University

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# Main topics

## (1) Technology Disruption and Economic Development

- First Unbundling Revolution
- Second Unbundling Revolution

## (2) Digital Economy

- Structure of Human Society (6 Degrees of Separation)
- Structure of Digital Social Network (3.5 Degrees of Separation)

## (3) Digital Economy and City

- City Agglomeration
- Future Challenge

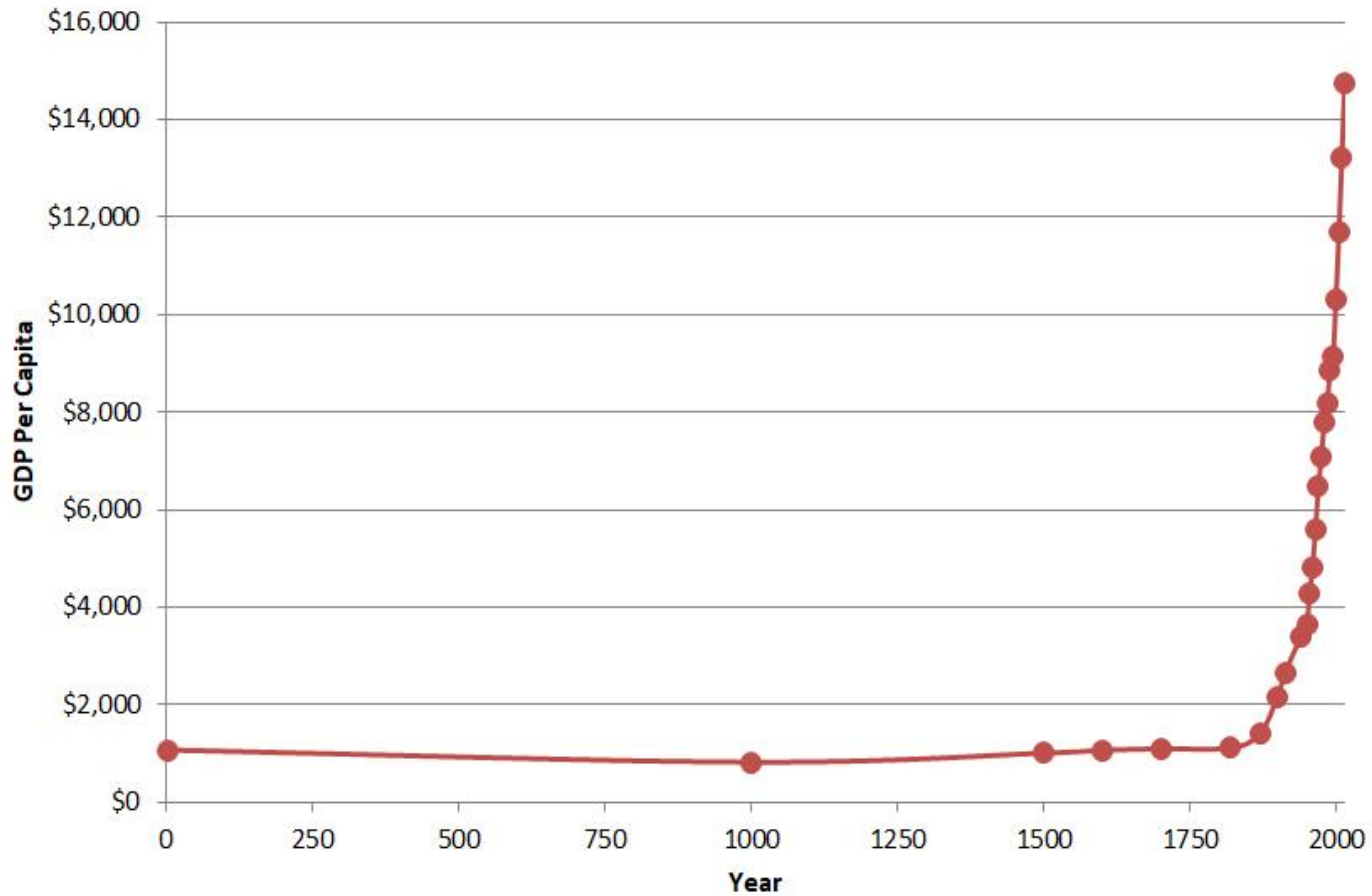
## (4) The New Unbundling Revolution

- The Power of 3.5 Degrees of Separation

# (1) Technology Disruption and Economic Development

- *First Unbundling Revolution*
- *Second Unbundling Revolution*

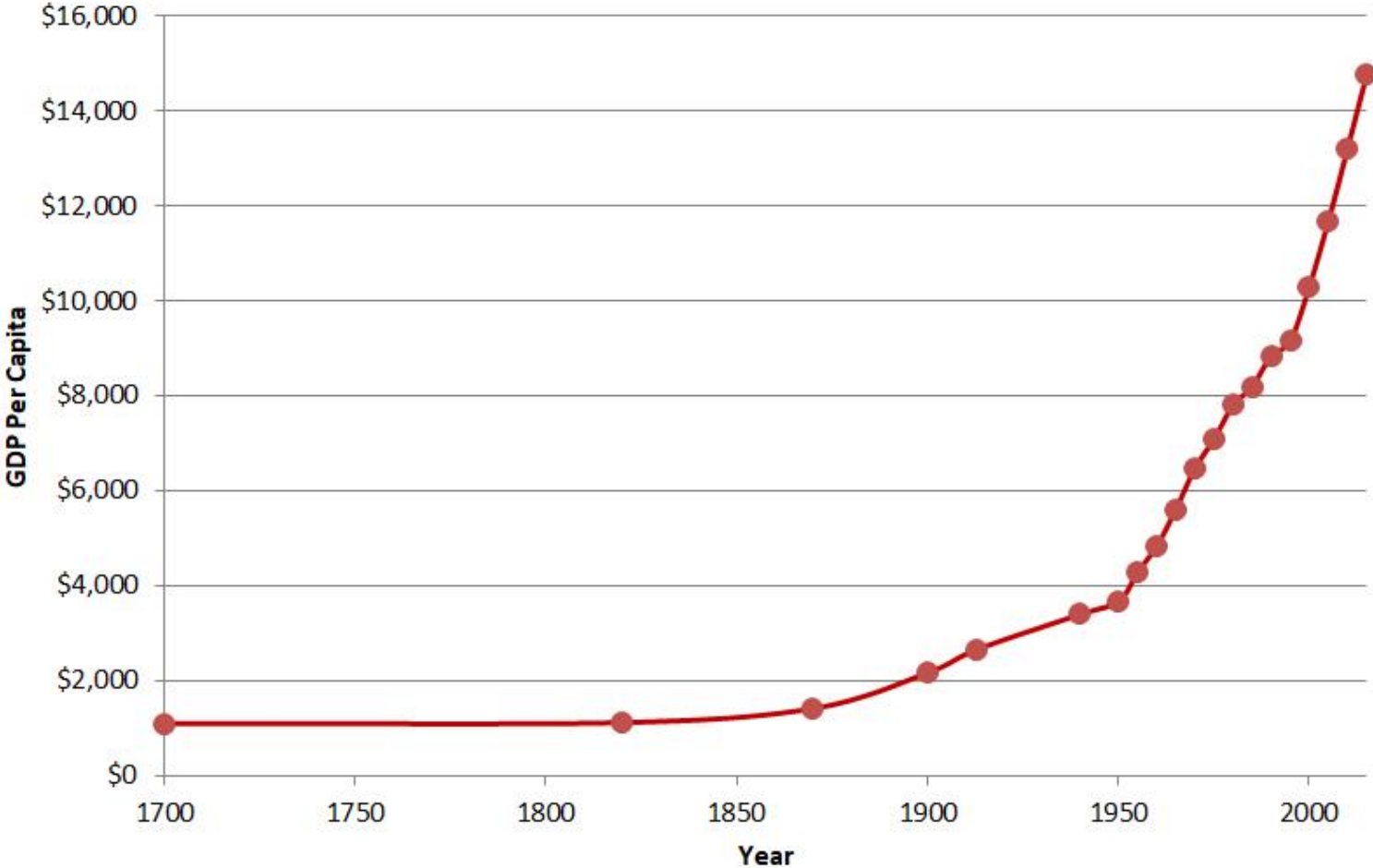
## Global GDP Per Capita, 1-2015 2011 International Dollars



Source: GDP data from [ourworldindata.org](http://ourworldindata.org). Population data from [worldpopulationhistory.org](http://worldpopulationhistory.org)

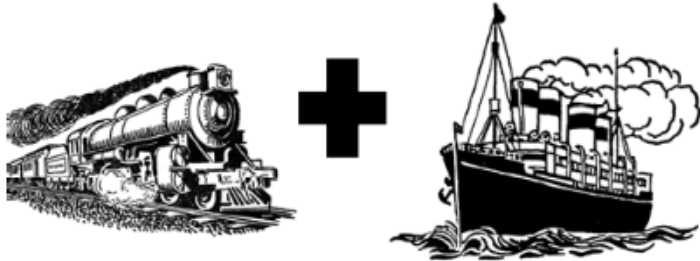
# Global GDP Per Capita, 1700-2015

## 2011 International Dollars

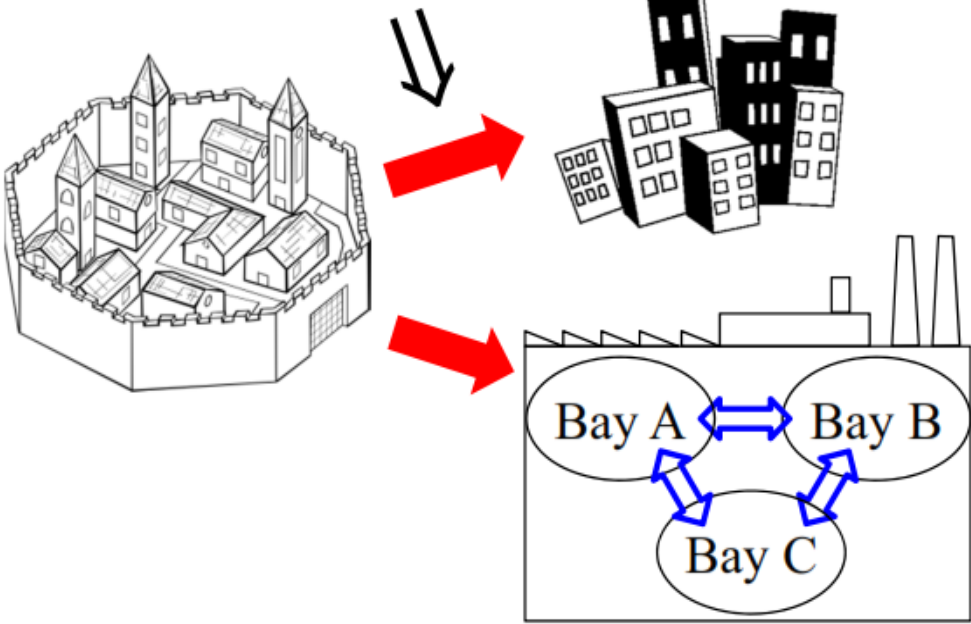


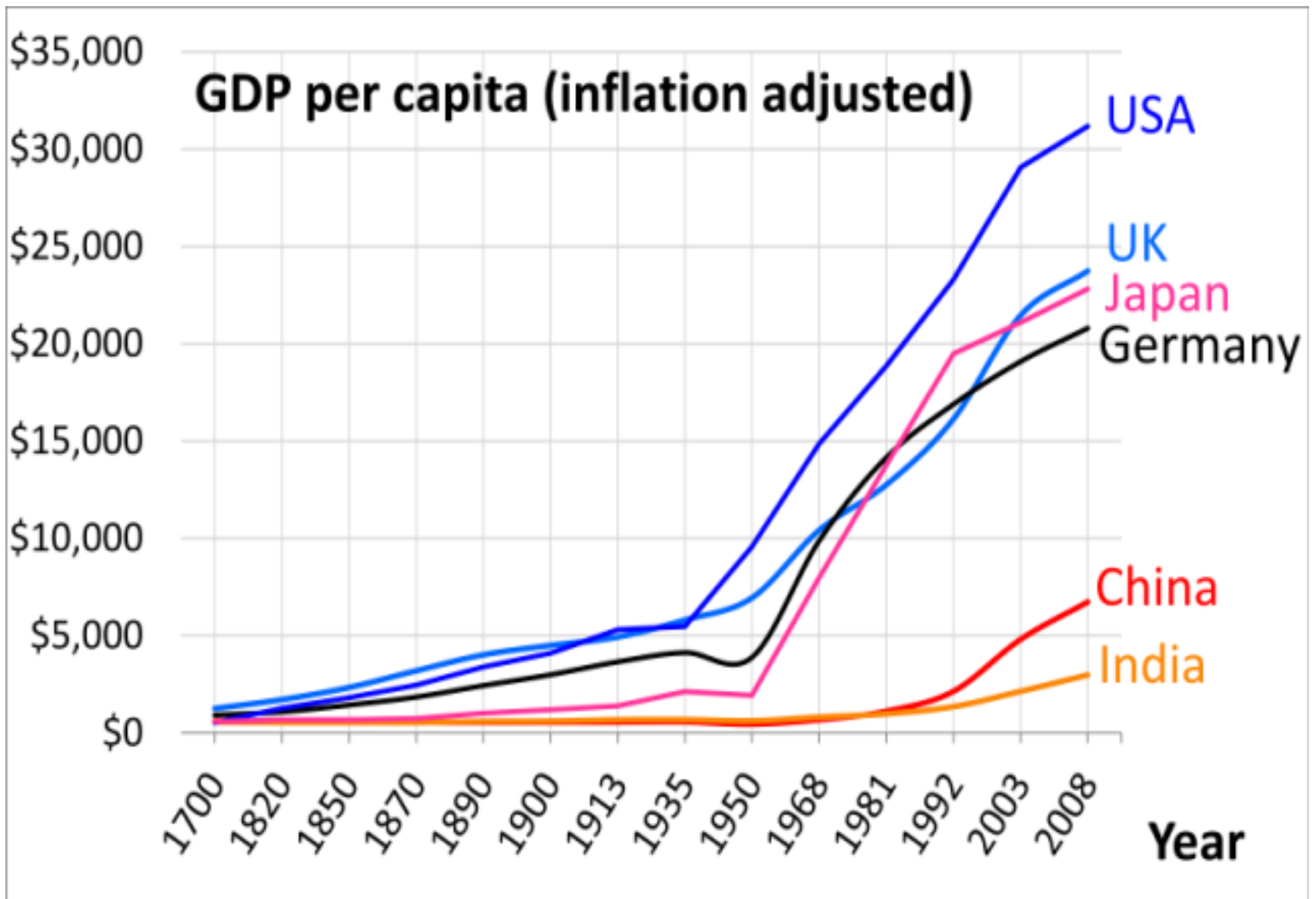
Source: GDP data from [ourworldindata.org](http://ourworldindata.org). Population data from [worldpopulationhistory.org](http://worldpopulationhistory.org)

# 1<sup>st</sup> unbundling

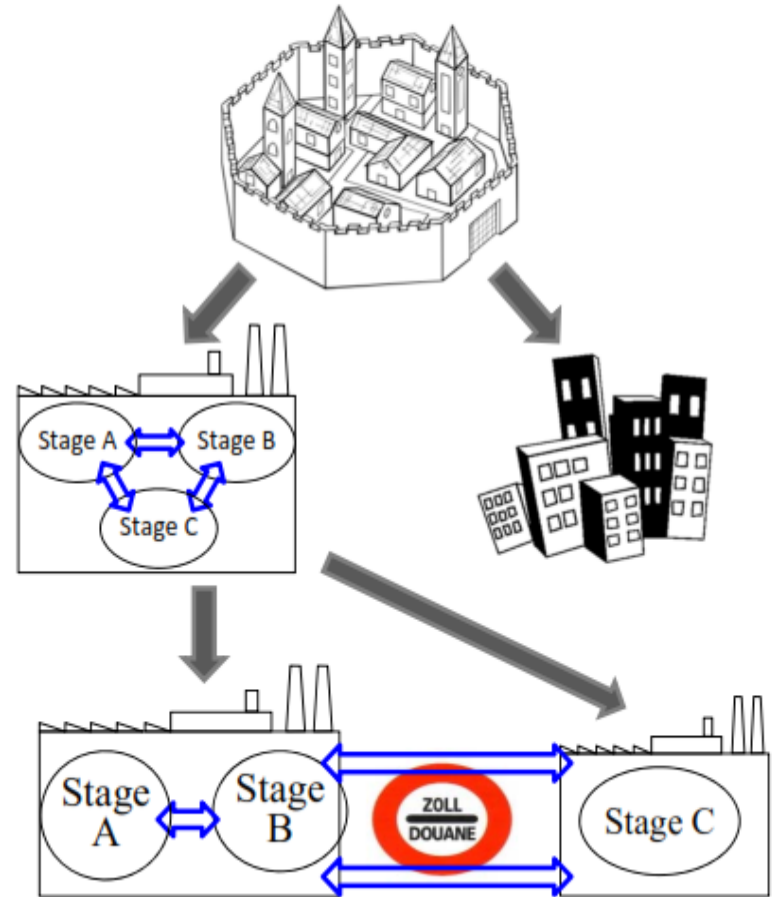
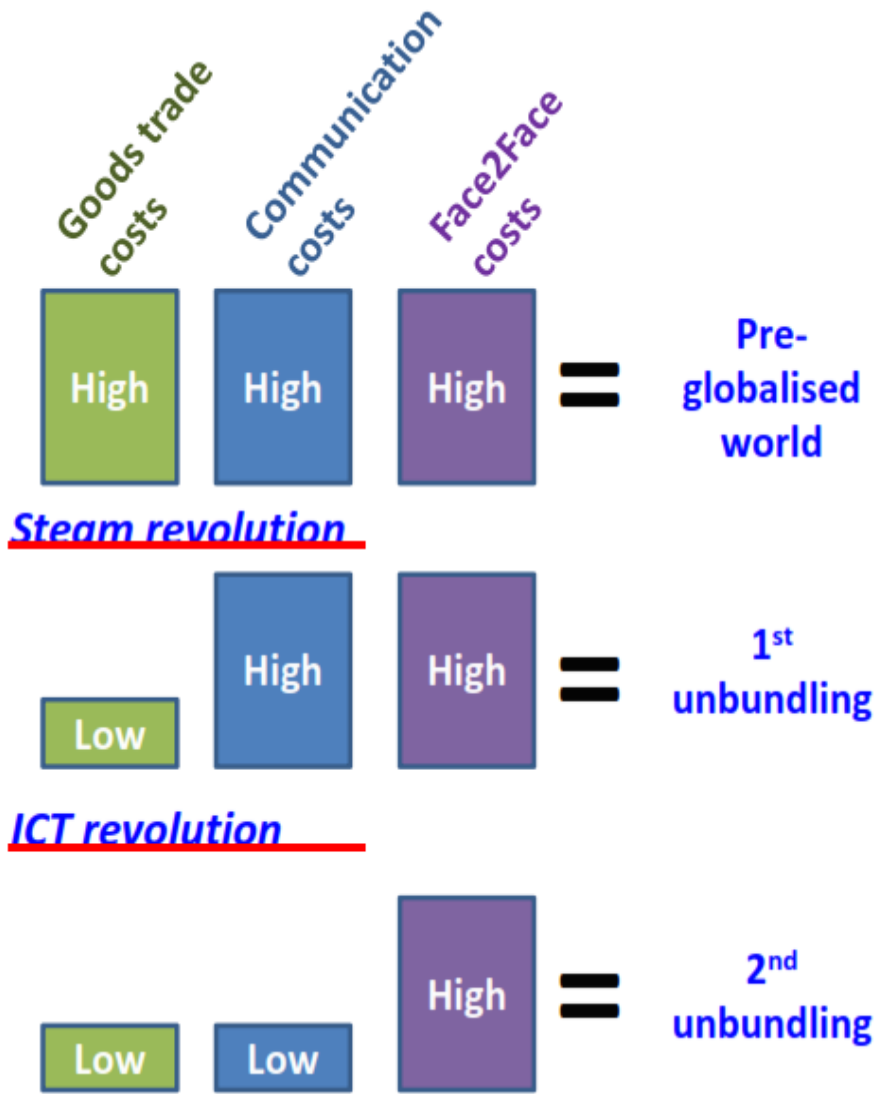


Steam revolution





source: <https://www.forbes.com/sites/goncalodevasconcelos/2015/03/04/the-third-industrial-revolution-internet-energy-and-a-new-financial-system/2/#7ec16dd7167e>



Source: Baldwin (2011)

# Technology and Economic Development

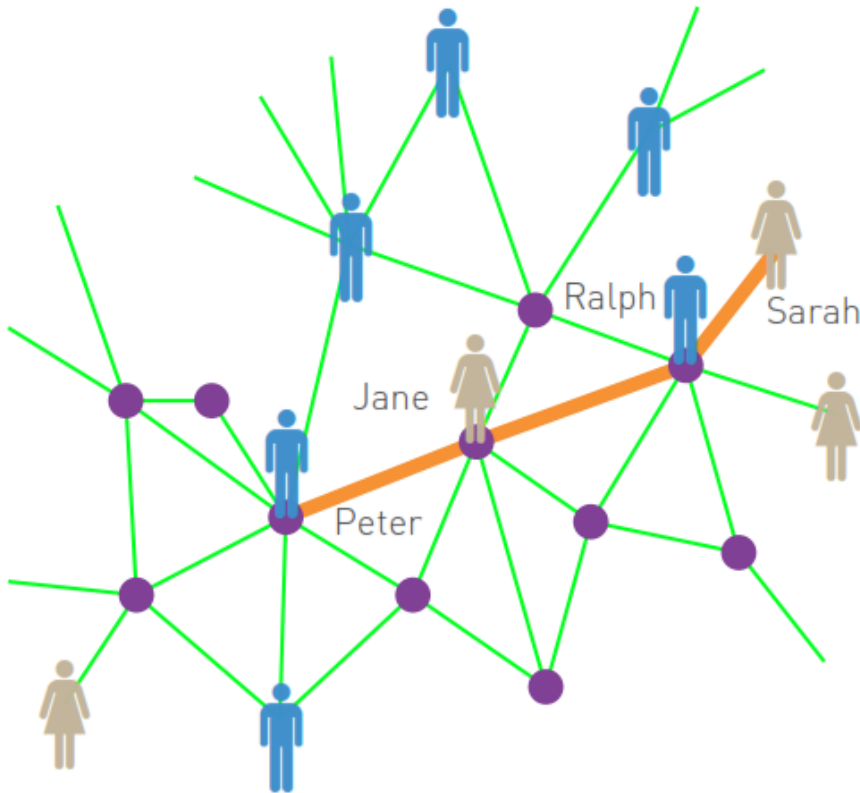
## Main lessons learned

- **Technology disruptions** have enabled the significant **unbundling**.
- This restructuring happened **twice** in the history of economic development.
- Unbundling
  - the **shorter path of connectivity** in the economic structure
  - **new opportunity** for economic growth

## (2) Digital Economy

- *Structure of Human Society*
- *Structure of Digital Social Network*

# Structure of Human Society



Source: Barabási (2016)

- De Sola Pooland and Kochen (1978) explained the **special characteristic of human's society**.
- Their work proposes the idea that there is actually **a short path linking any pair of persons in the world** (i.e. the small world effect).

# Structure of Human Society



Manfred Kochen



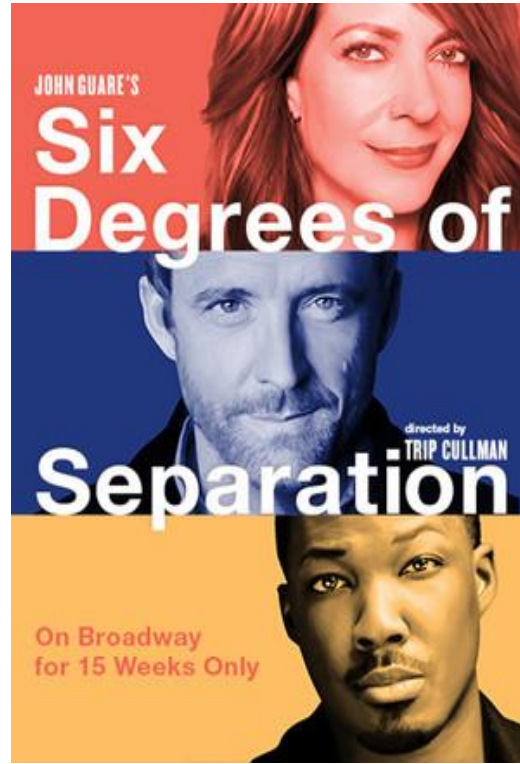
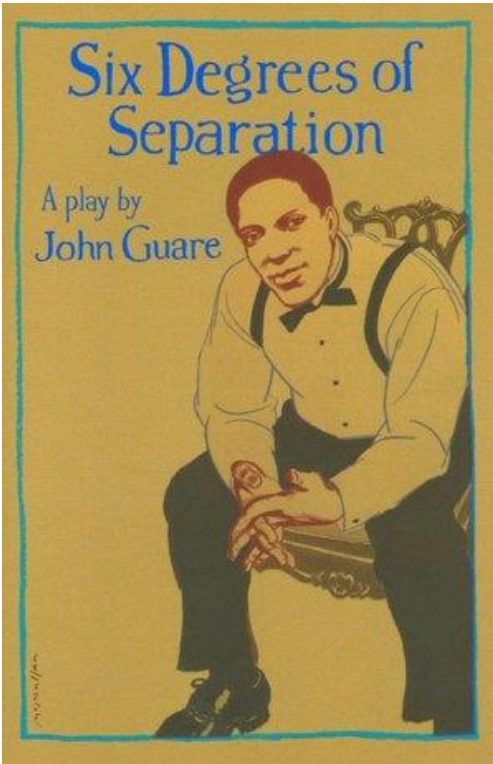
Ithiel de Sola Pool



Stanley Milgram

- Milgram(1967) documented the outcome of his **actual experiment** of small world effect using the **technique of randomly distributed mails**.
- His work, conducted in the US, has indicated that the **median of intermediates is 5.2**, implying that there are approximately the **maximum of 5-6 links connecting any pair of persons in the society**.

# Structure of Human Society



- Guare(1991) applied the finding of Milgram(1967) as the fundamental of his famous Broadway play ‘six degrees of separation’, and this play’s title has become the popular phrase.

*“Everybody on this planet is separated by only six other people. Six degrees of separation. Between us and everybody else on this planet. The president of the United States. A gondolier in Venice. ... I am bound to everyone on this planet by a trail of six people.”*

Guare, 1991

# Structure of Human Society



Duncan J. Watts



Steven Strogatz

“The **average path length or the diameter** depends logarithmically on the system size. Hence, “small” means that the distance is proportional to  **$\ln N$ , rather than  $N$  or some power of  $N$** ”

Source: Barabási (2016)

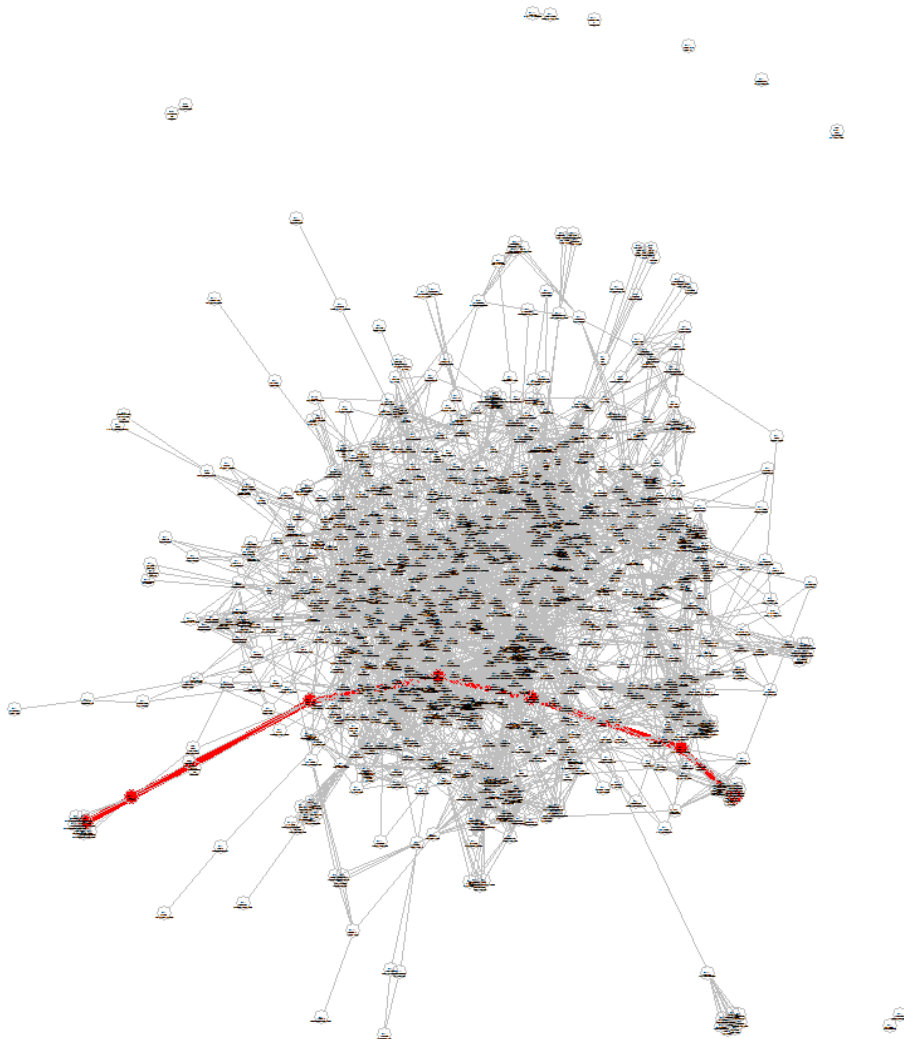
- Scientifically, Watts and Strogatz (1998) solidified the concept of small world effect through their breakthrough work.
- Their model provides the **mathematical framework** representing the **formulation and quantitative characteristics** of the small world phenomena.



# Structure of Human Society

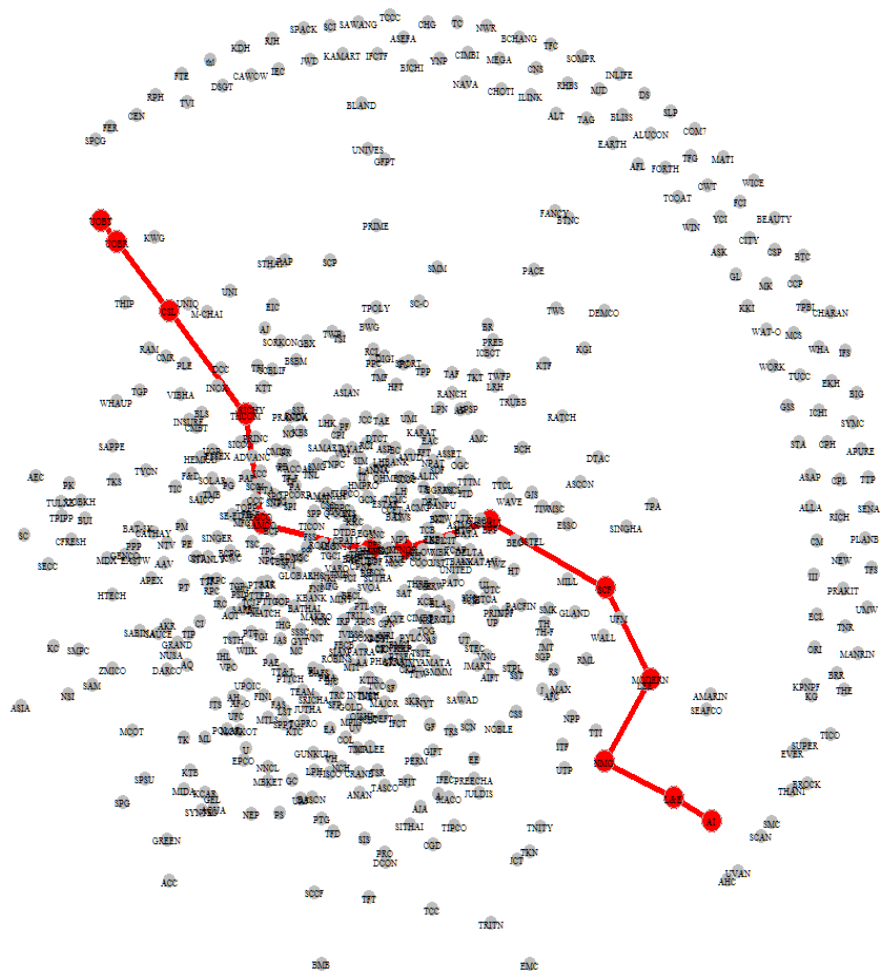
## Diameter of network of directors

(computationally formulated based on *Betweenness index* of directors in 2016)



## Diameter of network of listed companies

(computationally formulated based on *Betweenness index* of boards in 2016)



Source: Puttanapong (2018)

With an internet, the **structure of human's society** has been *changed*.

The definition of **six degrees of separation** has been *altered* too.

# Structure of Digital Social Network

Three and a half  
degrees of separation

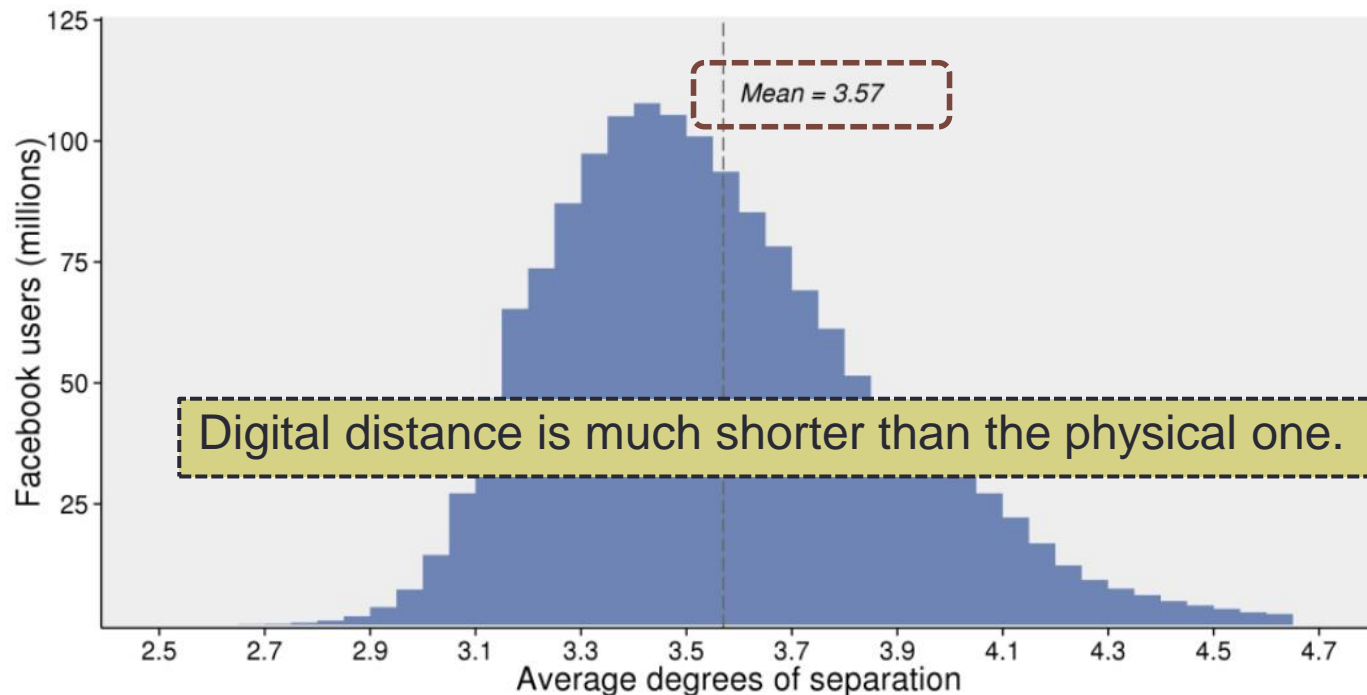


Source: <https://www.it.lut.fi/wiki/lib/exe/fetch.php/courses/ct60a7000/spring2016/critical/degrees.pdf>

# Structure of Digital Social Network

## RESULTS

- They found that the world is more closely connected than one might think.
- **Each person in the world (at least among the 1.59 billion people active on Facebook) is connected to every other person by an average of three and a half other people.**



Source: <https://www.it.lut.fi/wiki/lib/exe/fetch.php/courses/ct60a7000/spring2016/critical/degrees.pdf>

# The network of my Facebook friends

Friends: 893

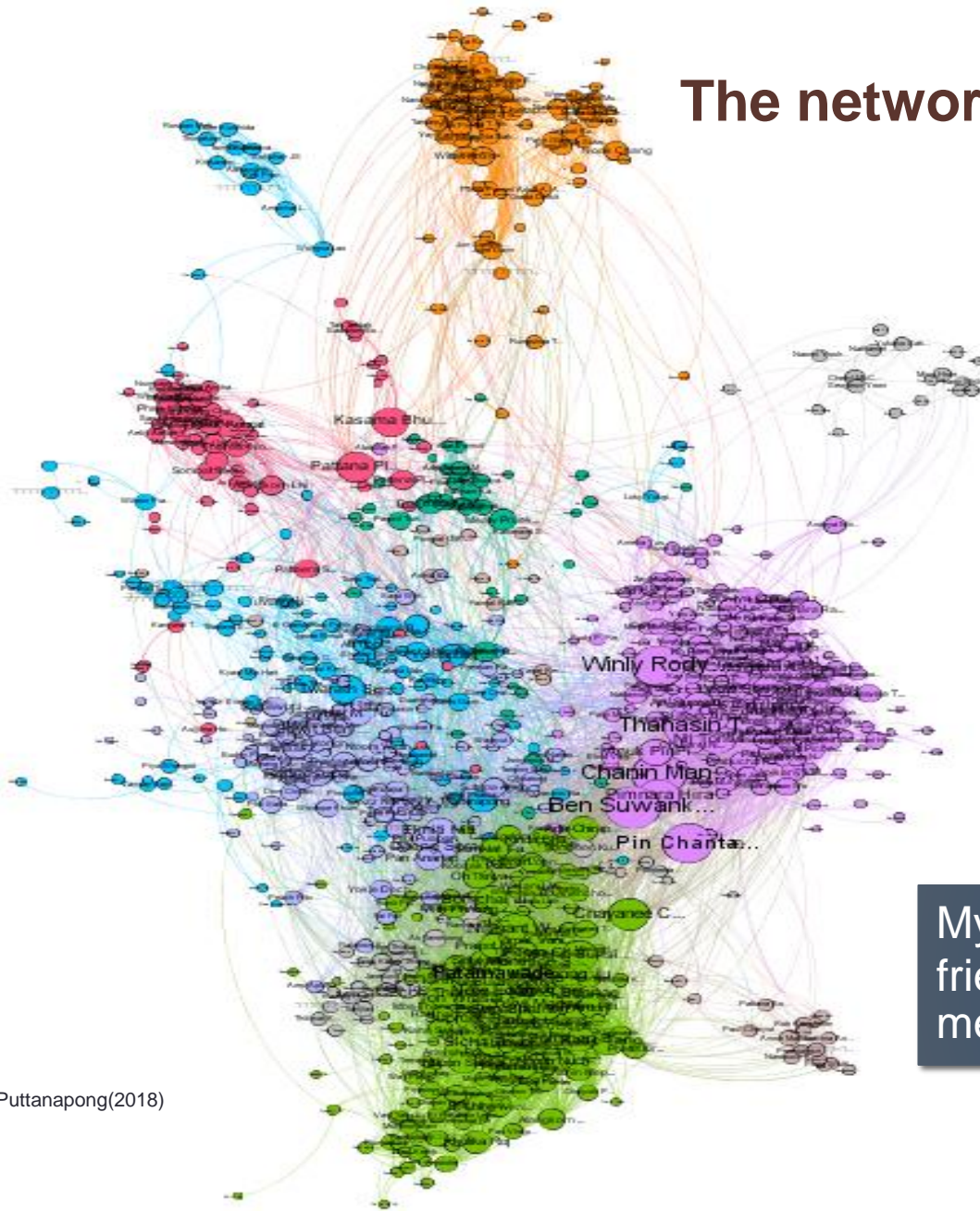
Links: 9,577

Max Path Length: 9

Average Path Length: 3.23

Clustering Coefficient: 0.47

My average digital distance to friends is very close to Facebook's mean.



# The Dynamics of Viral Marketing

JURE LESKOVEC

Carnegie Mellon University

LADA A. ADAMIC

University of Michigan

and

BERNARDO A. HUBERMAN

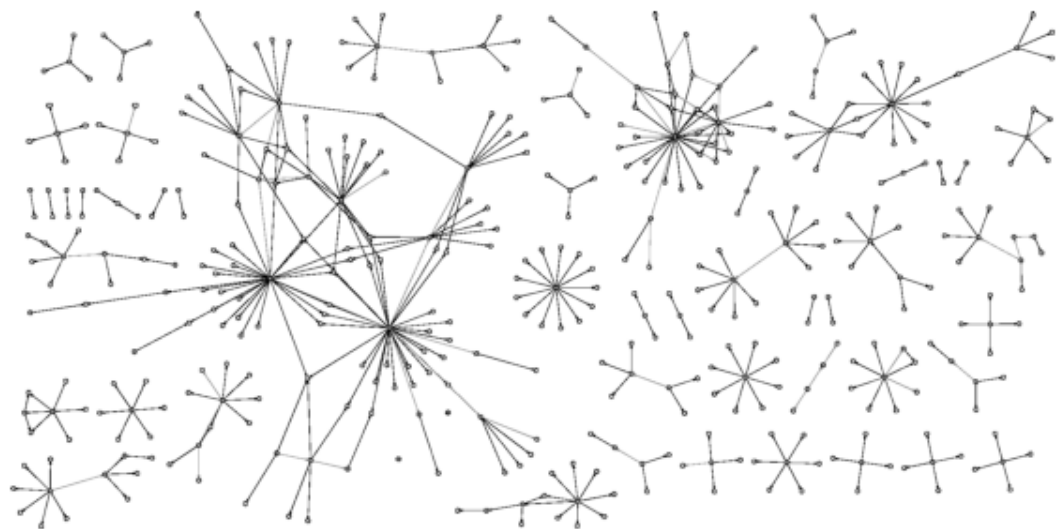
HP Labs

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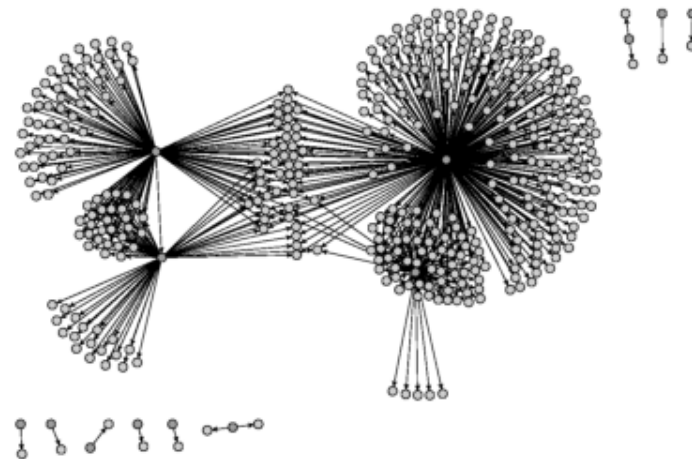
We present an analysis of a person-to-person recommendation network, consisting of 4 million people who made 16 million recommendations on half a million products. We observe the propagation of recommendations and the cascade sizes, which we explain by a simple stochastic model. We analyze how user behavior varies within user communities defined by a recommendation network. Product purchases follow a 'long tail' where a significant share of purchases belongs to rarely sold items. We establish how the recommendation network grows over time and how effective it is from the viewpoint of the sender and receiver of the recommendations. While on average recommendations are not very effective at inducing purchases and do not spread very far, we present a model that successfully identifies communities, product, and pricing categories for which viral marketing seems to be very effective.

Categories and Subject Descriptors: J.4 [**Social and Behavioral Sciences**]: *Economics*

General Terms: Economics



(a) Medical book



(b) Japanese graphic novel

**Fig. 3.** Examples of two product recommendation networks: (a) First-aid study guide *First Aid for the USMLE Step*, (b) Japanese graphic novel (manga) *Oh My Goddess!: Mara Strikes Back*.

Leskovec, J., Adamic, L. A., and Huberman, B. A. 2007. The dynamics of viral marketing. *ACM Trans. Web*, 1, 1, Article 5 (May 2007), 39 pages. <http://doi.acm.org/10.1145/1232722.1232727>

# (3) Digital Economy and City

- *City Agglomeration*
- *Future Challenge*

# Future Challenge

**Will the digital economy redefine  
the definition of these elements?**

**Space**

**Distance**

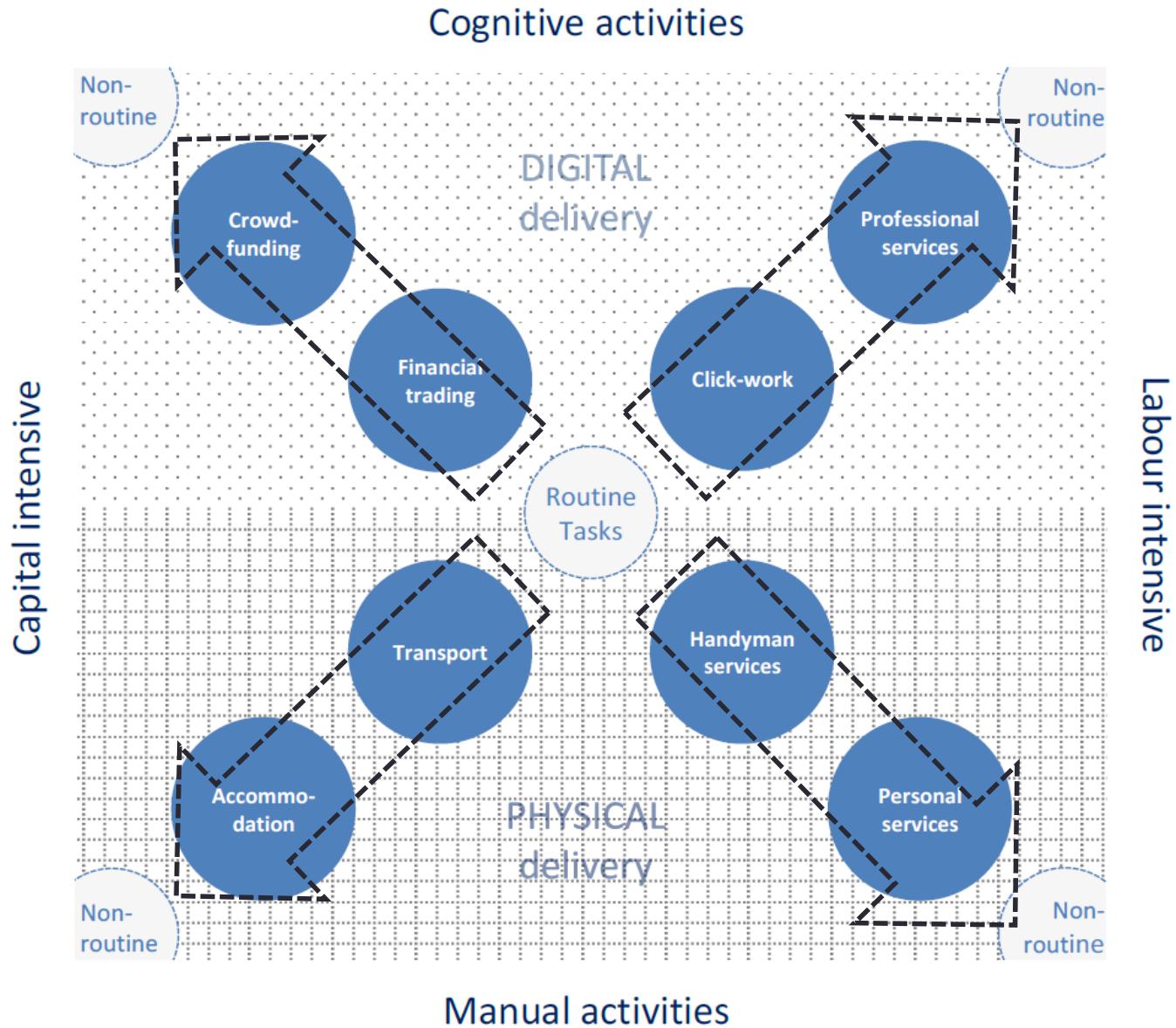
**Location**

**How the digital economy  
transforms the physical space?**

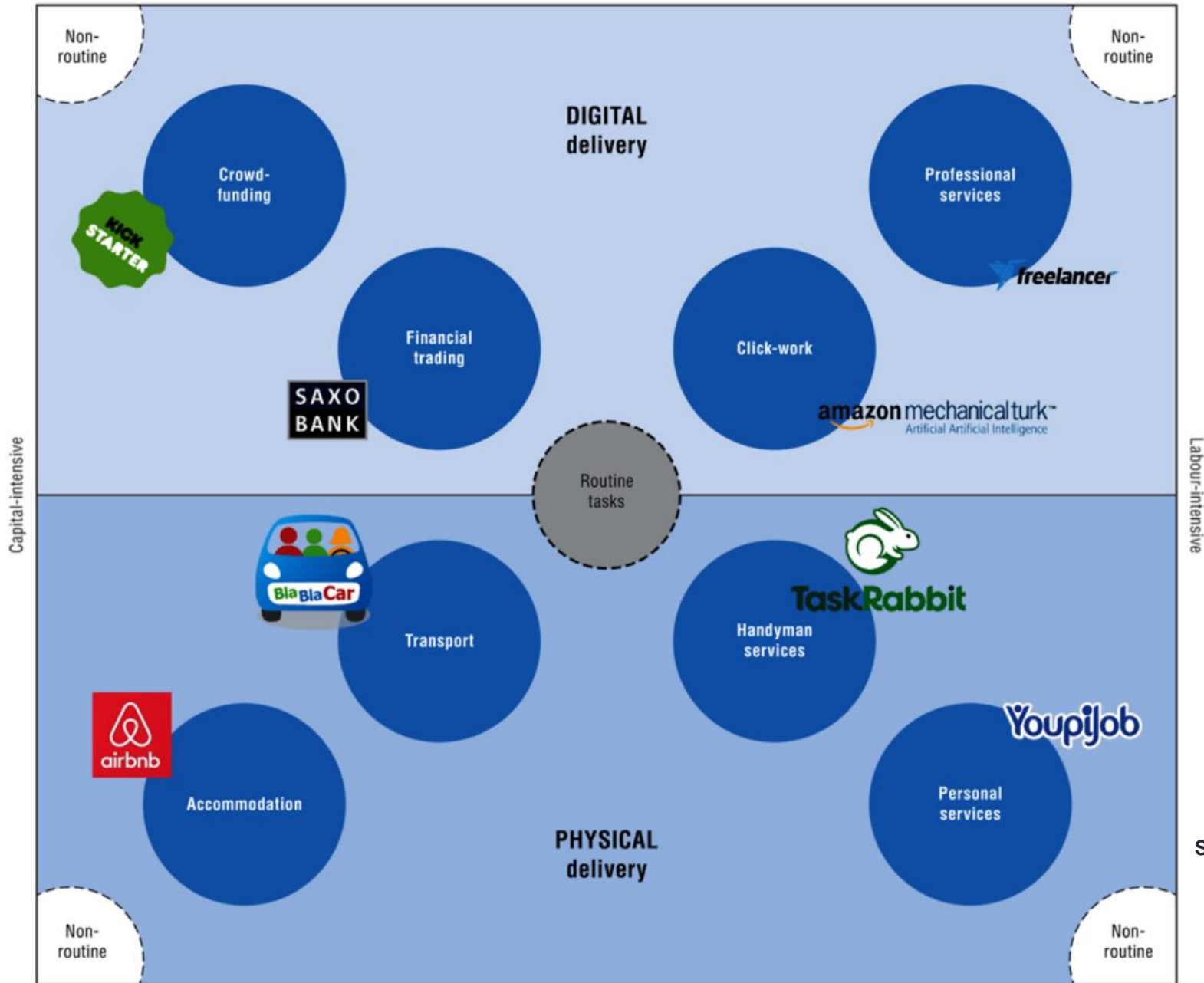
**The economy without city**

**versus**

**The higher dense city**



Cognitive activities



Source: OECD(2020)

# (4) The New Unbundling Revolution

- *The Power of 3.5 Degrees of Separation*

Average Number of Hours Spent on the Internet

45.0  
hours/week

6.4  
hours/day



45.3  
hours/week



44.7  
hours/week



48.9  
hours/week



Gen Z  
40.2  
hours/week



Gen Y  
53.2  
hours/week



Gen X  
44.3  
hours/week



Baby Boomer  
31.8  
hours/week



Bangkok Residents

48.1  
hours/week

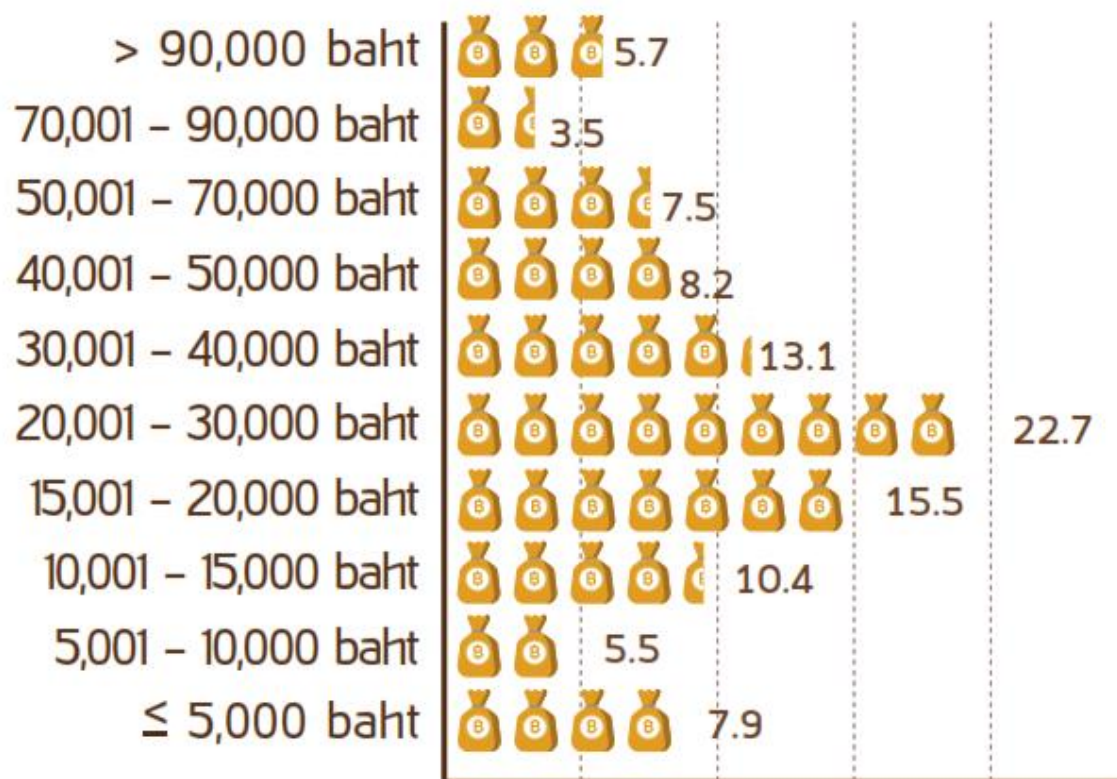


Provincial Residents

44.6  
hours/week

## Average Monthly Personal Income

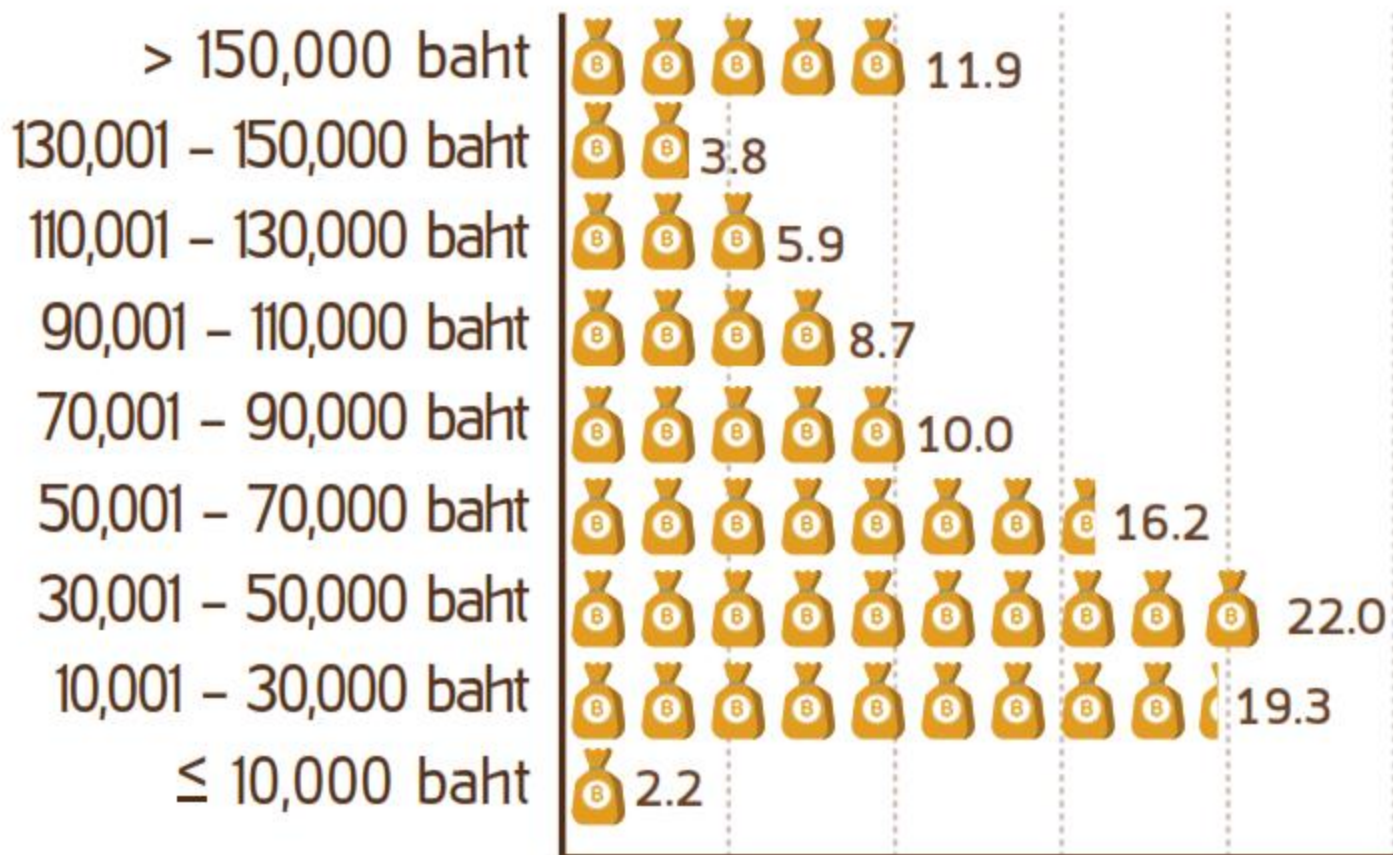
Chart 31 Survey respondents classified by average monthly personal income



As shown in Chart 31, most of the respondents (22.7 percent) earned 20,001-30,000 baht a month. Those whose incomes per month range between 15,001 - 20,000 baht, 30,001 - 40,000 baht and 10,001 - 15,000 baht constitute 15.5, 13.1 and 10.4 percent respectively.

# Average Monthly Household Income

Chart 32 Survey respondents classified by average monthly household income





Smartphone  
**85.5%** of users  
6.2 hours/day on average



Desktop Computer  
**62.0%** of users  
5.4 hours/day on average


















Laptop Computer  
**48.7%** of users  
4.7 hours/day on average



Tablet Computer  
**30.0%** of users  
3.5 hours/day on average



Smart TV  
**19.8%** of users  
2.7 hours/day on average

	 Most popular	 Second Most Popular	 Third Most Popular
Gen Z	 98.6%	 93.8%	 91.4%
Gen Y	 98.8%	 97.9%	 97.2%
Gen X	 96.2%	 95.3%	 93.9%
Baby Boomer	 91.5%	 89.3%	 86.5%

# Gen X

Time spent on the Internet:  
6.3 hrs/day

Devices of choice to access the Internet:



Smartphones  
86.4%



Desktop Computers  
72.9%



Laptop Computers  
43.6%

## Places

where they use the Internet:



Home/  
Accommodation  
82.2%



Workplace  
81.8%



Traveling  
15.2%



Part of the day during which they most use the Internet:



84.8%  
08.01-12.00 Hrs

## Top 5

activities they do on the Internet:



Social Network  
95.5%



YouTube  
81.9%



e-Mail  
Correspondence  
80.4%



Searching for  
Information  
79.3%



Reading  
e-Books  
75.2%

# Gen Y

Time spent on the Internet:  
7.6 hrs/day

Devices of choice to access the Internet:



Smartphones  
90.5%



Desktop Computers  
63.7%



Laptop Computers  
52.1%

## Places

where they use the Internet:



Home/  
Accommodation  
87.2%



Workplace  
67.9%



Traveling  
18.4%



Part of the day during which they most use the Internet:



83.3%  
12.01-16.00 Hrs

## Top 5

activities they do on the Internet:



Social Network  
98.0%



YouTube  
93.9%



e-Mail  
Correspondence  
85.1%



Searching for  
Information  
84.5%



Reading  
e-Books  
82.0%

# Gen Z

Time spent on the Internet:  
5.7 hrs/day

Devices of choice to access the Internet:



Smartphones  
81.4%



Desktop Computers  
51.7%



Laptop Computers  
50.1%

## Places

where they use the Internet:



Home/Accommodation  
92.6%



Educational Institutions  
40.4%



Public Places  
17.0%



Part of the day during which they most use the Internet:



76.1%  
16.01-20.00 hrs

## Top 5

activities they do on the Internet:



Social Network  
95.8%



YouTube  
90.6%



Online TV/  
Movie/Radio  
79.2%



Downloading  
Programs/Music/  
Series/Games  
79.1%



Searching for  
Information  
77.0%



Source: Thailand Internet User Profile 2016

# ASIAN DEVELOPMENT OUTLOOK 2018

HOW TECHNOLOGY AFFECTS JOBS

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APRIL 2018

# Informal retail transforming into social commerce

- Despite rapid growth in internet use, **e-commerce in Southeast Asia remains in its infancy** for **lack of well-developed digital finance or logistics** (Chadha 2016).
- In Southeast and South Asia, **less than a third of companies have their own websites**, and only **about half use e-mail to communicate** with clients and suppliers (ADB 2017b).
- However, despite small e-commerce markets, developing economies lead the world in **social commerce**, or **unofficial e-commerce using social media**.

# Informal retail transforming into social commerce

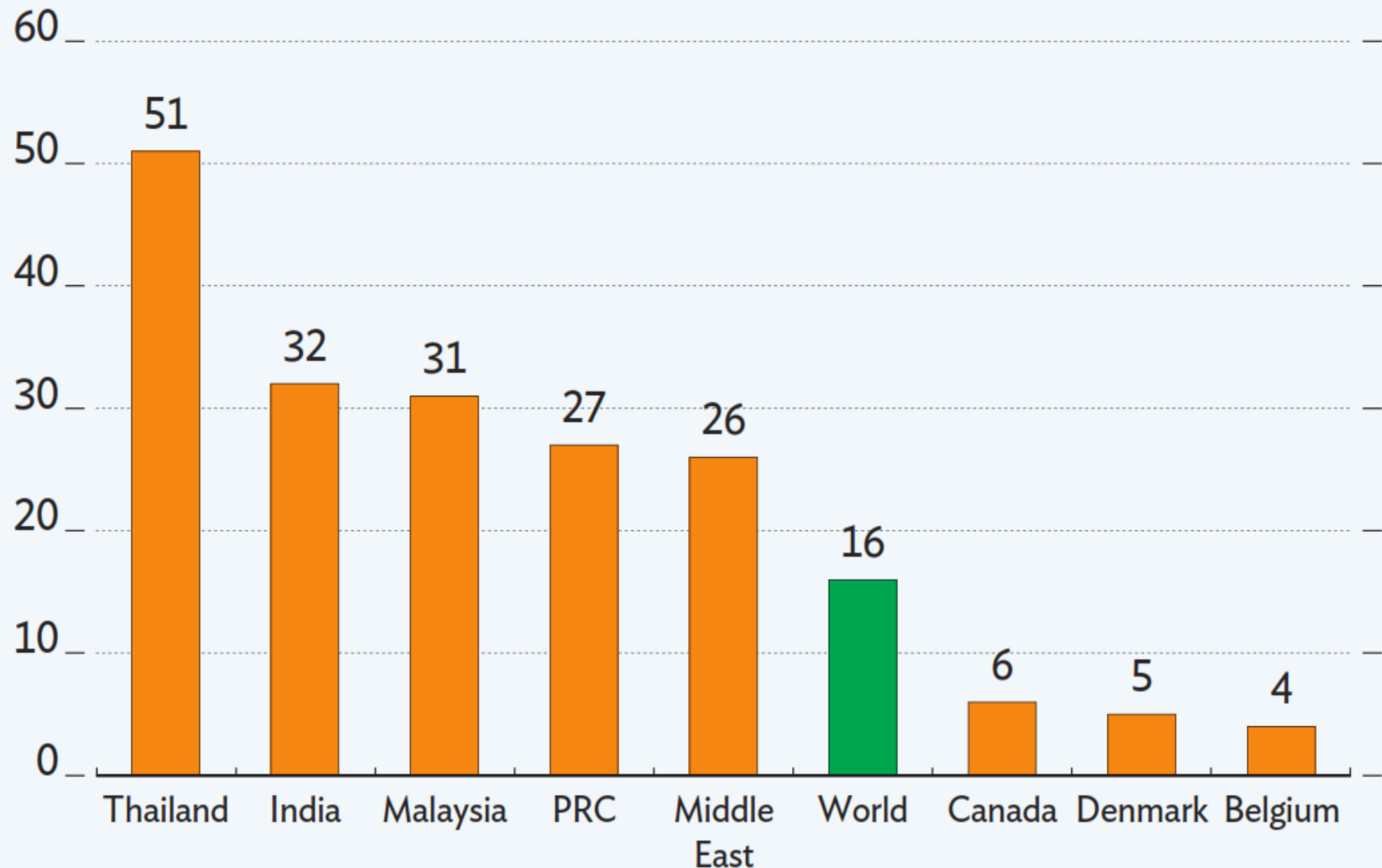
- Social commerce is characterized by **online sales and offline payments**. It **begins on a social media platform**, followed by **direct communication between buyer and seller**, usually using **instant messaging apps**, and closes using **offline payment** (Malabuppha 2017).
- Cash on delivery is widely used (International Trade Center 2017). The popularity of social media turns these venues into **cheaper e-commerce platforms than traditional e-commerce**. Whereas **websites charge commissions, selling on social media is free**.
- **The world's most avid social media shoppers are in Thailand**, where **51%** of online shoppers report **buying on social media**, and India at 32% (box figure).
- **Facebook** is the **preferred platform** for selling online in Viet Nam (Asia Pacific Foundation of Canada 2017) and Indonesia (JakPat 2015), and it is widely used in the Philippines (Llamas 2017).
- Social media sales account for 30% of e-commerce transactions in Southeast Asia (Chadha 2016).
- **India and Southeast Asia** are the **largest Facebook** and **Instagram** users globally.

# Informal retail transforming into social commerce (cont'd)

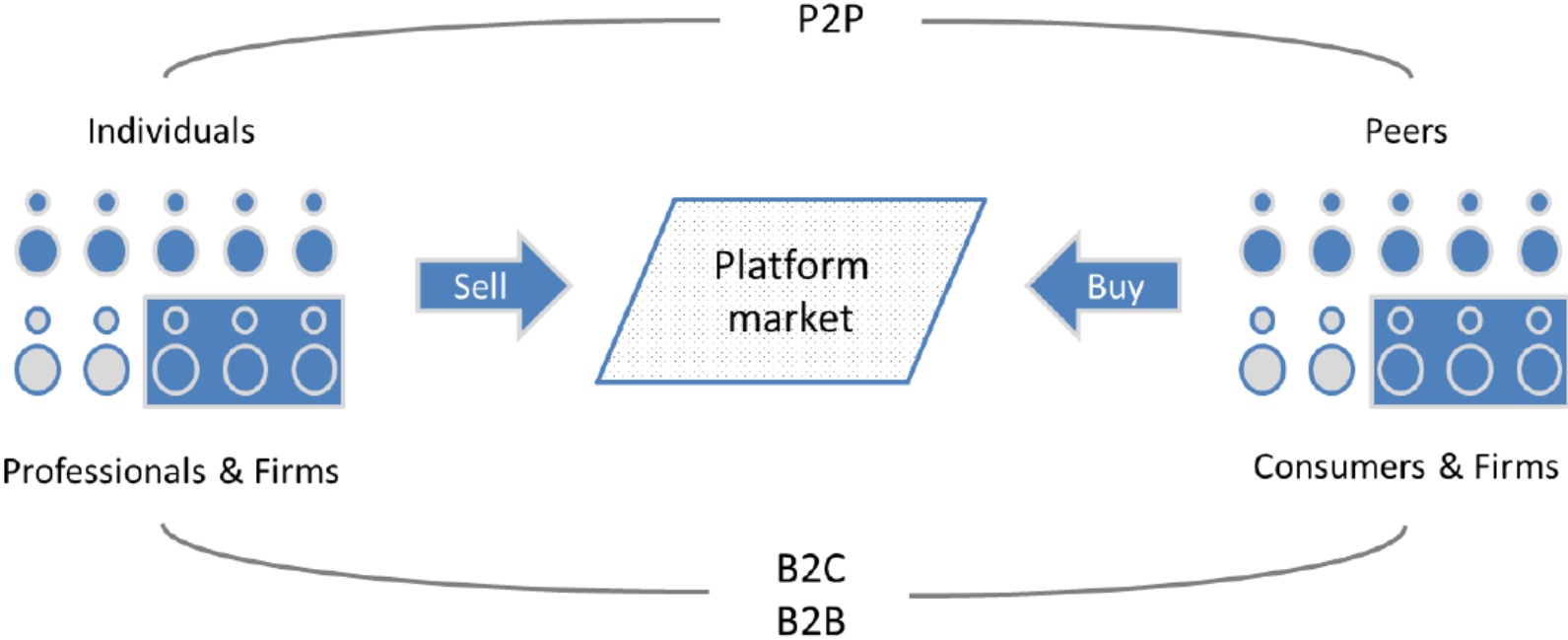
- Social mobile use is also large and growing. In **Southeast Asia**, **47%** of people are **active on social media**, with **42%** accessing platforms from **mobile devices** (Klemp 2017).
- Social commerce in the region is largely domestic. However, small businesses worldwide are becoming “**micro-multinationals**” by using **digital platforms**— including social media—to connect with **international customers and suppliers** (McKinsey Global Institute 2016).
- This has created **new opportunities for informal retailers**. Studies find that **small and medium-sized enterprises** using e-commerce increase **revenues, lower costs, boost profits, add jobs**, and are more likely to export and innovate. As **digital payment infrastructure** and **logistics improve**, the informal sector will be better able to **tap global markets**.
- In an age of digital expansion, the **rise of social commerce** is making e-commerce a **reality for many sellers** with few resources or formal skills.

## Where online shoppers said they purchased directly through a social media channel

% of online shoppers via social media

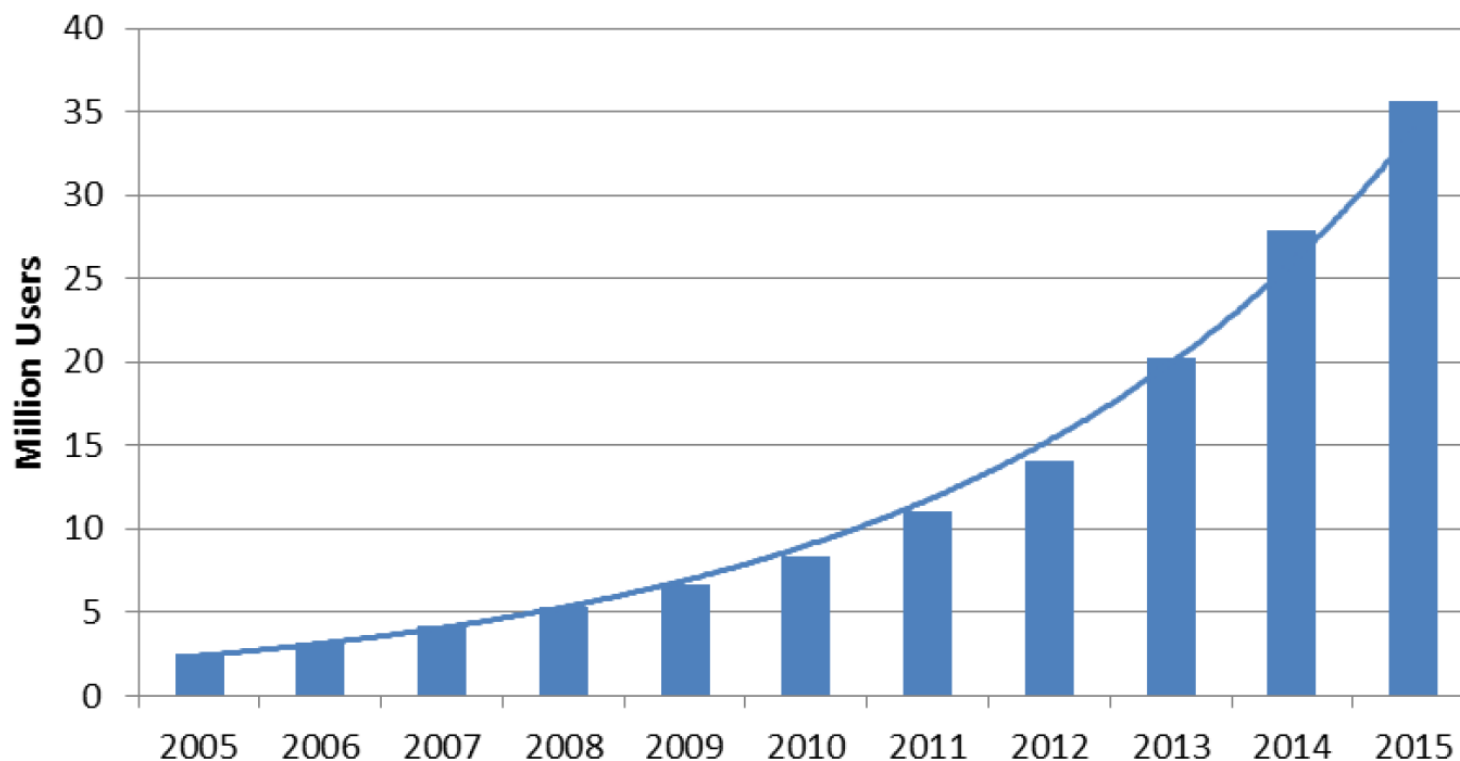


# Possible transactions over online platforms



Source: OECD(2016)

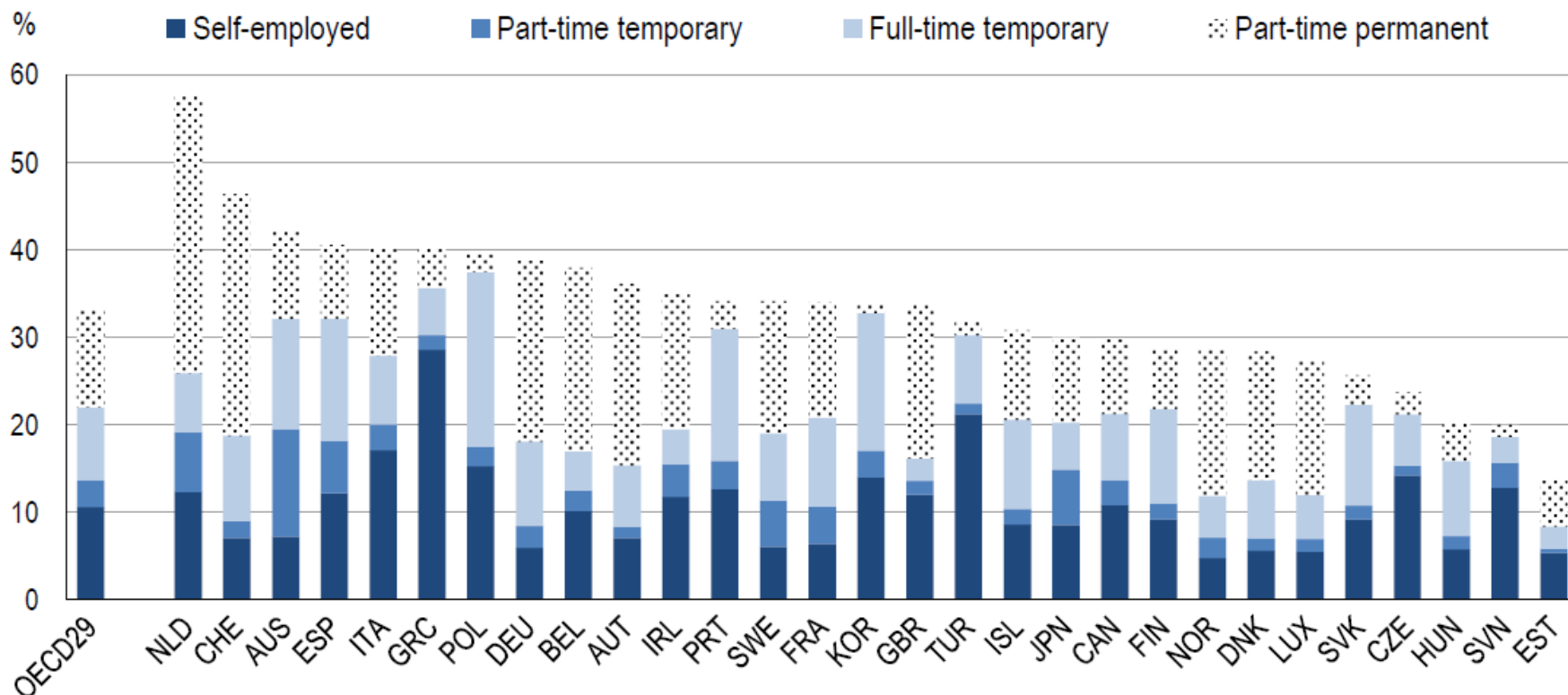
## Combined Registered Users of Upwork and Freelancer



Freelancer top job categories	Jobs posted	Share *	Growth 2014
Websites, IT, Software	62 243	40%	178%
Design, Media, Architecture	31 435	20%	136%
Writing, Content	24 564	16%	155%
Data Entry, Admin	12 446	8%	201%
Sales, Marketing	11 960	8%	219%
Translation, languages	5 977	4%	183%
Accounting, HR, legal, other	5 122	3%	151%

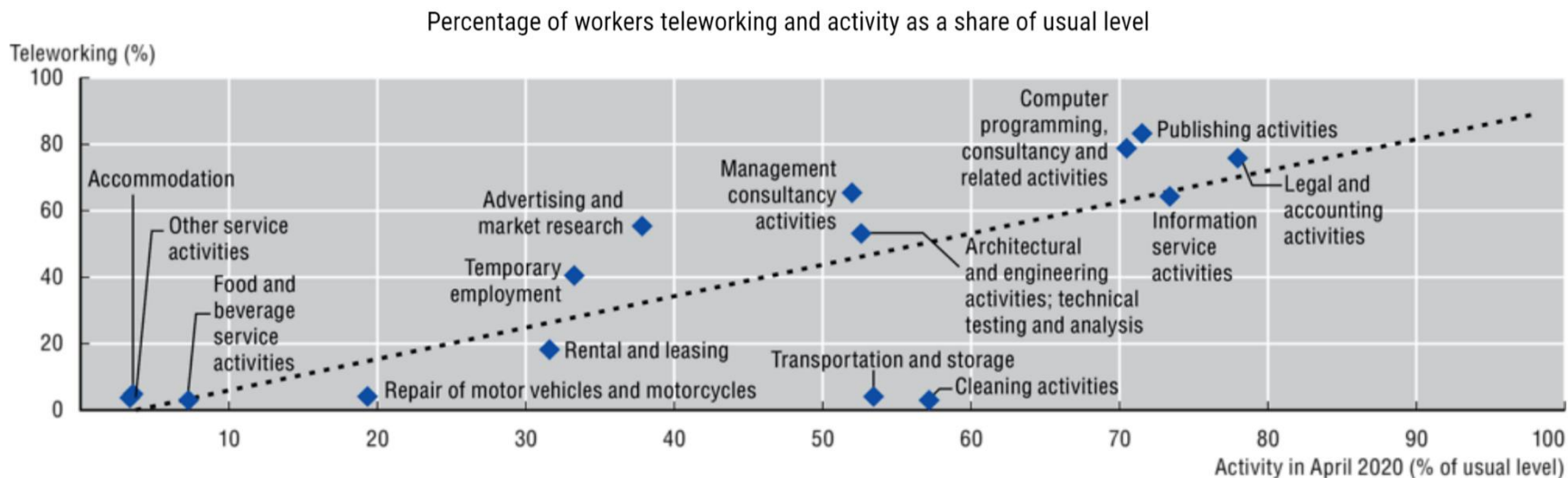
Upwork top job categories	Value in USD mio	Share	Growth 2014
Technology	486	52%	22%
Admin support	110	12%	37%
Writing, translation	109	12%	31%
Design, multimedia	83	9%	27%
Mobile	71	8%	43%
Sales, Marketing	49	5%	38%
Finance, Legal	33	4%	30%

# Non-standard work as a share of total employment (2013)



Source: OECD(2016)

# Business activity and teleworking, service industries in France, April 2020



Data are from a survey of business managers' perceptions (e.g. of how the level of activity of their business in April 2020 compares to a typical recent period before the COVID-19 crisis).

Source: OECD(2020)

# From Bitcoin to Bitcoin Cash: a network analysis

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*CryBlock'18, June 15, 2018, Munich, Germany*

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<https://doi.org/10.1145/3211933.3211947>

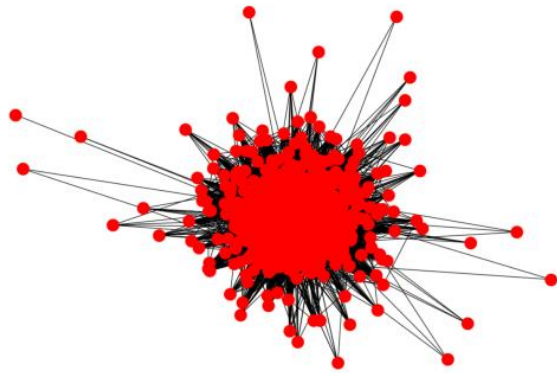


Figure 1: Pictorial representation of the Bitcoin Cash Network related to the month of August 2017. A giant core strongly connected clearly emerges. Each link should be represented by an arrow, since our dataset represents a directed network, however here they are drawn as simple lines.

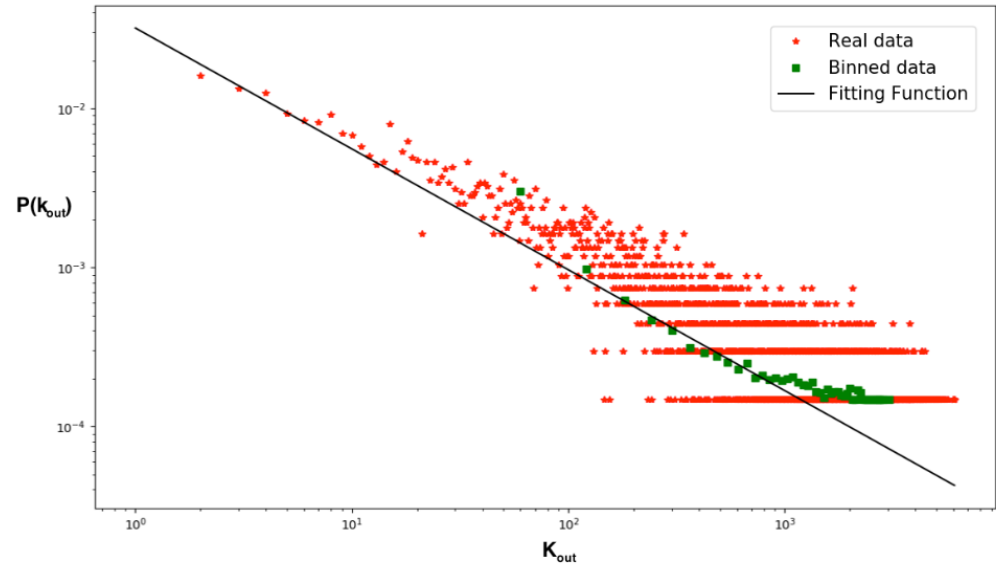


Figure 2: Out-degree distributions  $P(k_{out})$

Bitcoin network on April 2016

### NETWORK PARAMETERS

Network	$N$	$\gamma_{out}$	$C$	SPL
BC Apr 2016	7025	0.76	0.486	1.816
BCH Aug 2017	963	0.72	0.576	1.7267
BCH Dec 2017	1454	0.74	0.544	1.7605

“... *all networks seem to be provided with a small-world behavior, since their SPL is smaller than the logarithm of their size (i.e.  $N$ )...*”

**Source:** Marco Alberto Javarone and Craig Steven Wright. 2018. From Bitcoin to Bitcoin Cash: a network analysis. In CryBlock'18: 1st Workshop on Cryptocurrencies and Blockchains for Distributed Systems, June 15, 2018, Munich, Germany. ACM, New York, NY, USA, 5 pages. <https://doi.org/10.1145/3211933.3211947>

# Blockchain and Economic Development

- Most of current Blockchain networks are based on “3.5 Degrees of Separation”.
- Blockchain has enabled the new establishment of decentralized authority
  - **decentralized opportunity to all people**
- **Decentralized accessibility** of information and transaction
- The new growth pattern for developing countries