INTRODUCTION AND AXIOMS OF URBAN ECONOMICS

EE464: Urban Economics
EE562: Selected Topics in Development Economics 2
Semester 1 / 2020
Faculty of Economics, Thammasat University

Main Contents

1. Introduction
2. Subfields of Urban Economics
3. Definitions of Urban ad Metropolitan areas
4. Why do cities exist?
5. The 5 Axioms of Urban Economics

1.Introduction

- The field of urban economics is the **crossing point** of **geography** and **economics**.
- The economics investigates the **decisions of individuals** under the **constrained resources**.
- **Households** make their decisions **to maximize their utilities**, while **firms optimize their profits**.
- **Geographers** study how **resources and settlements** are **located** across **spatial dimension**.

Source: O'Sullivan (2018) and O'Sullivan (2012)

1.Introduction (continued)

- **Where** does human action happen?
- Urban economics integrates the main features of **economics and geography altogether**, investigating the **spatial pattern** and **location-related decisions** of household's utility maximizing and firm's profit maximization.
- Urban economics also studies the **externalities (both positive and negative ones)** and **inefficiencies**, enabling the formulation of policy recommendations to improve inefficiencies and manage externalities.

Source: O'Sullivan (2018) and O'Sullivan (2012)

1.Introduction (continued)

- An urban economics identifies an urban area as a **region that satisfies the criteria**, typically the number of individuals in a specific boundary.
- In other words, an urban region satisfies the threshold, which is generally **the specified population density**.
- A population density is also the proxy representing the **concentration of economic activities**, which is the boundary of highly dense economic interaction and transaction.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Demographia World Urban Areas

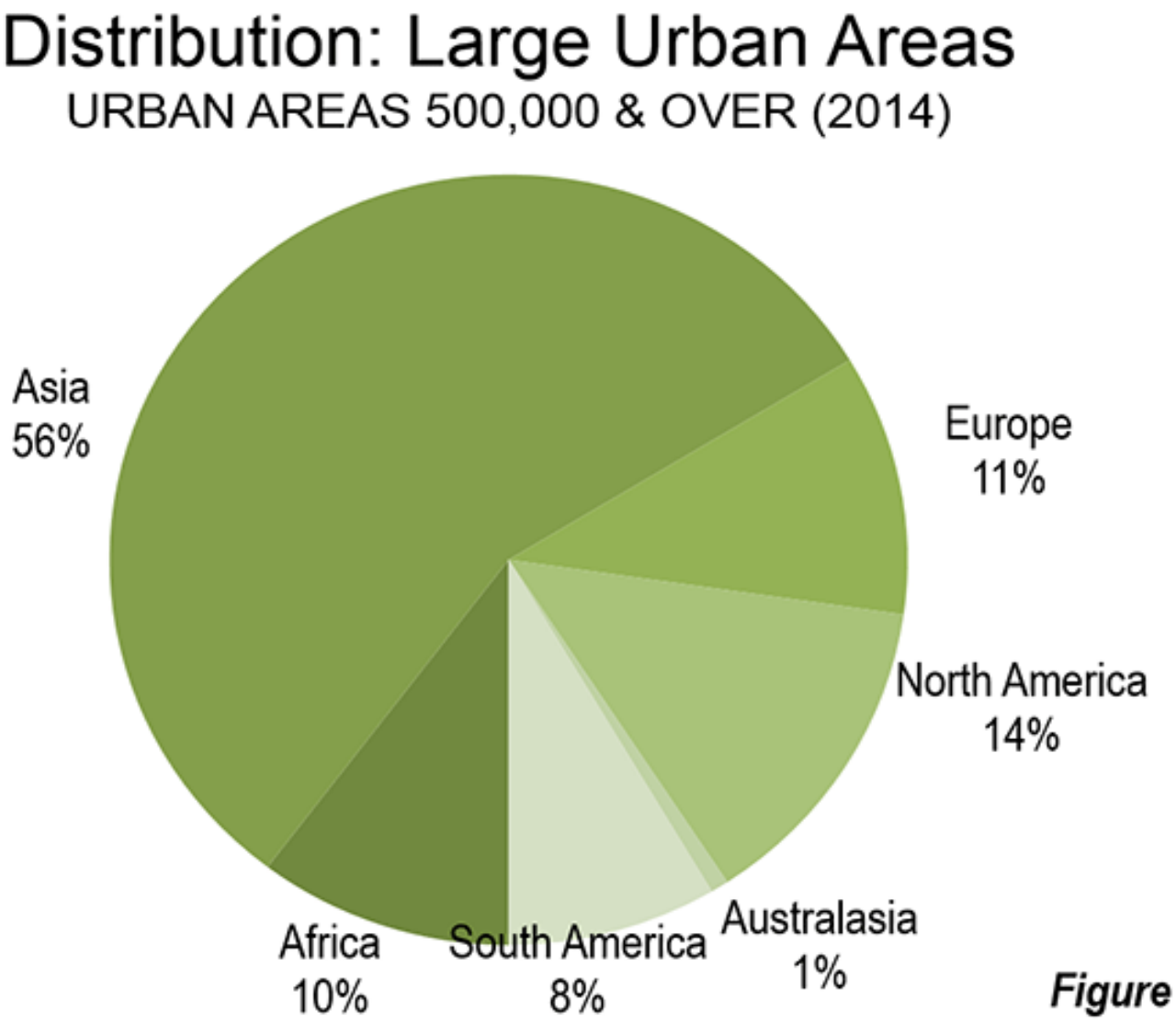


Figure 1

Source: http://www.newgeography.com/content/004280-largest-world-cities-2014

Demographia World Urban Areas

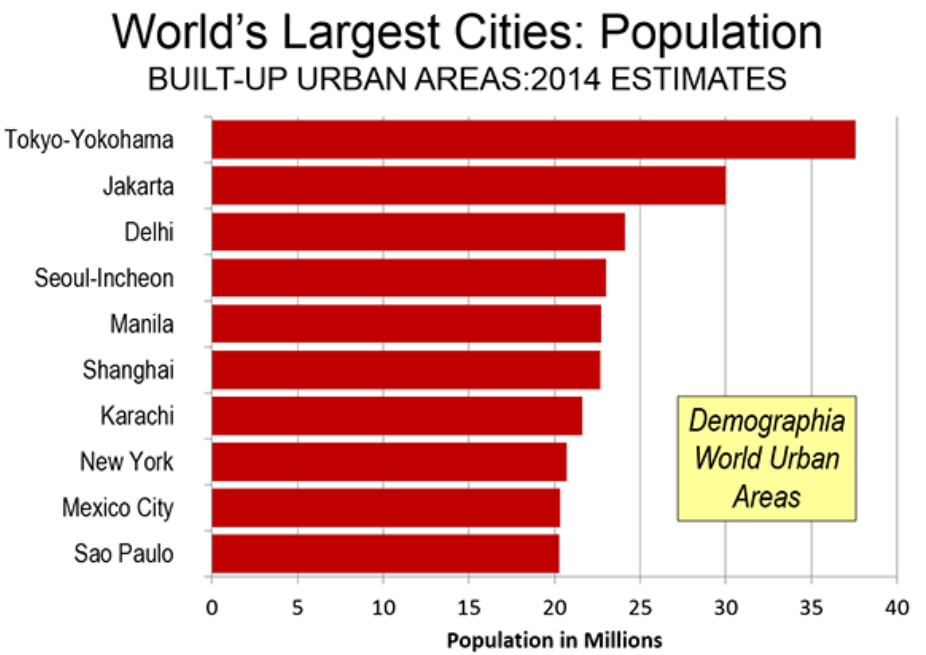


Figure 2

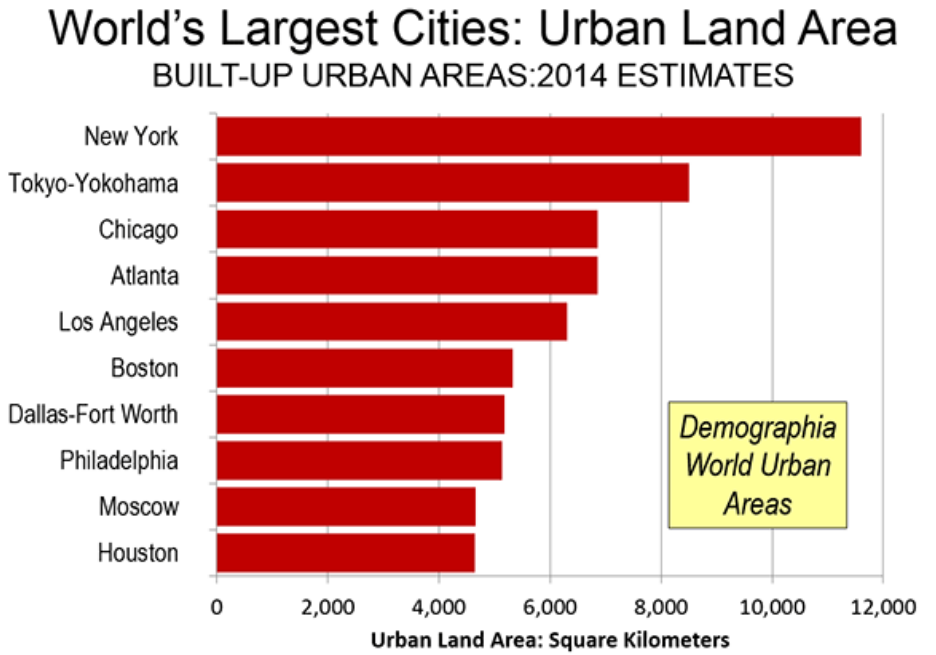


Figure 3

Source: http://www.newgeography.com/content/004280-largest-world-cities-2014

Demographia World Urban Areas

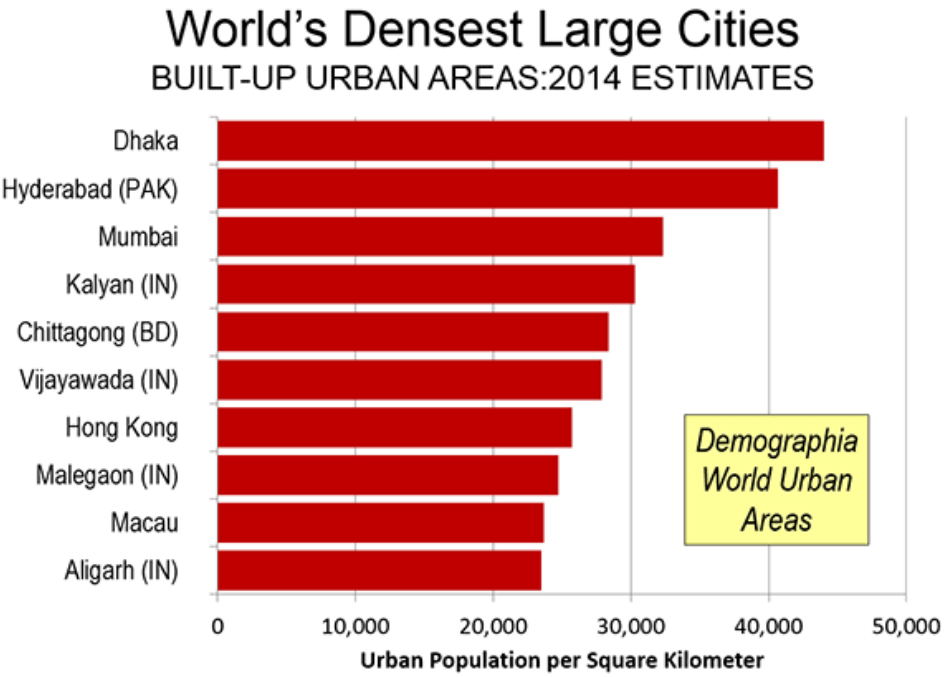


Figure 4

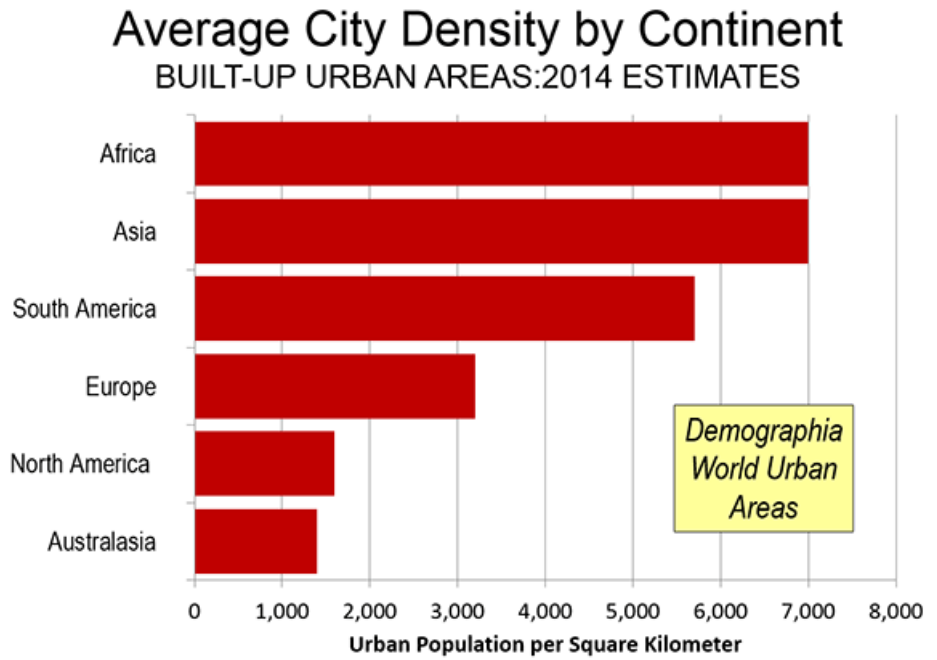


Figure 5

Source: http://www.newgeography.com/content/004280-largest-world-cities-2014

1.Introduction (continued)

- An urban economist describes an **urban area** as a **geographical region** that includes a **large number of people in a relatively small area.**
- In other words, the metropolitan area has a **concentration of population that is high** compared to the density of the surrounding area.
- The definitions include **urban areas** of **various sizes**, from a **small town** to a **major metropolitan area**.
- The U.S. Census Bureau has been continuously formulating the **geographical definitions**, simultaneously identifying the **characteristics** of **urban economics**.

Source: O'Sullivan (2018) and O'Sullivan (2012)

2. Subfields of Urban Economics

- Market forces and location decisions
- Urban sprawl
- Land use
- Urban transportation
- Crime and Public Policy
- Housing and public policy
- Local government expenditure and taxes

3. Definitions of Urban ad Metropolitan areas

Urban area:

- A **minimum population** of **2,500 people**
- A population density of **500 people per square mile**
- In 2000, there were **3,756 urban areas** in the US.

Urban population:

- People living in urban areas.
- In the US, the urban population was **79%** of the **total population** in the US.

Metropolitan area:

- A **combination** of population **nucleus** and **adjacent communities.**
- A minimum population of **50,000 people**.
- In the US, there were **361 metropolitan areas** in 2000.

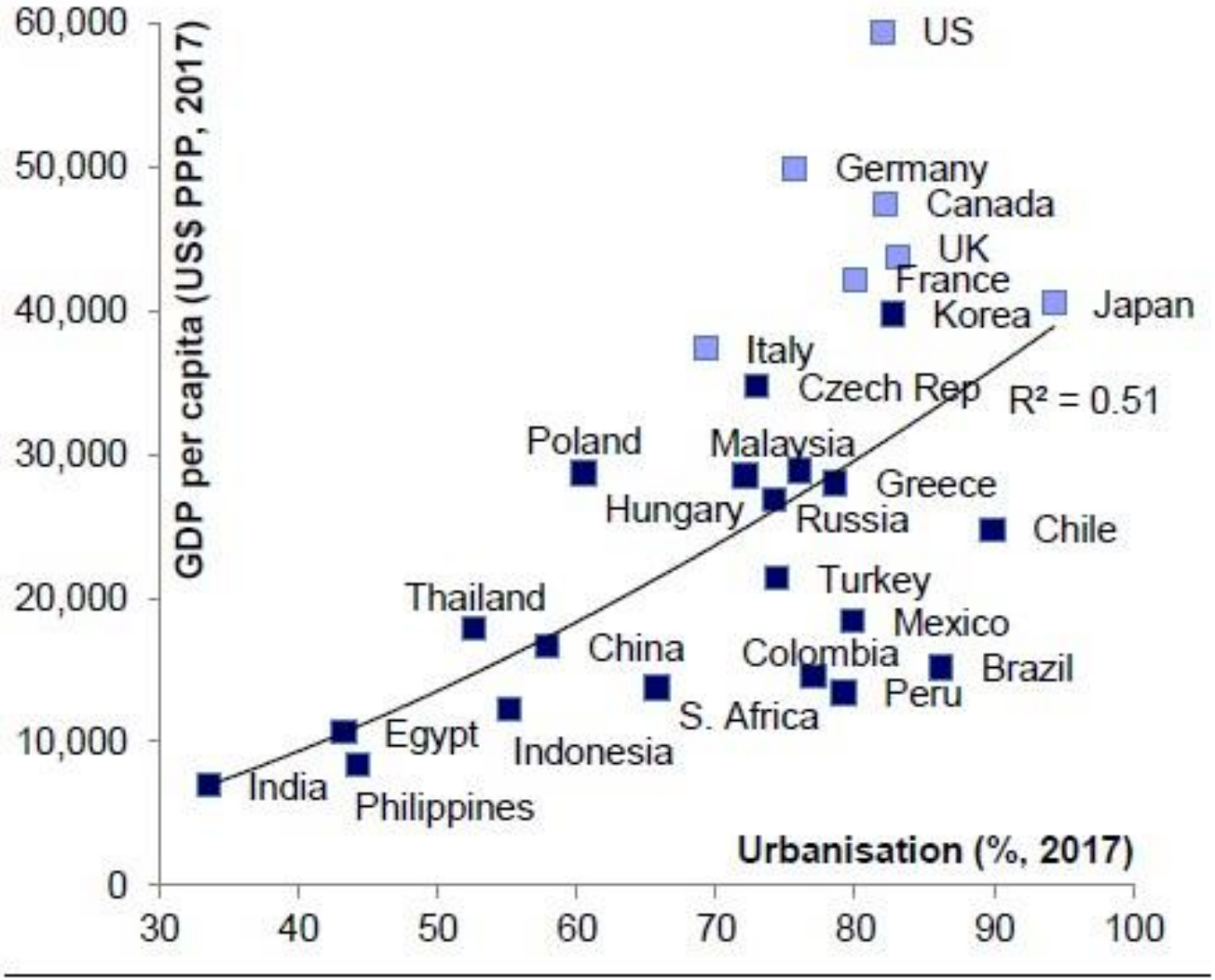
Micropolitan area:

- A minimum population of **10,000 to 50,000** people
- In the US, there were **559 metropolitan areas** in 2000.

Principal/Municipal city:

- The boundary that **municipal agency/government** functions as the **political authority** and **provides local services** such as sewage service, crime protection, and fire protection.

Source: O'Sullivan (2018) and O'Sullivan (2012)



Source: United Nations Population Division, Oxford Economics, Credit Suisse research

4. Why do cities exist?

- This is the **important fundamental question** of many field of studies, e.g. urban economics, sociology, architect.
- **Land** is one of the **main resources** for people to cultivate **crops** and do other **economic activities**.
- Bartlett (1998) states that other **creatures in the animal world** form anything like cities.
  - A **bee hive** or the **anthill** are the **city/community** formed by animals in nature.
  - These **Eusocial insects** (e.g. bees and ants) form their **physical structures**, technically called colonies, for **thousands of inhabitants**.
  - Interestingly, within the colony, there also exists the **social division** and **collaboration** among highly specialized subgroups such as soldier ants, drones, breeders, nurses, and cleanup crews.
- In contrast, **human's cities** exist driven by **economic system**, providing the areas for production, inhabitation, and the voluntary exchange.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Science
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The Origins of Scaling in Cities
Luís M. A. Bettencourt
Science **340**, 1438 (2013);
DOI: 10.1126/science.1235823

The Origins of Scaling in Cities

Luís M. A. Bettencourt

Despite the increasing importance of cities in human societies, our ability to understand them scientifically and manage them in practice has remained limited. The greatest difficulties to any scientific approach to cities have resulted from their many interdependent facets, as social, economic, infrastructural, and spatial complex systems that exist in similar but changing forms over a huge range of scales. Here, I show how all cities may evolve according to a small set of basic principles that operate locally. A theoretical framework was developed to predict the average social, spatial, and infrastructural properties of cities as a set of scaling relations that apply to all urban systems. Confirmation of these predictions was observed for thousands of cities worldwide, from many urban systems at different levels of development. Measures of urban efficiency, capturing the balance between socioeconomic outputs and infrastructural costs, were shown to be independent of city size and might be a useful means to evaluate urban planning strategies.

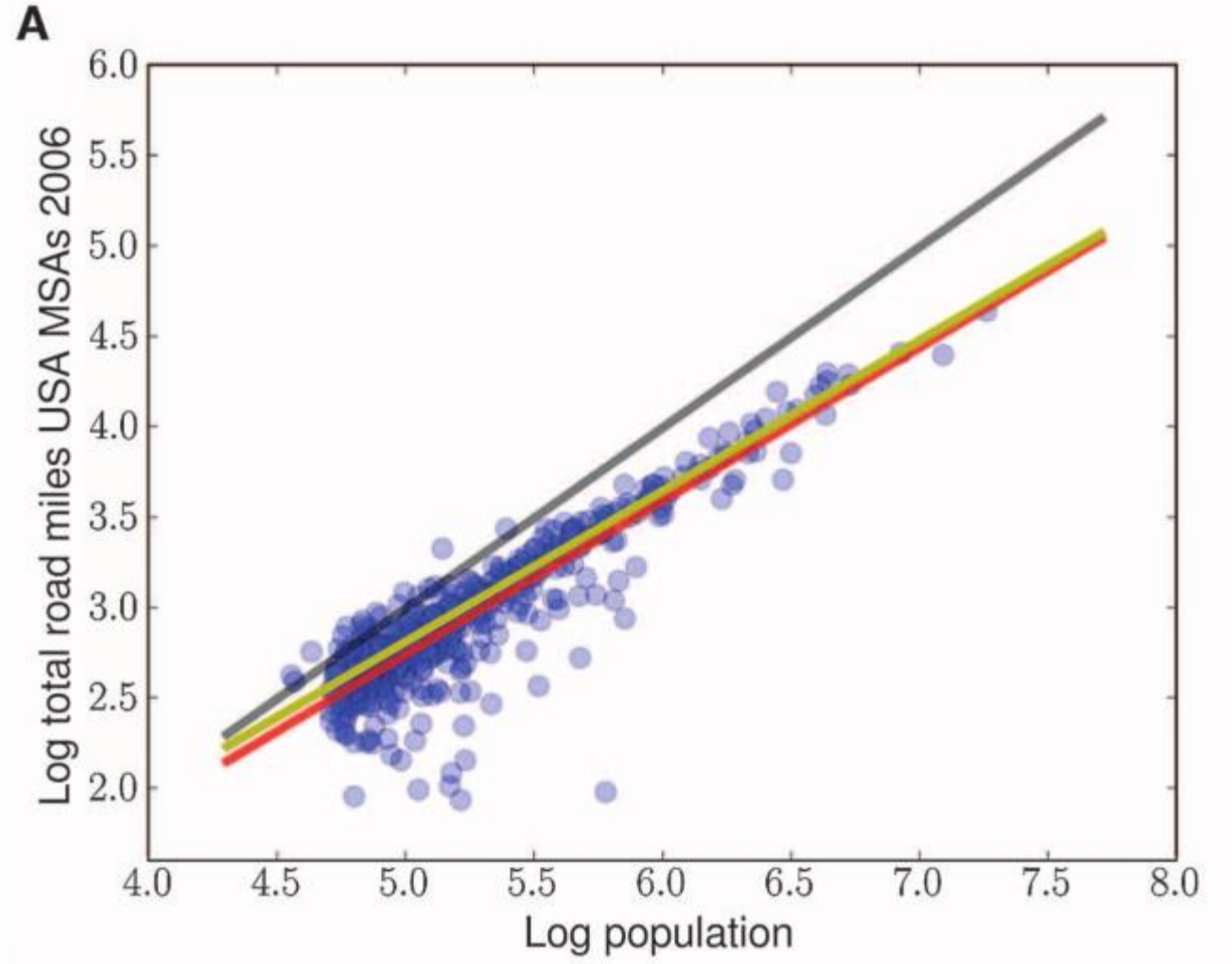
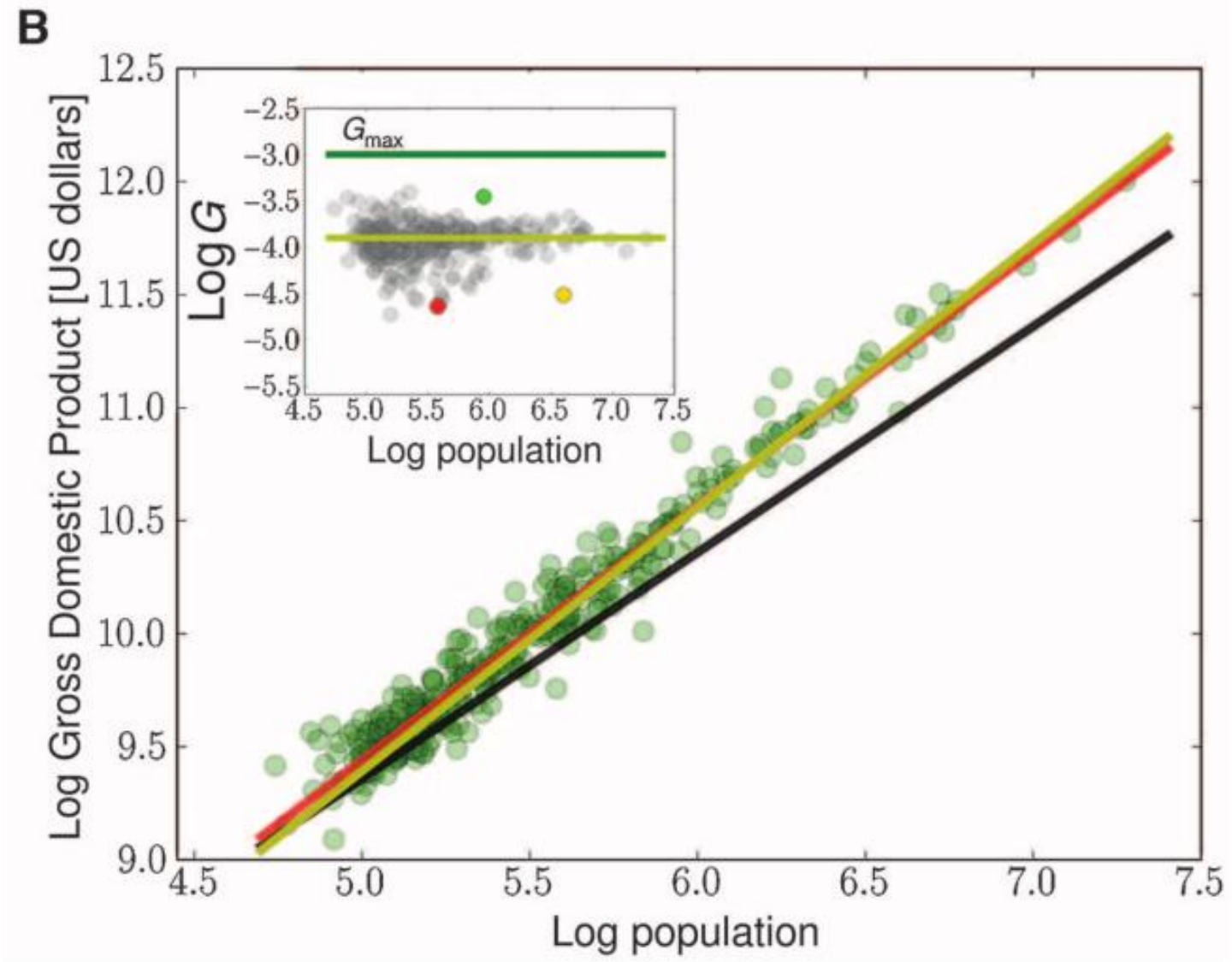
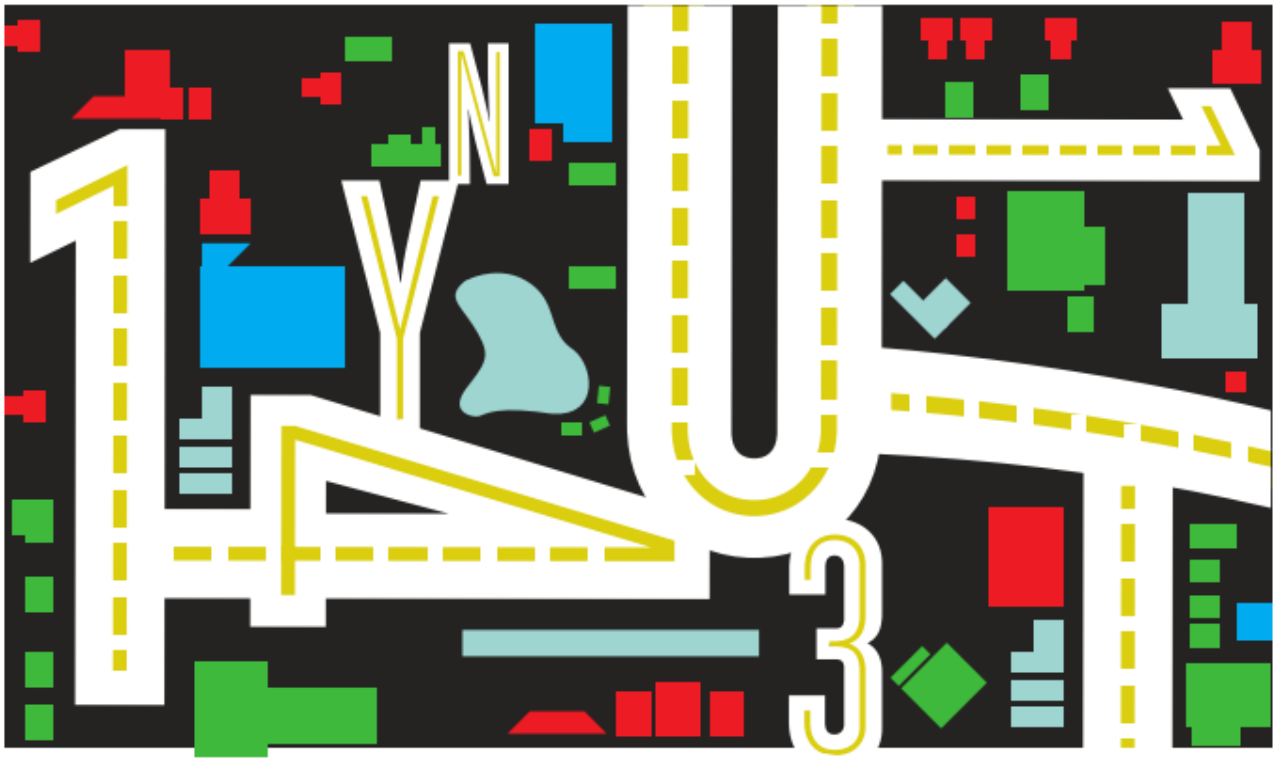


Fig. 1. Scaling of urban infrastructure and socioeconomic output. (A)

Source: Bettencourt (2013)



Source: Bettencourt (2013)

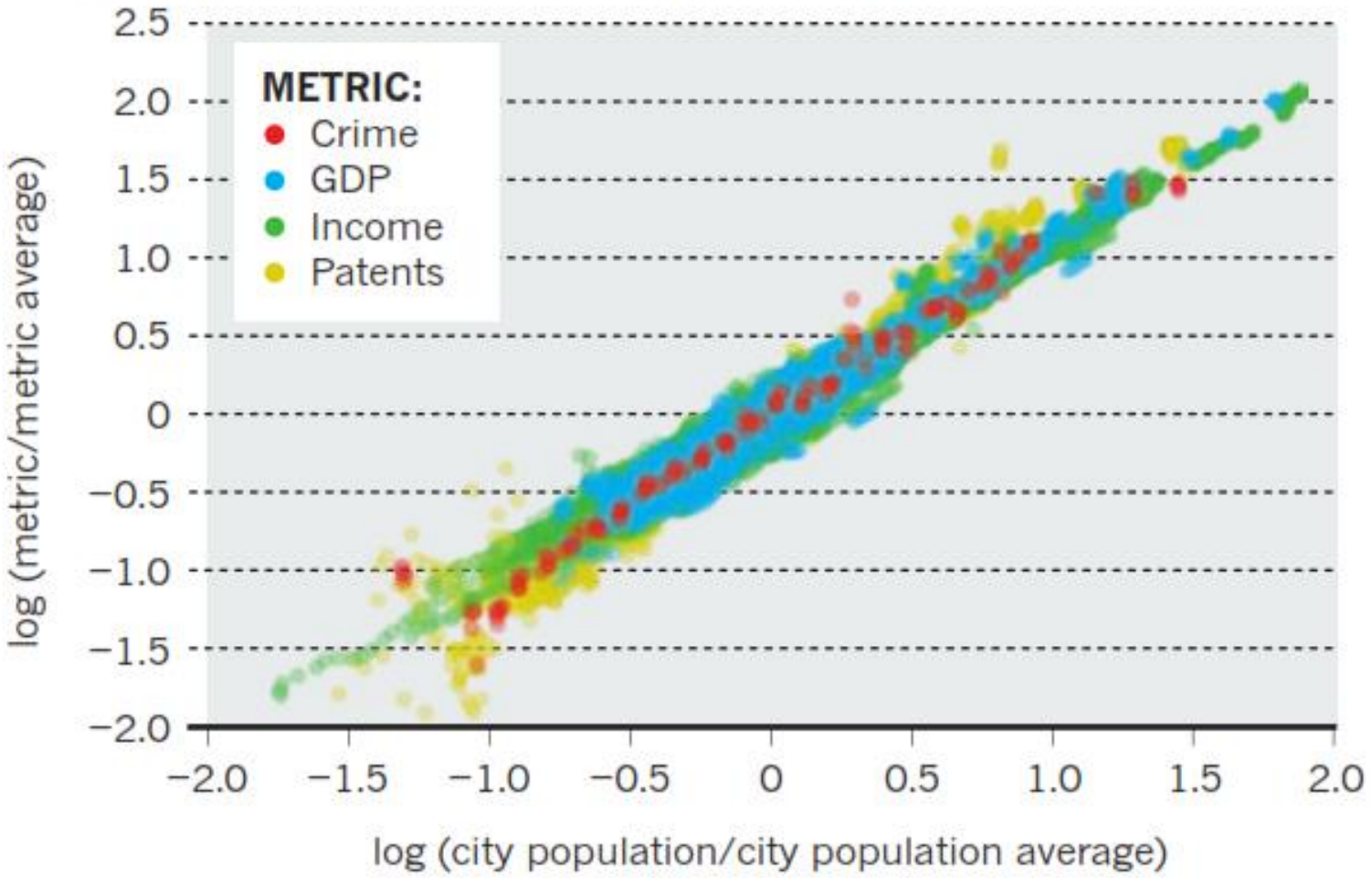


A unified theory of urban living

It is time for a science of how city growth affects society and environment, say **Luis Bettencourt** and **Geoffrey West**.

PREDICTABLE CITIES

Data from 360 US metropolitan areas show that metrics such as wages and crime scale in the same way with population size.



Source: Bettencourt and West (2010)

Source: O'Sullivan (2018) and O'Sullivan (2012)

4. Why do cities exist? (continued)

- Human's **economic activities influence the formulation of cities**, allowing the broader opportunities beyond the natural order (i.e. the cases of Eusocial insects).
- For the existence of cities, **three conditions** must be satisfied.
  (1) **Agricultural surplus** (sufficient food production)
  (2) **Urban production** (sufficient industrial productions and services)
  (3) **Transportation for exchange** (sufficient infrastructure)

Source: O'Sullivan (2018) and O'Sullivan (2012)

Agricultural surplus

- Rural inhabitants must produce enough food to supply themselves as well as for city residents.

Urban production

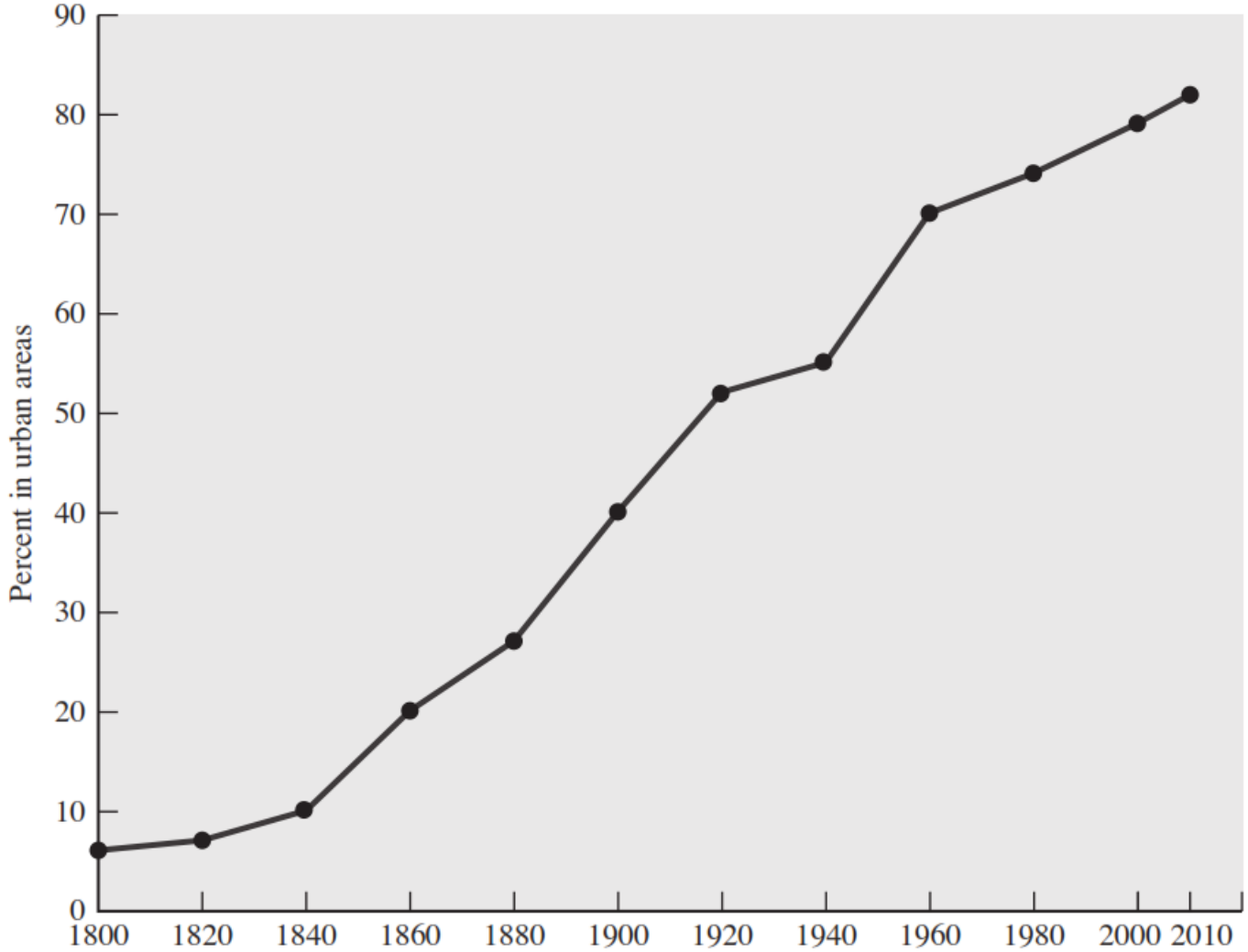
- City residents must produce sufficient industrial goods and services to supply rural people.

Transportation for exchange

- A sufficient infrastructure (e.g. transportation and communication) can effectively provide the interconnectivity between rural and urban areas.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Percent of U.S. Population in Urban Areas, 1800–2010



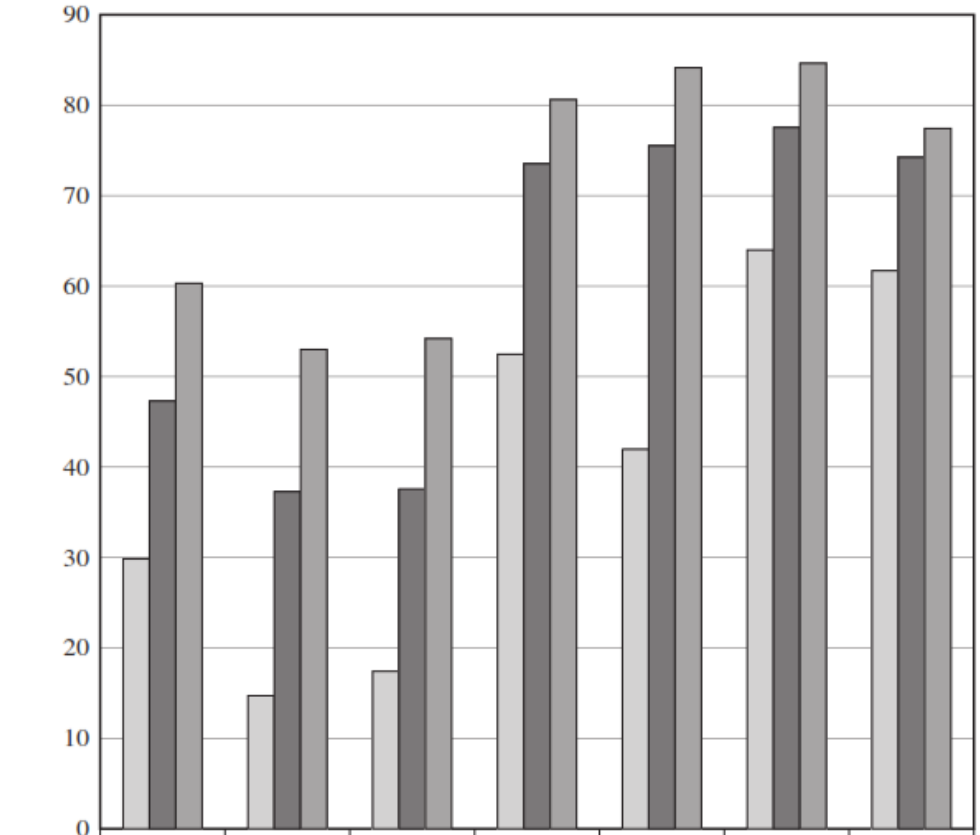
Source: O'Sullivan (2012)

Largest Metropolitan Areas in the United States, 2009

Metropolitan Area	Population in 2009	Percentage Change 2000–2009	Rank
New York-Northern New Jersey-Long Island, NY-NJ-PA	19,069,796	4.1	1
Los Angeles-Long Beach-Santa Ana, CA	12,874,797	4.1	2
Chicago-Naperville-Joliet, IL-IN-WI	9,580,567	5.3	3
Dallas-Fort Worth-Arlington, TX	6,447,615	24.9	4
Philadelphia-Camden-Wilmington, PA-NJ-DE-MD	5,968,252	4.9	5
Houston-Sugar Land-Baytown, TX	5,867,489	24.4	6
Miami-Fort Lauderdale-Pompano Beach, FL	5,547,051	10.8	7
Washington-Arlington-Alexandria, DC-VA-MD-WV	5,476,241	14.2	8
Atlanta-Sandy Springs-Marietta, GA	5,475,213	28.9	9
Boston-Cambridge-Quincy, MA-NH	4,588,680	4.5	10
Detroit-Warren-Livonia, MI	4,403,437	–1.1	11
Phoenix-Mesa-Scottsdale, AZ	4,364,094	34.2	12
San Francisco-Oakland-Fremont, CA	4,317,853	4.7	13
Riverside-San Bernardino-Ontario, CA	4,143,113	27.3	14
Seattle-Tacoma-Bellevue, WA	3,407,848	12.0	15
Minneapolis-St. Paul-Bloomington, MN-WI	3,269,814	10.1	16
San Diego-Carlsbad-San Marcos, CA	3,053,793	8.5	17
St. Louis, MO-IL	2,828,990	4.8	18
Tampa-St. Petersburg-Clearwater, FL	2,747,272	14.7	19
Baltimore-Towson, MD	2,690,886	5.4	20
Denver-Aurora-Broomfield, CO	2,552,195	17.1	21
Pittsburgh, PA	2,354,957	–3.1	22
Portland-Vancouver-Beaverton, OR-WA	2,241,841	16.3	23
Cincinnati-Middletown, OH-KY-IN	2,171,896	8.1	24
Sacramento–Arden-Arcade–Roseville, CA	2,127,355	18.4	25
Cleveland-Elyria-Mentor, OH	2,091,286	–2.6	26
Orlando-Kissimmee, FL	2,082,421	26.6	27
San Antonio, TX	2,072,128	21.1	28
Kansas City, MO-KS	2,067,585	12.6	29
Las Vegas-Paradise, NV	1,902,834	38.3	30

Source: O'Sullivan (2012)

Urbanization Rates, by World Region, 1950–2030



	World	Africa	Asia	Europe	Latin America and the Caribbean	North America	Oceania
1950	29.8	14.7	17.4	52.4	41.9	63.9	61.6
2000	47.2	37.2	37.5	73.4	75.4	77.4	74.1
2030	60.2	52.9	54.1	80.5	84	84.5	77.3

Percent in urban areas

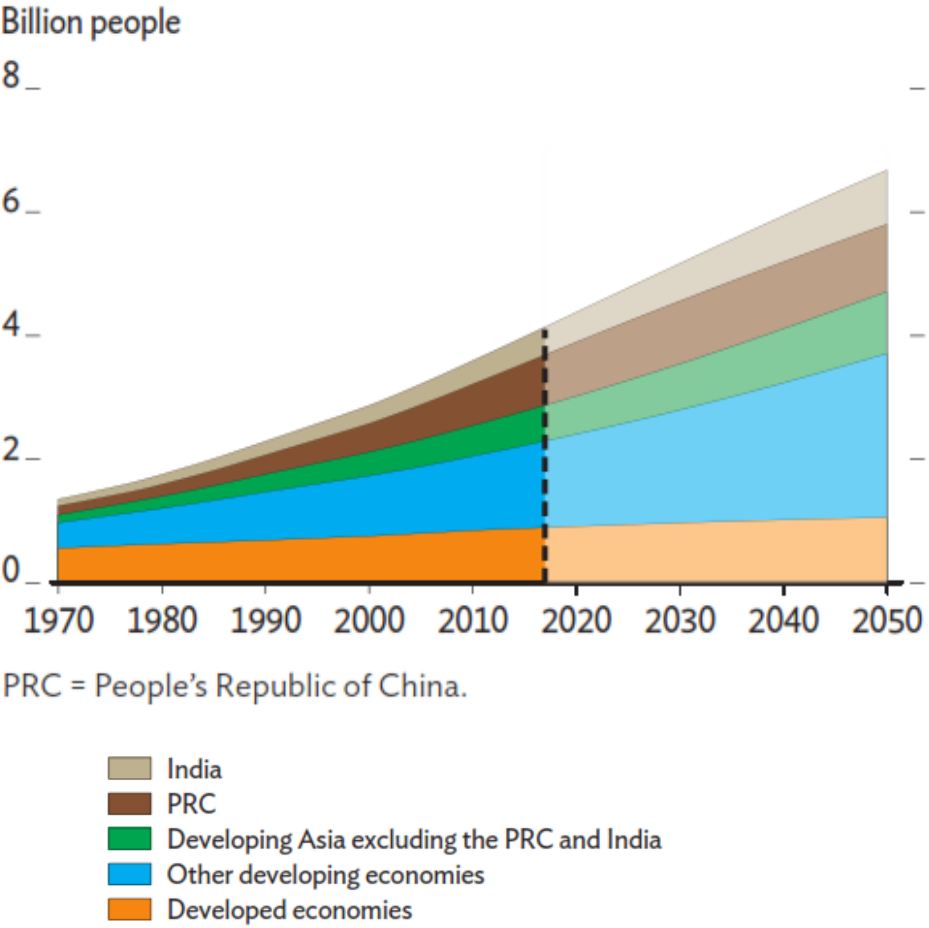
Source: O'Sullivan (2012)

Populations and Projected Populations of Large World Cities

Metropolitan Area	Nation	Population 1975 (million)	Population 2005 (million)	Population 2015 (million)	Percent Change 2005–2015
Tokyo	Japan	26.6	35.2	35.5	1
Ciudad de México (Mexico City)	Mexico	10.7	19.4	21.6	11
Sao Paulo	Brazil	9.6	18.3	20.5	12
Mumbai (Bombay)	India	7.1	18.2	21.9	20
Delhi	India	4.4	15.0	18.6	24
Shanghai	China	7.3	14.5	17.2	19
Kolkata (Calcutta)	India	7.9	14.3	17.0	19
Jakarta	Indonesia	4.8	13.2	16.8	27
Buenos Aires	Argentina	8.7	12.6	13.4	7
Dhaka	Bangladesh	2.2	12.4	16.8	35
Karachi	Pakistan	4.0	11.6	15.2	31
Rio de Janeiro	Brazil	7.6	11.5	12.8	11
Osaka-Kobe	Japan	9.8	11.3	11.3	0
Al-Qahirah (Cairo)	Egypt	6.4	11.1	13.1	18
Lagos	Nigeria	1.9	10.9	16.1	48
Beijing	China	6.0	10.7	12.9	20
Manila	Philippines	5.0	10.7	12.9	21
Moskva (Moscow)	Russian Federation	7.6	10.7	11.0	3
Paris	France	8.6	9.8	9.9	0
Istanbul	Turkey	3.6	9.7	11.2	15

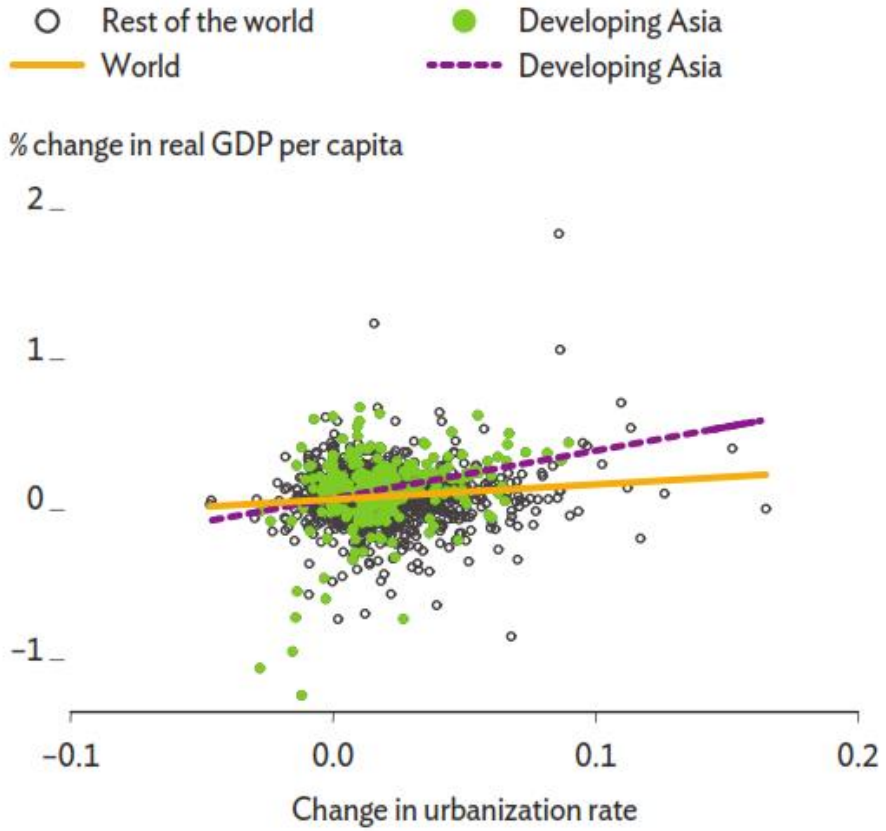
Source: O'Sullivan (2012)

Urban population



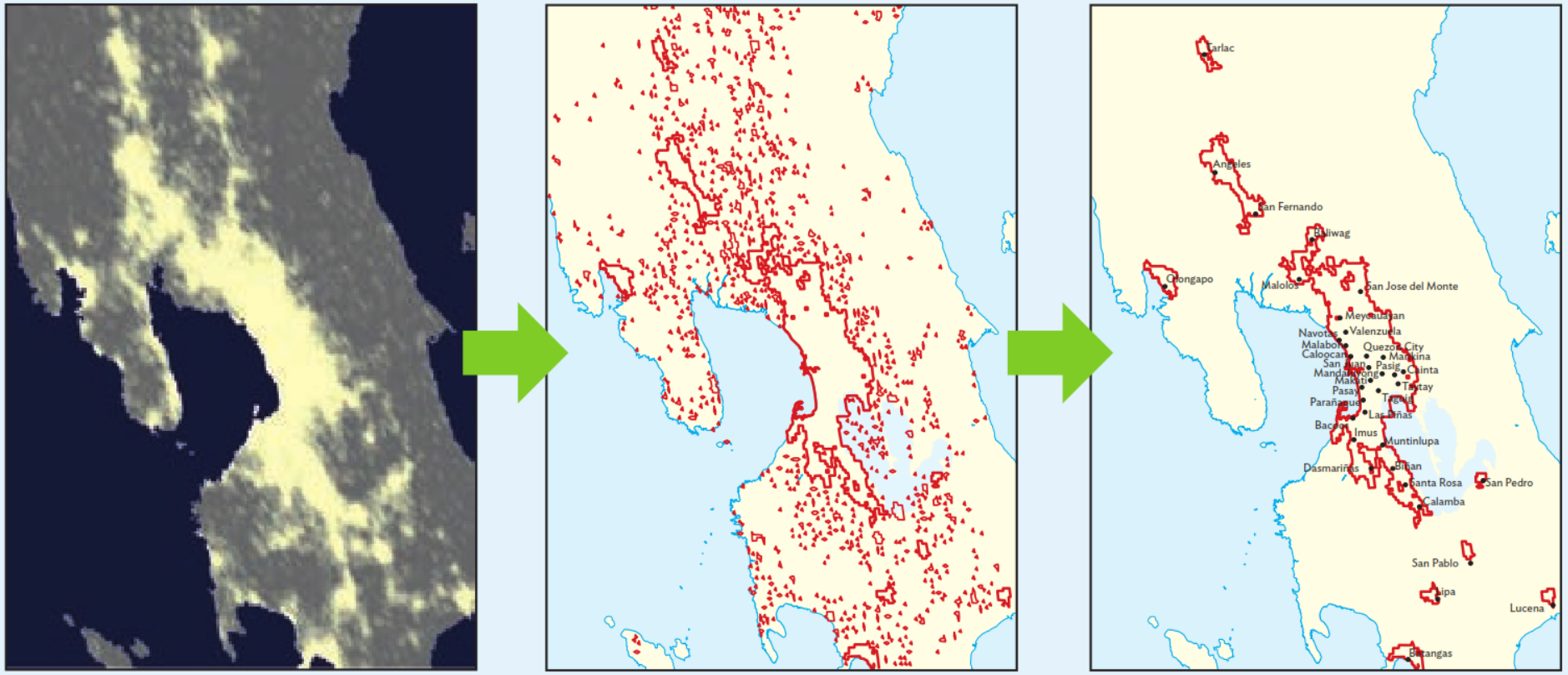
Source: ADB (2019)

Five-year changes in GDP per capita versus change in urbanization



Source: ADB (2019)

Natural cities extracted from nighttime lights of the Metro Manila area in the Philippines, 1992



Raw nighttime lights image.

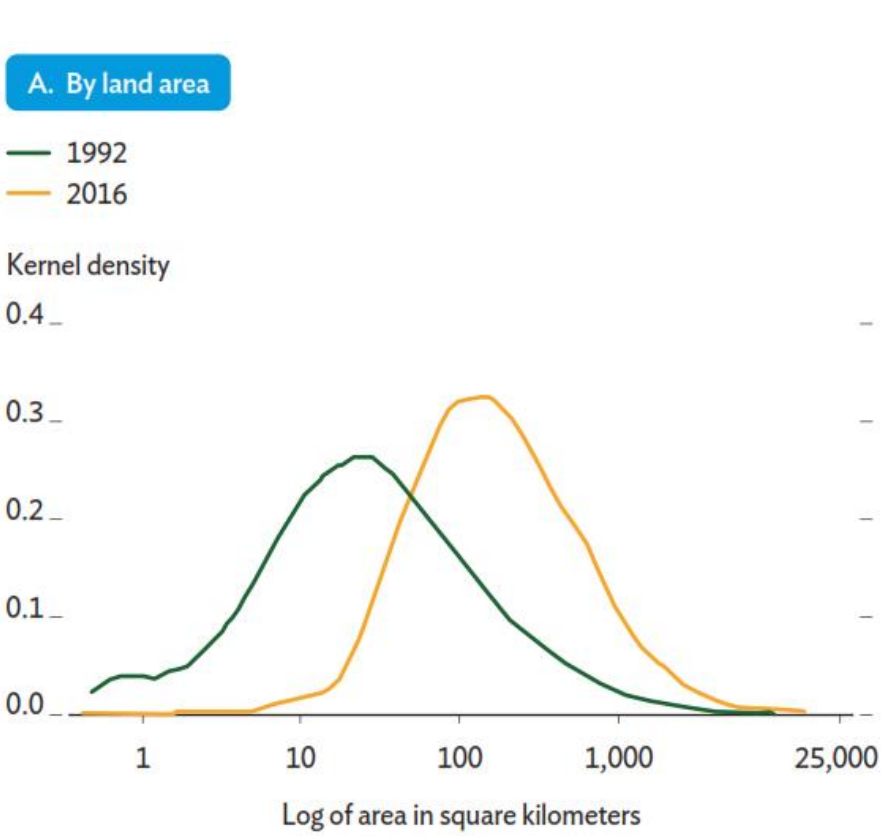
This map was produced by the cartography unit of the Asian Development Bank. The boundaries, colors, denominations, and any other information shown on this map do not imply, on the part of the Asian Development Bank, any judgment on the legal status of any territory, or any endorsement or acceptance of such boundaries, colors, denominations, or information.

Source: ADB (2019)

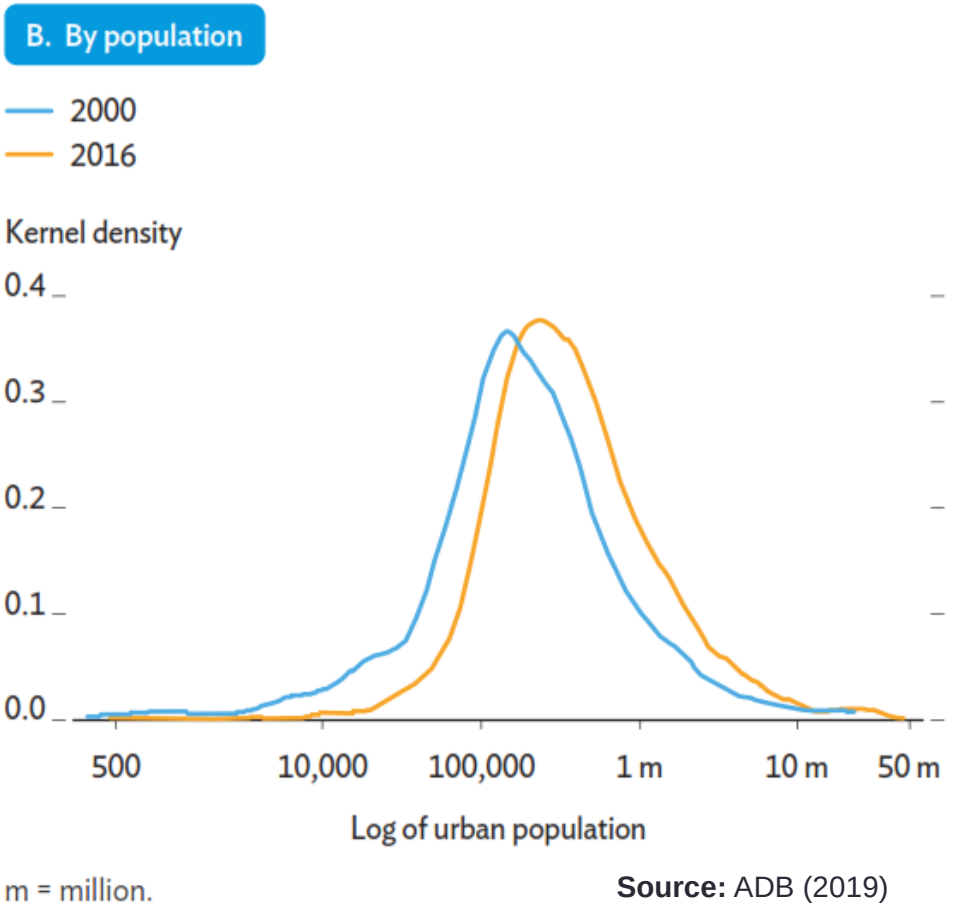
- The Nighttime-Light (NTL) data suggest that the total area of the **natural cities in Asia** expanded **more than threefold**, from 170,000 km^2 in 1992 to 560,000 km^2 in 2016, for an **average annual growth** rate of **5.1%**.
- The number of natural city inhabitants increased from 0.82 billion in 2000 to 1.38 billion in 2016, for an average **annual growth rate** of **3.3%.**
- In 2016, the total land area of 42 economies studied was **24.8 million km^2** and the total population **was 4.0 billion**.
- Hence, natural cities hosted **34.7% of the population** of developing Asia on only **2.3% of the land area**.

Source: ADB (2019)

Distribution of natural city size



Source: ADB (2019)



m = million.

Source: ADB (2019)

5. The 5 Axioms of Urban Economics

- Urban economics studies the **behaviors of households and firms**, particularly their **location selections**.
- Usually, people and firms do not instantly relocate. Therefore, the models developed in the field of urban economics predict the **medium- and long-term changes** of **spatial behaviors**.
- In the case of the US, the average household **relocates every 7 years**, representing that **14% of population** moving to the **new locations every year**.
- Some theocratical models in urban economics **assume perfect mobilities**, and some **impose some constraints**.

Source: O'Sullivan (2012) and author's additional explanation

5. The 5 Axioms of Urban Economics (continued)

1. Prices adjust to achieve locational equilibrium
2. Self-reinforcing effects generate extreme outcomes
3. Externalities cause inefficiencies
4. Production is subject to economies of scale
5. Competition generates zero economic profit

Source: O'Sullivan (2012)

5. The 5 Axioms of Urban Economics (continued)

1. Prices adjust to achieve locational equilibrium

- **Locational equilibrium** can be attained when everyone is **satisfied with her/his location** under the **given prices** of resources, goods and service in all areas. Therefore, there is **no motivation to relocate**.
- When prices change, households' utilities and firms' profits have been altered, motivating them to **select the new locations** to **maximize their utilities and profits**.

Source: O'Sullivan (2012) and author's additional explanation

5. The 5 Axioms of Urban Economics (continued)

2. Self-reinforcing effects generate extreme outcomes

- There exists the **feedback loop of effects**, **recursively amplifying the initial change**.
- **Example:** When firms move to the center of the city, they subsequently influence more firms to relocate to the downtown area as well. This positive feedback loop of relocation could cause the higher density of firm located in the city's core area.

Source: O'Sullivan (2012) and author's additional explanation

5. The 5 Axioms of Urban Economics (continued)

3. Externalities cause inefficiencies

- When a firm is maximizing its profit, its economic activity might create the **outcome(s)** (i.e. the by-product) that **simultaneously affects others**.
- Similarly, when a consumer is **maximizing her/his profit**, she/he might also create the **outcome affecting others**.

Example: When a person drives a car for her/his daily commute to the office.

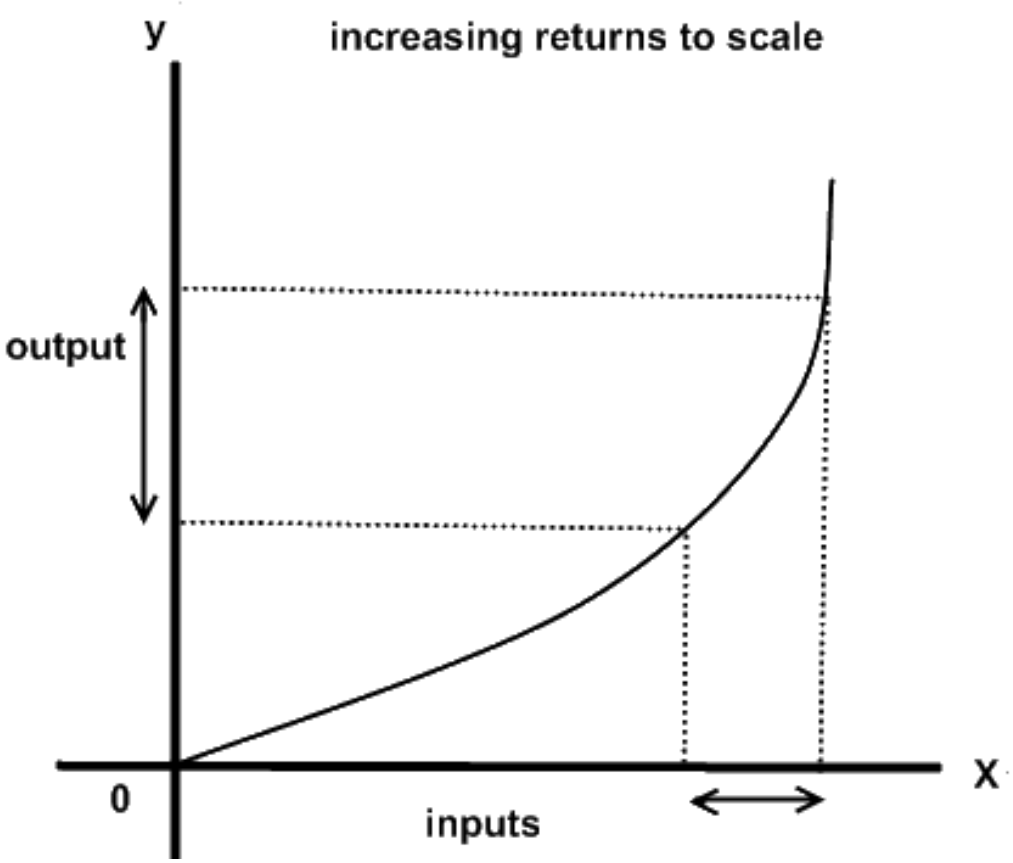
Personal benefits: travel time, comfort, convenience, etc.

Social costs: traffic congestion, pollution, road accident, etc.

Source: O'Sullivan (2012) and author's additional explanation

5. The 5 Axioms of Urban Economics (continued)

4. Production is subject to economies of scale



- The relationship between input and output is **not linear**, but it is based on exponential one.
- When **doubling all inputs** of production, the output is **increased more than a double**.

Source: O'Sullivan (2012) and author's additional explanation

Source: https://sites.google.com/site/economicsbasics/increasing-returns-to-scale-1

5. The 5 Axioms of Urban Economics (continued)

5. Competition generates zero economic profit

- Without barriers to entry, firms can enter the market and produce their outputs. This process will collectively lower the opportunity and profit. Eventually, the economic profit is zero
- **Necessary condition:** **all factors of production** are earning their **opportunity costs**, allowing firms to receive the sufficient returns on all factors to do business. Also, all firms are earning the normal profit.

Example: Judy just opened a bakery shop.

- She could have earned $30,000/year in another job offer
- To finance her bakery shop, she withdrawn her savings from the bank ($50,000 with 5% interest rate)
- Given that the market of bakery shop is highly competitive, what would be her earning from the bakery shop?

Source: O'Sullivan (2012) and author's additional explanation