Why do cities exist?

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- **Details**
  - **h.koster@vu.nl**
  - **Available until September 19**
  - **18 hours of lectures**

- **Key elements in lectures; study at home!**
  - **See *www.urbaneconomics.nl/coursematerial* for lecture sheets and links to papers**
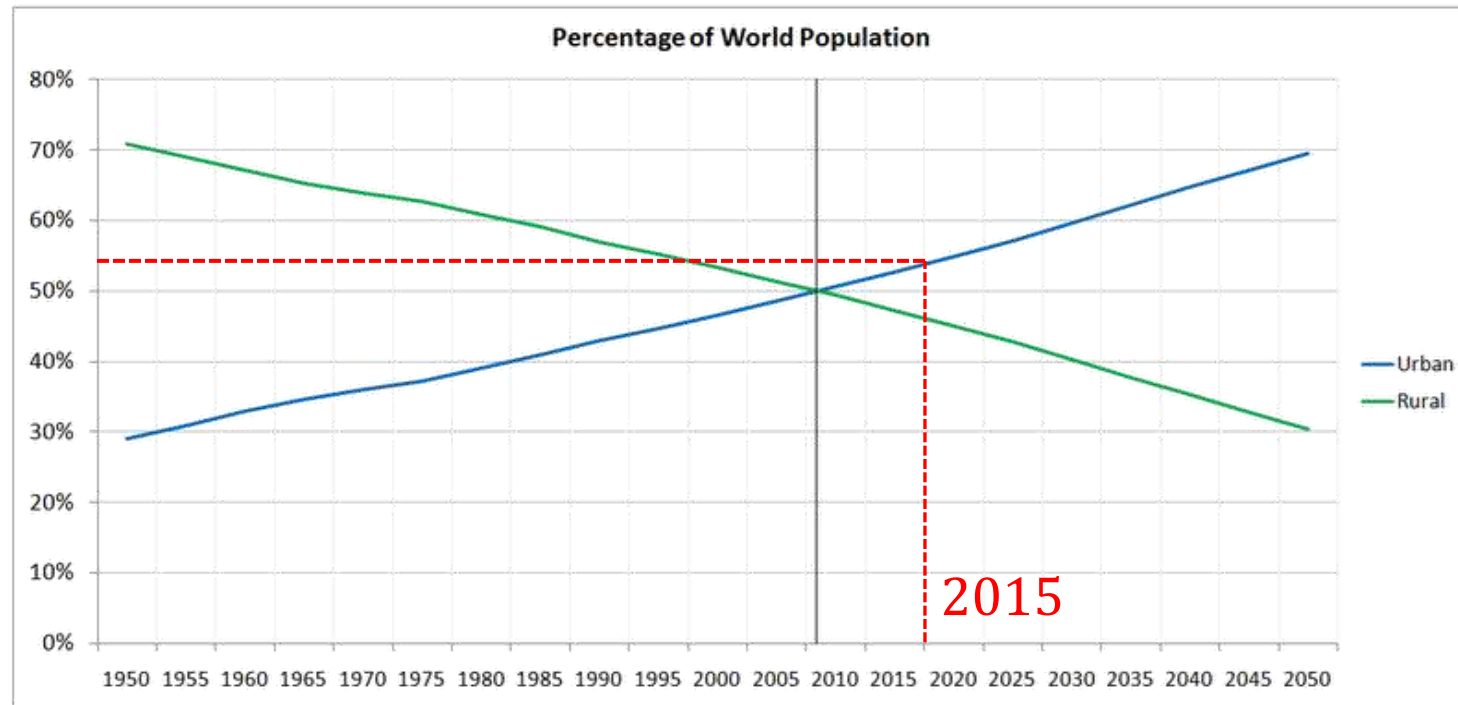
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■ **Interactive; input during lectures requested**

■ **Do not hesitate to ask questions during class!**
  • **No such thing as a stupid question**

■ **A small remark on notation in the slides**
  $\mathbb{Q}$ **= question**
  $\mathbb{E}$ **= exercise**
  $\mathbb{A}$ **= application**

■ **This lecture: test exam micro-economics**
  • **Appendix of O'Sullivan**
  • **Answers will be published on**
    www.urbaneconomics.nl/coursematerial

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Observation 1:

The world is *urban*, ever more...

Percentage of World Population

Data Source: United Nations, http://esa.un.org/unup/p2k0data.asp

2015

Observation 1

- **The world is _urban_, ever more...**
  - **About 15% of population in Sri Lanka is urban**
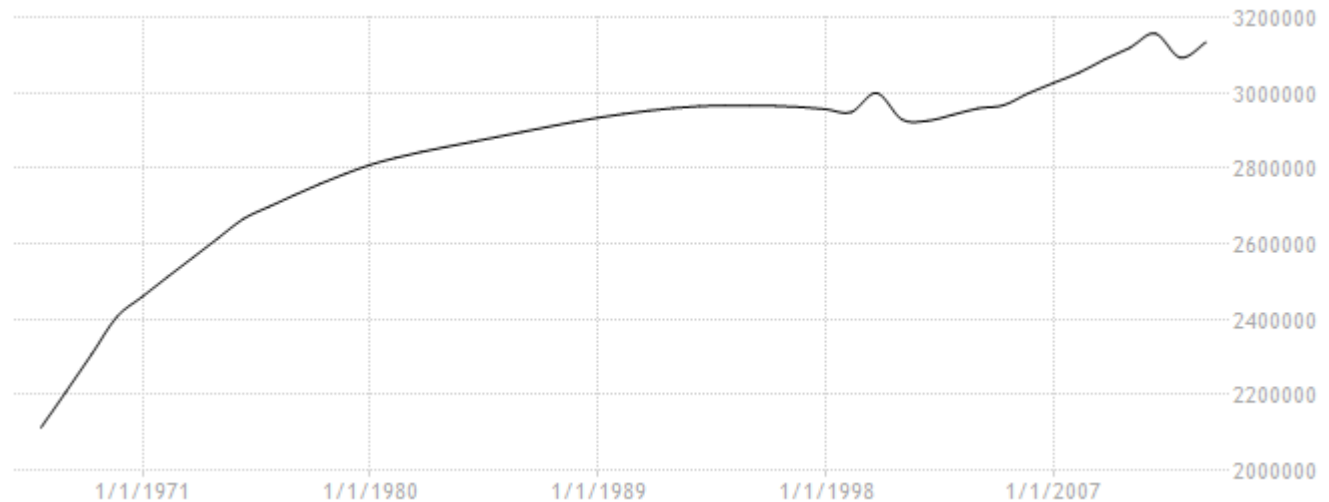
Source: World Bank

Observation 1

- **People move to cites**

Percent of Population Living in Urban Areas in Major World Regions, 1950, 1975, 2000, and 2025
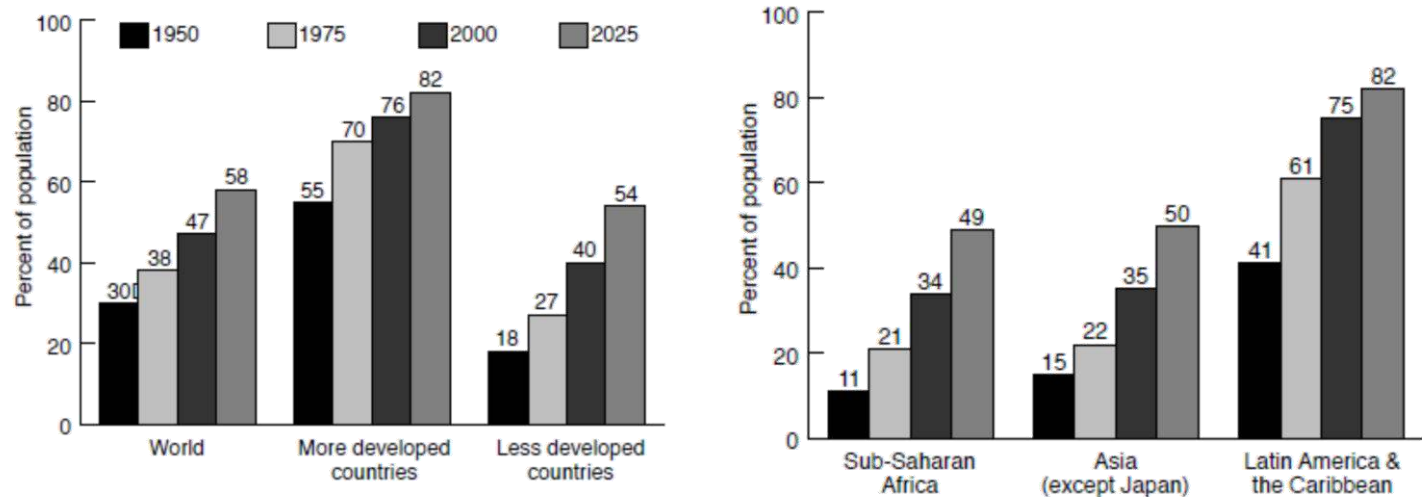
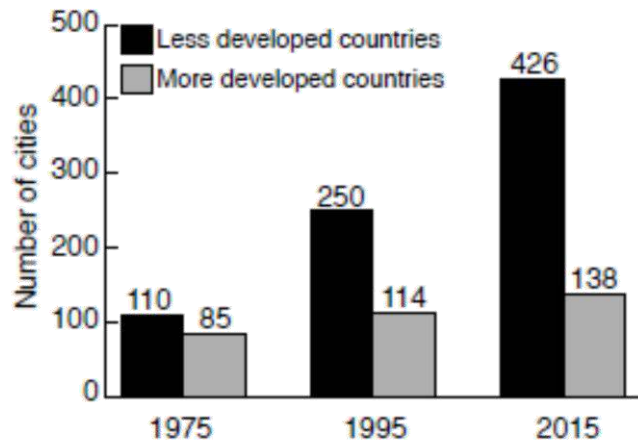Source: United Nations, *World Urbanization Prospects: The 1999 Revision* (2000).

Observation 1

▪ **Cities grow big ...**

Mumbai

Number of Cities With 1 Million or More Residents, 1975, 1995, and 2015

(bar chart)
- Less developed countries
- More developed countries

1975: 110 (less developed), 85 (more developed)
1995: 250 (less developed), 114 (more developed)
2015: 426 (less developed), 138 (more developed)

Source: United Nations, *World Urbanization Prospects: The 1999 Revision* (2000).

Lagos

Observation 1

- **And even bigger.**

1970		2015	
1. Tokyo, Japan	16.5	1. Tokyo, Japan	37.1
2. New York, United States	16.2	2. Jakarta, Indonesia	26.1
3. Shanghai, China	11.2	3. Seoul, South Korea	22.5
4. Osaka, Japan	9.4	4. Delhi, India	22.2
5. Mexico City, Mexico	9.1	5. Shanghai, China	20.9
6. London, England	8.6	6. Manila, Philippines	20.8
7. Paris, France	8.5	7. Karachi, Pakistan	20.7
8. Buenos Aires, Argentina	8.4	8. New York, United States	20.5
9. Los Angeles, United States	8.4	9. Sao Paulo, Brazil	20.2
10. Beijing, China	8.1	10. Mexico City, Mexico	19.5

Ⓠ **What is remarkable here?**

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Observation 1

- A city is:

Observation 1

- **A city is:**

    ... high population density

    ... people and firms wanting to reduce distance

Observation 2

- **The world is flat**

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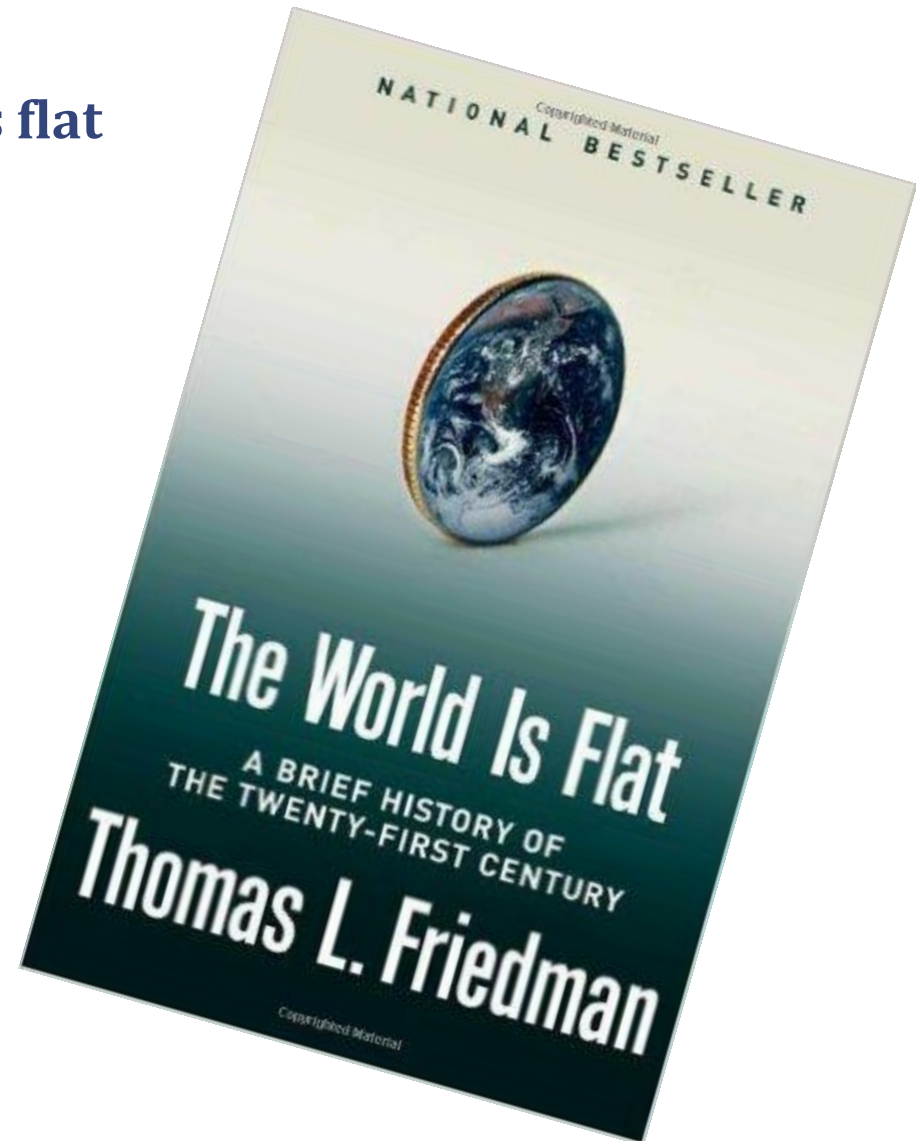
Observation 2

- **The world is flat**

Until 1850: 7km/h   **2000: 1000km/h**   **2015: ∞ km/h**

Observation 2

- **The world is flat**

- **The products we consume originate from all over the world**
    - **Transport costs of goods are very low**
    - **➔ Outsourcing**

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Paradox!

People and firms want to reduce distance by locating in cities

$$\longleftrightarrow$$

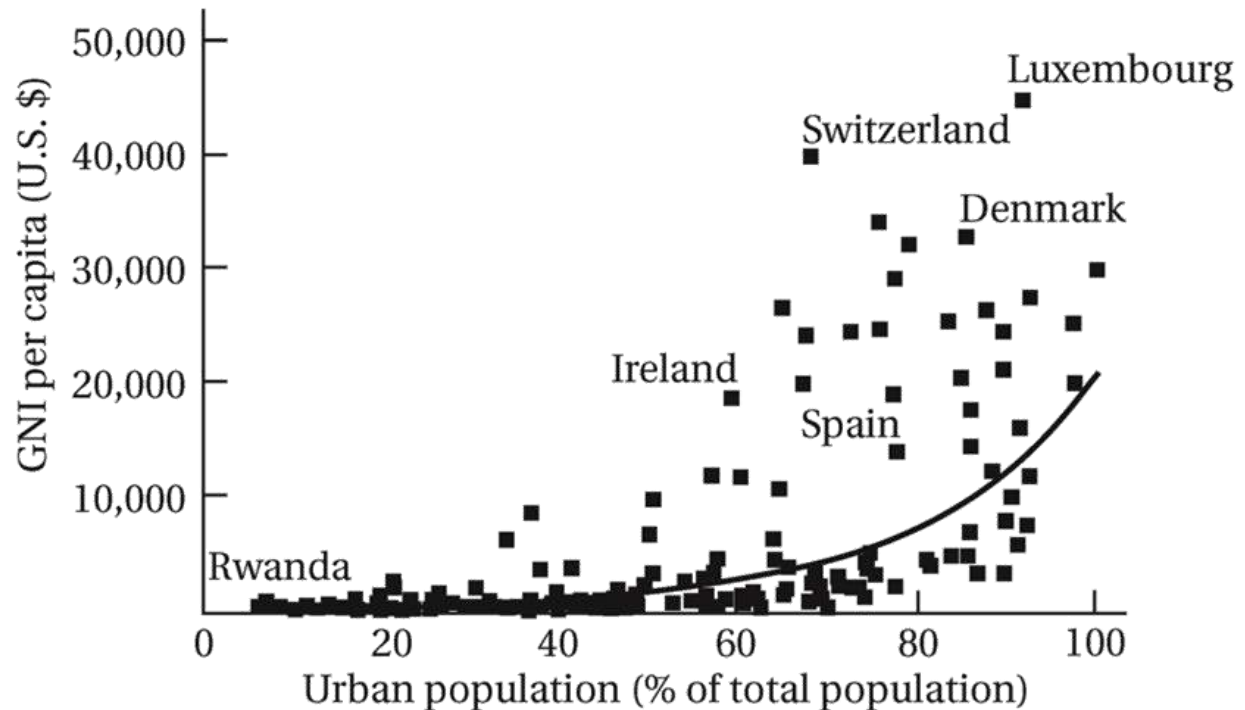**Decreasing effective distance makes the world flat**

- **What do some stylised facts tell us about this paradox?**

Stylised fact 1: urbanised countries are richer

Source: UN-Habitat, "State of the World's Cities, 2001," http://www.unchs.org/Istanbul+5/86.pdf. Reprinted with permission.

Ⓠ **Does this figure conclusively show that cities *make* you richer?**

Stylised fact 2: cities cluster
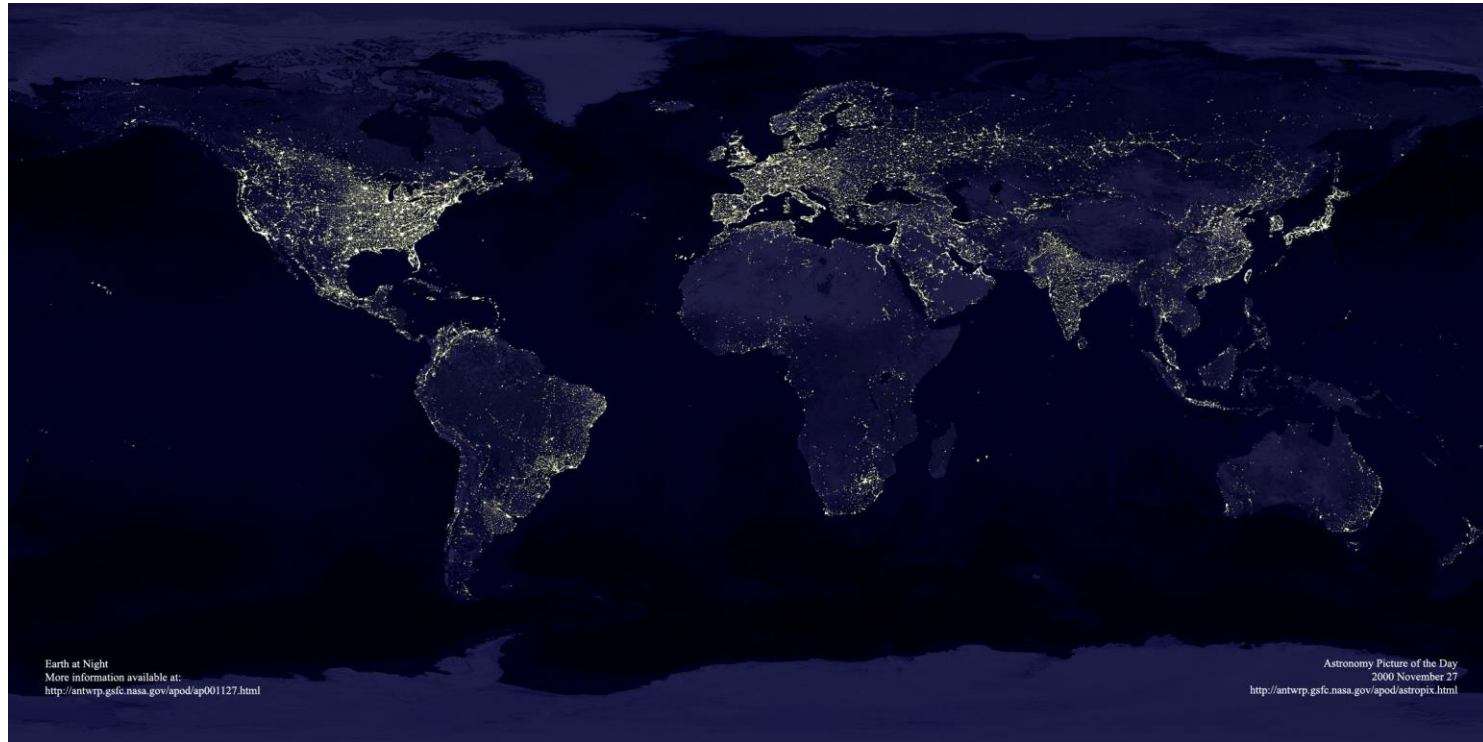
Earth at Night
More information available at:
http://antwrp.gsfc.nasa.gov/apod/ap001127.html

Astronomy Picture of the Day
2000 November 27
http://antwrp.gsfc.nasa.gov/apod/astropix.html

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Stylised fact 3: firms cluster

In the Netherlands:

Metal and Electronic Industry

ICT Industry

Culture, Other Services

Stylised fact 4: people cluster

Boston:

MAP 8–1 Income Segregation: Boston
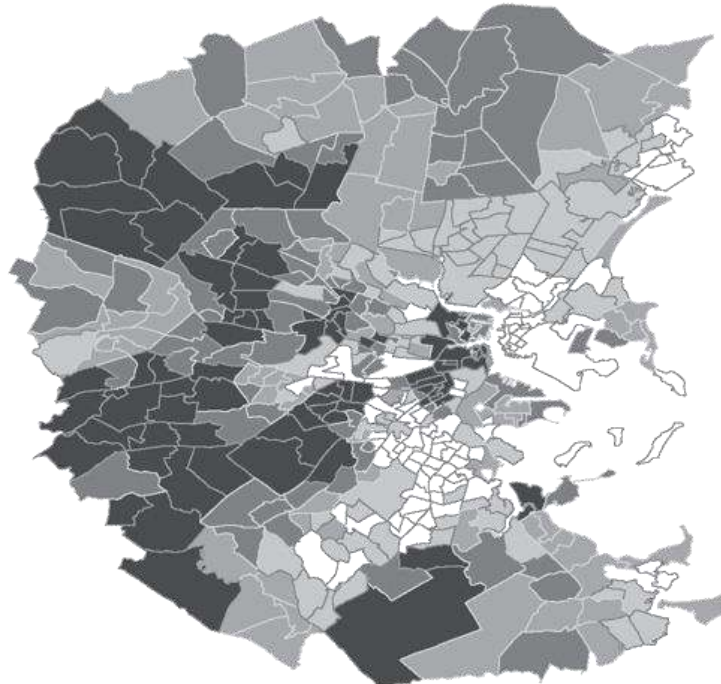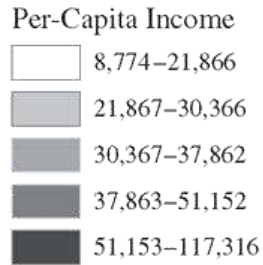
Per-Capita Income

	8,774–21,866
	21,867–30,366
	30,367–37,862
	37,863–51,152
	51,153–117,316

Stylised fact 4: people cluster

Sri Lanka:
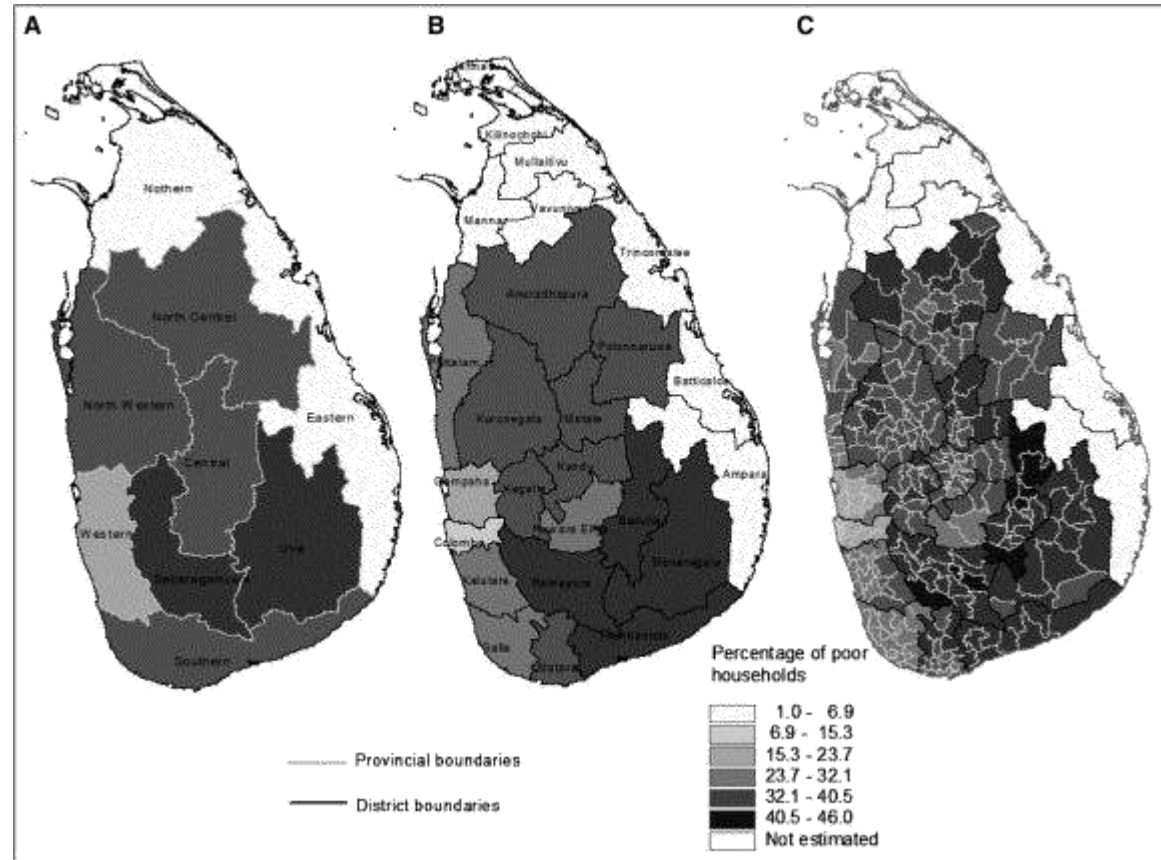
Source: Amarsinghe et al. (2005)

Stylised fact 5: the largest cities are in developing countries
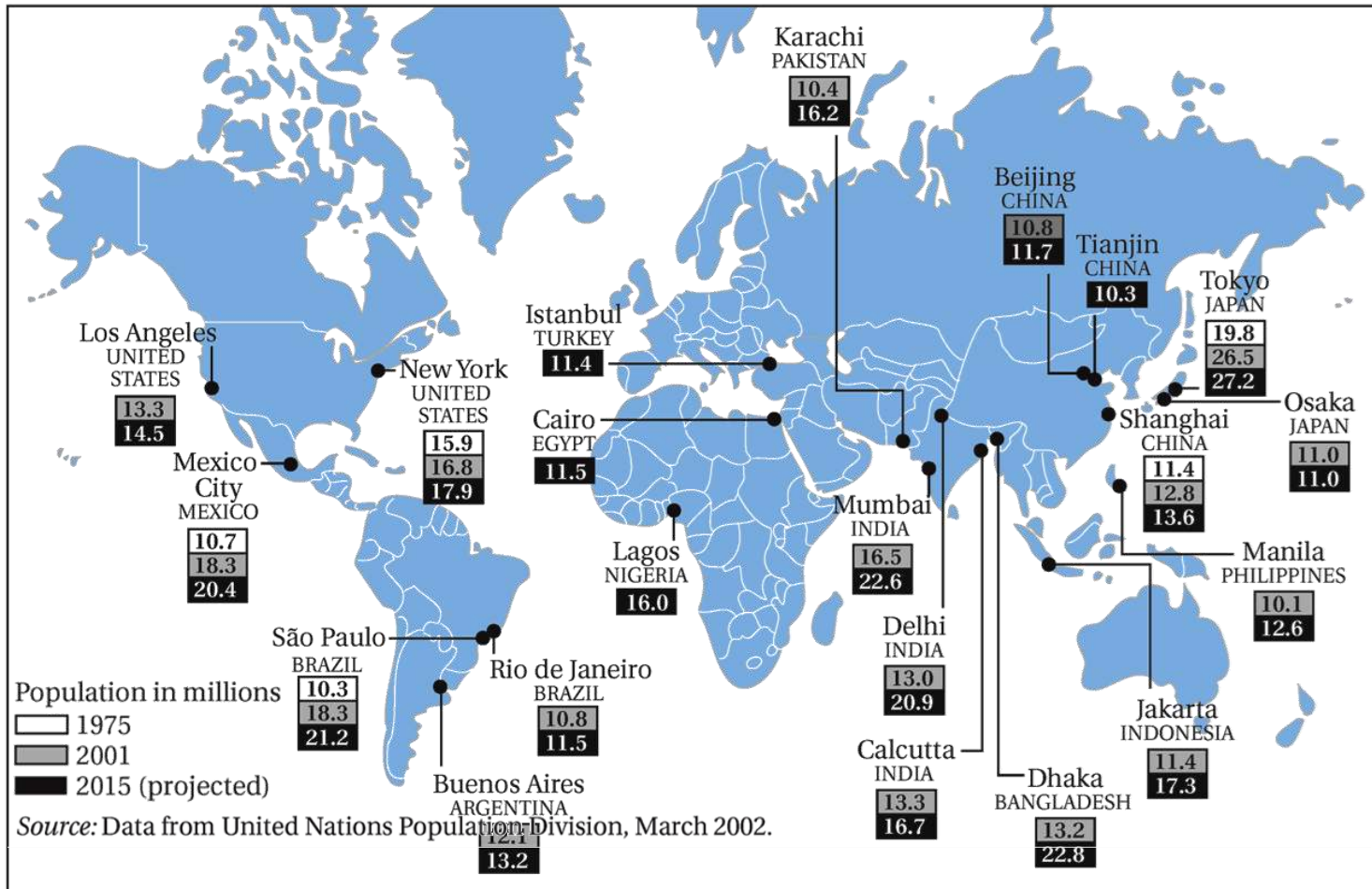
Stylised fact 6: Some cities grow faster than others

Municipal population growth
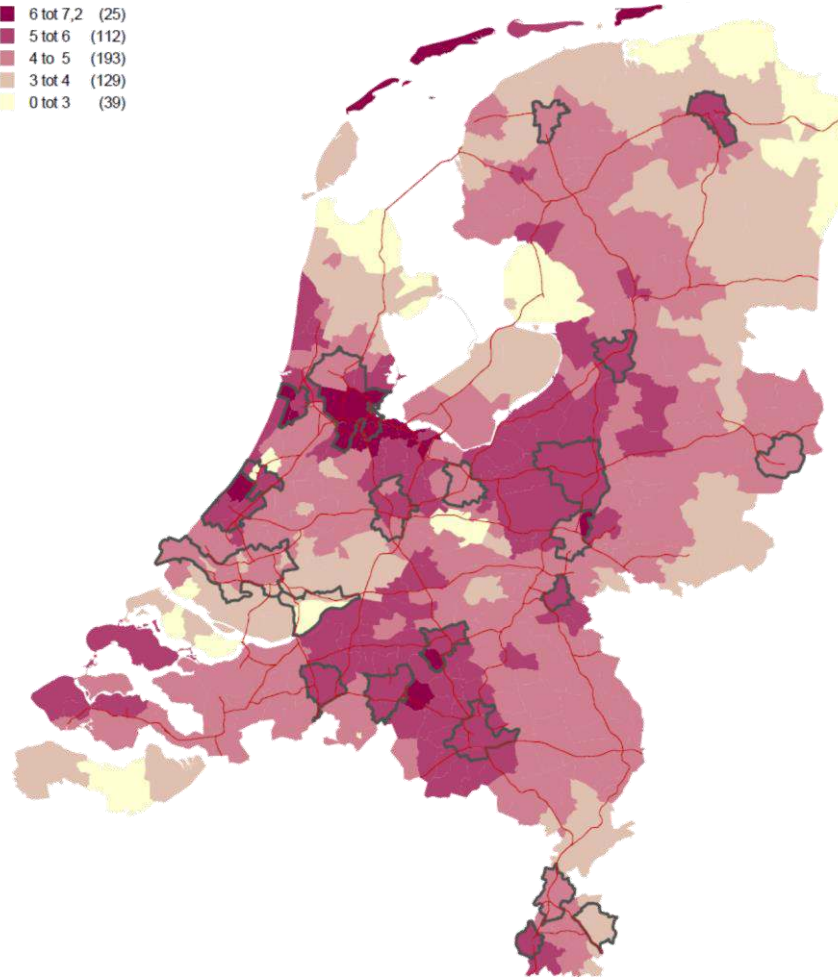
Stylised fact 7: Zipf's law

City		Rank	Size (population)	
City A	(largest)	1	100	
City B	(2nd largest)	2	50	=(1/2)*100
City C	(3th largest)	3	33	=(1/3)*100
City D	(4nd largest)	4	25	=(1/4)*100
City E	(5th largest)	5	20	=(1/5)*100
City N	(nth largest)	n		(1/n)*100

Stylised fact 7: Zipf's law

Zipf's Law for Sri Lanka
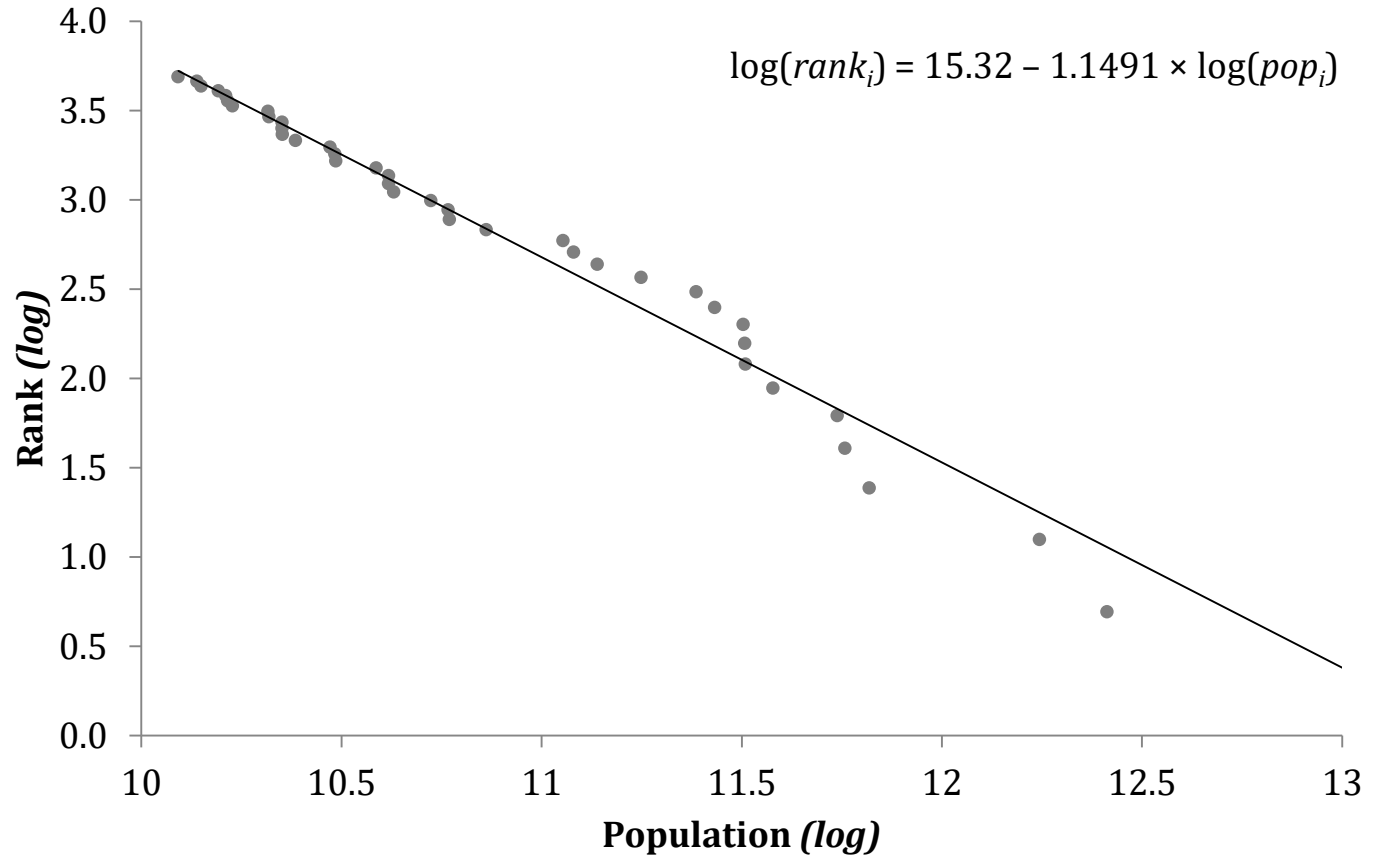
$$\log(rank_i) = 15.32 - 1.1491 \times \log(pop_i)$$

Stylised fact 8: Prices/m² differ over space

FIGURE 6–9 Panel A: Bid Rent of the Office Sector
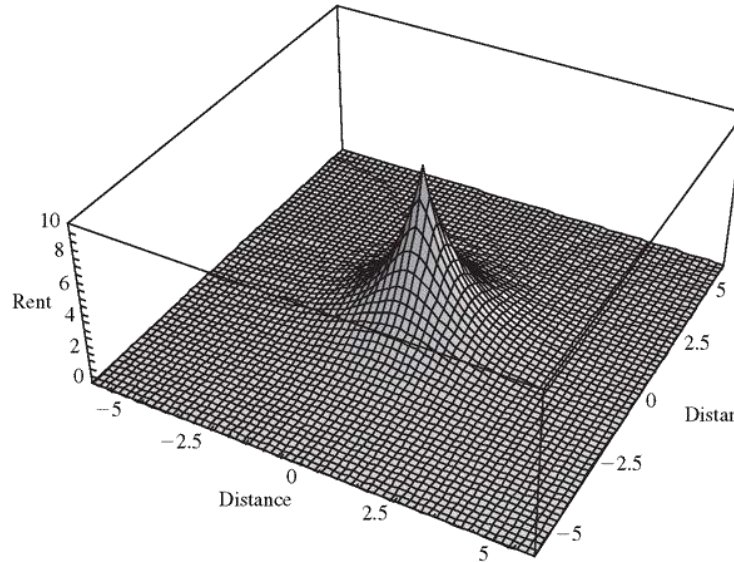
FIGURE 6–9 Panel B: Bid Rent of the Manufacturing Sector
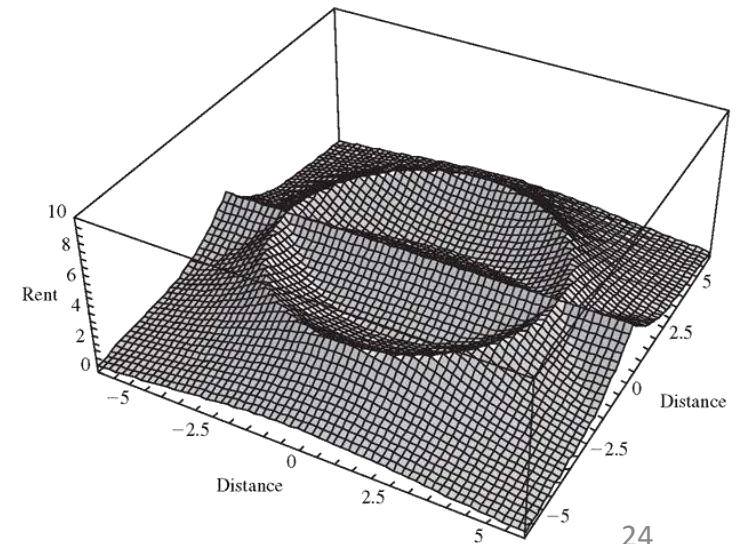
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Stylised fact 9: Larger cities have higher crime rates
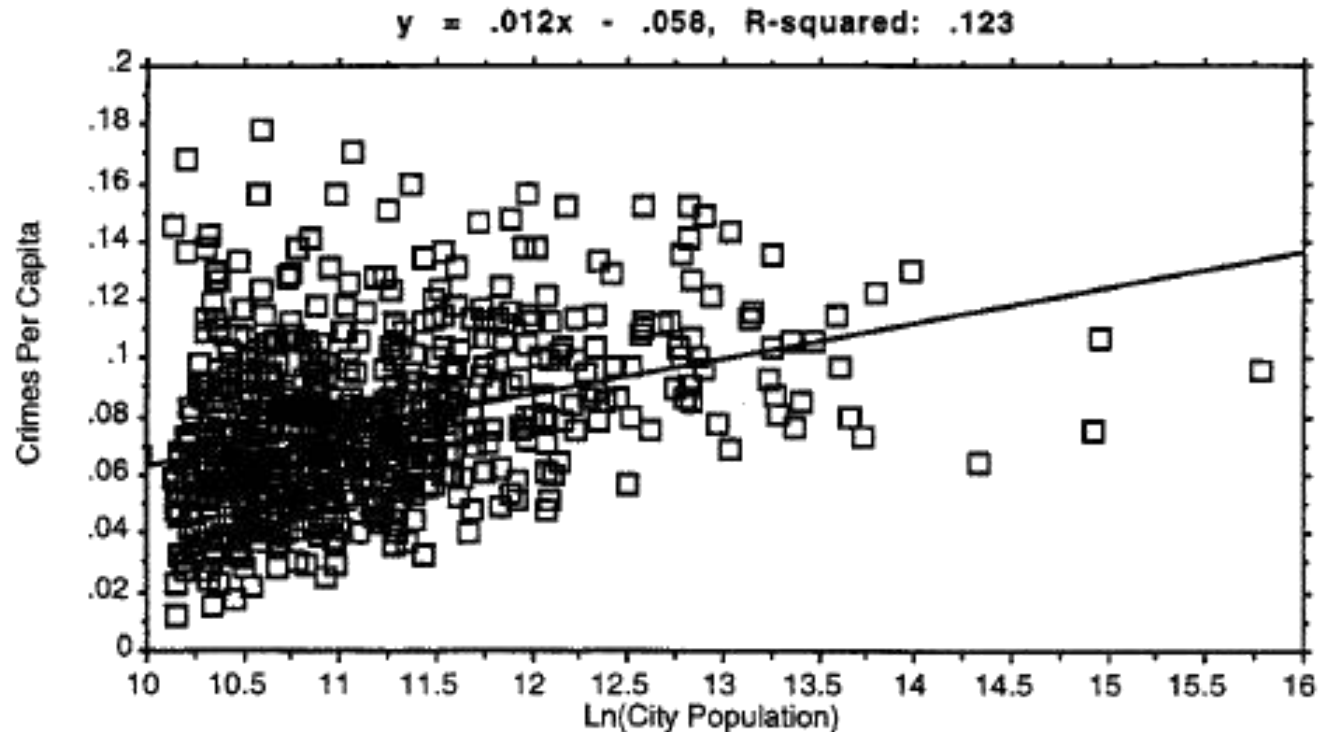
FIG. 1.—Crime and city population: relationship between crime and city population taken from the 1982 Uniform Crime Reports and the 1980 census. *t*-statistic is 9.44.

Stylised fact 10: Energy use per capita is higher for countries with more urbanisation
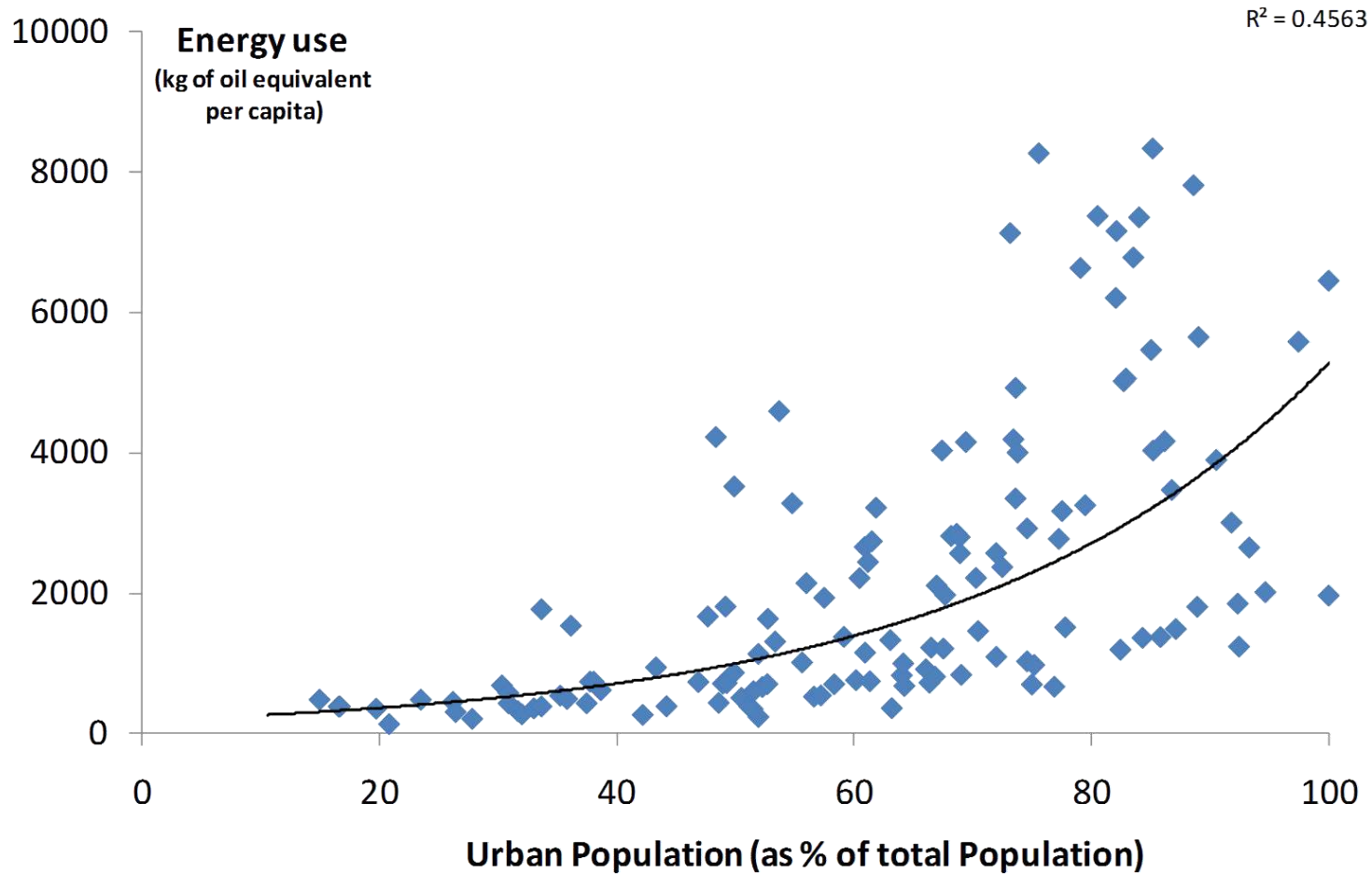
Stylised fact 11: Some buildings are taller than others

Stylised fact 12: Larger cities are more congested

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- **In this course we will try to explain most of these stylised facts**

- **Economic theories**
  - **Profit-maximising firms and utility maximising households**
  - **Externalities**
  - **Restrictions**

- **We will use data to provide evidence for these theories**
  - **Regression models**
  - **Assess statistical significance**
  - **Make a distinction between *correlation* and *causal effects* (ℚ What is the difference?)**

- **Why are people willing to live in dirty, noisy, crowded cities?**
  - **Individuals are not self-sufficient**
  - **Specialisation in specific tasks**

- **Recall definition of a city:**
  - **An area with 'high' population density**
  - **Firms and people wanting to reduce distance**

- **Recall paradox:**
  - **Growing cities vs. 'death of distance'**

- **Existence of a city requires:**
    - **Agricultural surplus**
    - **Urban production**
    - **Transportation for exchange**

Q **Can you think of non-economic reasons why cities may arise or decline?**

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▪ **Three assumptions that make city formation unattractive**

1. **Equal productivity of all land and all workers**

2. **Constant returns to scale in transport and exchange**

3. **Constant returns to scale in production**

ℚ **What is 'constant returns to scale'**

- **These assumptions imply:**

1. **Equal productivity of all land and all workers**
   - **Everybody would be self-sufficient**

2. **Constant returns to scale in transport and exchange**
   - **Exchange would only cause transport costs, no benefits**

3. **Constant returns to scale in production**
   - **No benefits of clustering of production in factories**

- **Note that clustering in space would drive up land prices (cost) without generating benefits**

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- **Relax assumption 1**
  - **Unequal productivity benefits = comparative advantage**
  - ℚ **Please provide an example of a comparative advantage**

	North		South	
	Bread	**Shirts**	**Bread**	**Shirts**
Output / hr	2	6	1	1
Opportunity cost	3 shirts	1/3 loaf	1 shirt	1 loaf

ℚ **What is the best thing to do for 'North'?**

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- **Relax assumption 1**
  - **Let's assume that 'South' switches 2 hours from shirt to bread production**

TABLE 2–2 Specialization and Gains from Trade

	North		South	
	Bread	Shirts	Bread	Shirts
Change in production from specialization	−2	+6	+2	−2

- **Relax assumption 1**
  - **Let's assume that 'South' switches 2 hours from shirt to bread production**

TABLE 2–2 Specialization and Gains from Trade

	North		South	
	Bread	Shirts	Bread	Shirts
Change in production from specialization	−2	+6	+2	−2
Exchange 4 shirts for 2 loaves	+2	−4	−2	+4
Gain from trade	0	+2	0	+2

- **Trade in itself causes no cities; families could exchange among themselves**

- **Relax assumption 2**
  - **Economies of scale in exchange**

- **Trading cities**
  - **Result of combination of productivity differences and scale economies in transport**
  - **Long history (3000 BC)**

- **Examples**
  - **Cape Town, New York**
  - **Amsterdam**
  - **Colombo**

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- **Relax assumption 3**
  - **Economies of scale in production**

- **Sources of scale economies in production**
  - **Factor specialisation (Adam Smith)**
  - **Indivisibility of inputs (minimum efficient scale)**

- **If economies of scale in production exist**
  - **Concentration, in spite of high land rents**
  - **Emergence of a market area**

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- **Relax assumption 3**
  - **Economies of scale in production**

- **Households buy the product from the factory if:**
  - **Factory price $p_f + t \cdot d < p_h$**
  - **$t \cdot d$ are total transport costs**
  - **p_h costs of home production**

- **Relax assumption 3**
  - **Economies of scale in production**

$$p_f + t \cdot d$$

p_h

p_f

distance from fact

0

boundaries of market area
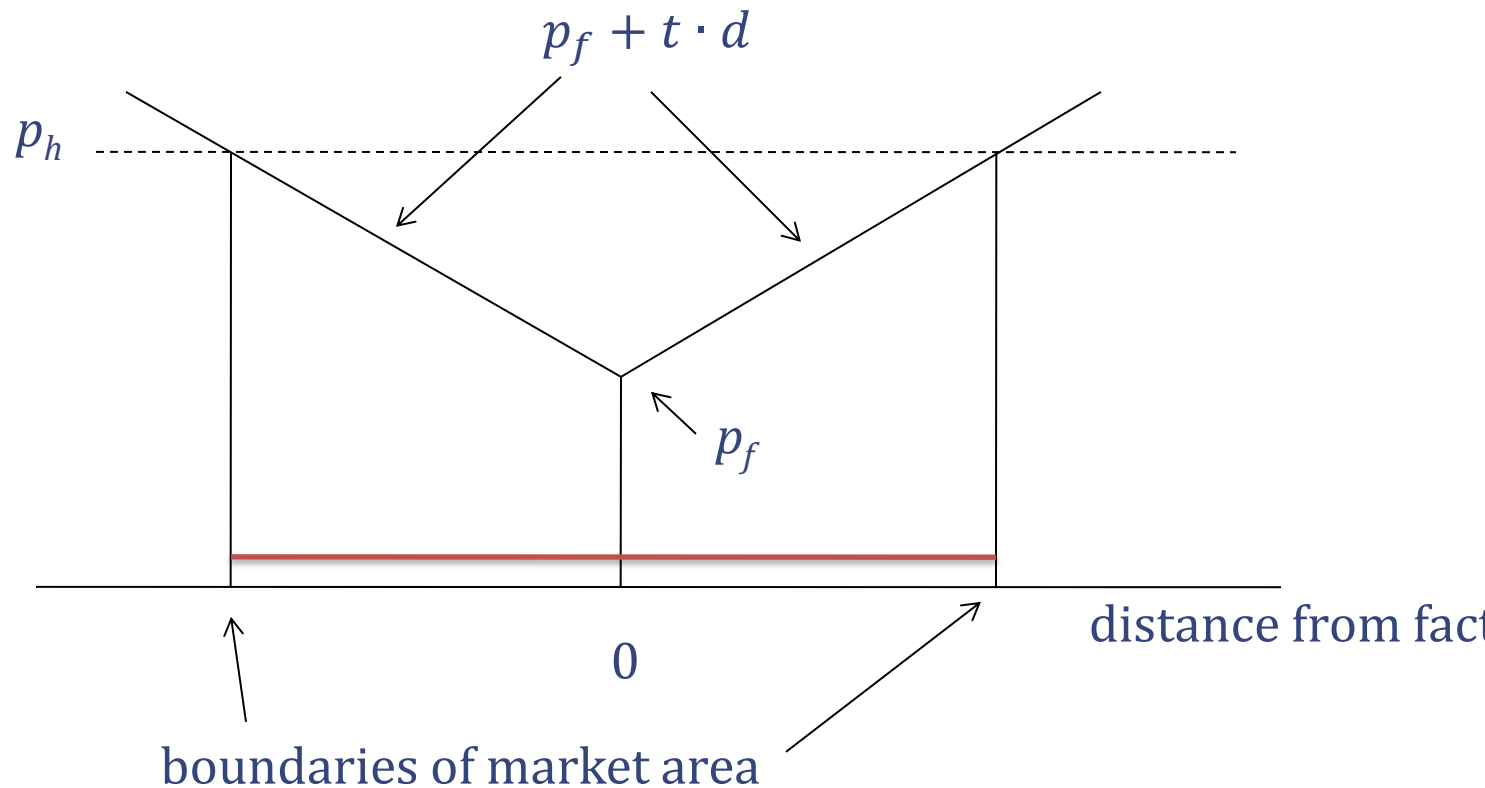
Ⓠ **What happens when transport costs go down (e.g. due to innovations)**

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- **Relax assumption 3**
    - **Economies of scale in production**

- **Market area**
    - **Total volume of demand**
    - **Number of households for which the price of the product is less than p_h**
    - **Area in which supplier underprices its competitors**

- **Factory town**
  - **Workers want to economise on commuting costs**
  - **Concentration of workers near factory**
  - **Substitution of (expensive) land for consumption of other goods**
  - **Higher population density**
  - ➔ **Factory town**

- **Simple model**
  - **Economies of scale in production (due to fixed costs)**
  - **Economies of scale in transport**
  - **It explains cities that emerge during industrial revolution**

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To summarise:

- **Cities emerge when:**

1. **Unequal productivity of land and workers**
   - **Some locations are more attractive than others**

2. **Increasing returns to scale in transport and exchange**
   - **Emergence of trading cities**

3. **Increasing returns to scale in production**
   - **Benefits of clustering of production in factories**
   - **Emergence of factory towns**

Remaining questions

- **Why do modern cities grow beyond the size of one firm?**
  - **Agglomeration economies, city size, urban growth**

- **Where do cities emerge?**
  - **Location of cities is explained by economic forces**
  - **… Location theory ➔ Wednesday**

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Questions?

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See also URBANECONOMICS.NL

- **See *www.urbaneconomics.nl/coursematerial* for lecture sheets and links to papers**

- **Test exam micro-economics**
  - **Appendix of O'Sullivan**
  - **Basic econometrics**

- **Answers will be published on** *www.urbaneconomics.nl/coursematerial*
  - **Please e-mail *name* and *grade* to** *h.koster@vu.nl*.
  - **The grade will not count for the general grade, but gives for me the general level of micro and econometrcs**

- **You may leave when you are ready**