Urban Economics

Lecture 1: Introduction

Spring 2023
Tuukka Saarimaa

Organization

- **Urban Economics (31C02100, REC-E3500)**
- **Lecturer**
  - Tuukka Saarimaa: tuukka.saarimaa@aalto.fi
  - Homepage: https://sites.google.com/site/ttsaarimaa/home
- **Course TAs**
  - Arttu Ahonen: arttu.ahonen@aalto.fi
  - Marika Ventovuori: marika.ventovuori@aalto.fi
- **Course homepage**
  - mycourses.aalto.fi -> my own courses-> Urban Economics
  - Lecture slides, assignments, return of assignments

Organization

- **Diverse set of students**
  - Economics students from the business school
  - Students from the dept. of built environment
  - Students from Urban Studies and Planning program (joint master's program with University of Helsinki)
- **Maybe less formal than usual economics courses at this stage, but maybe more formal than what non-econ students are used to**
- **In addition to theoretical models, lots of empirical examples with emphasis on causal evidence**

Course requirements

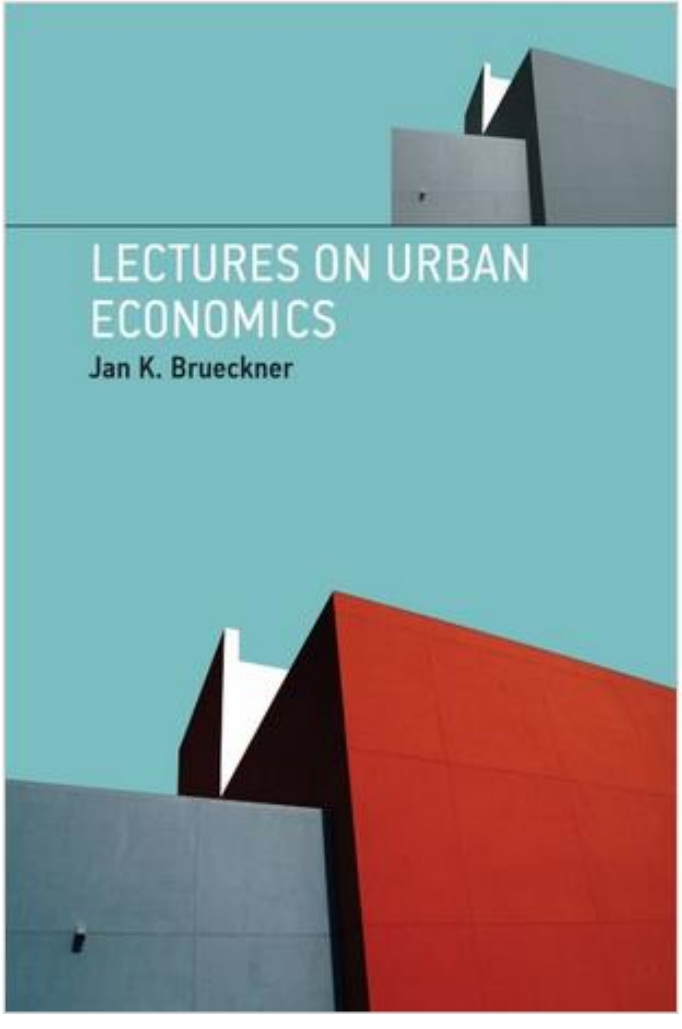
- **Grading**
  - Exam: 60%
  - Exercises/problem sets: 30%
  - Reading assignment: 10%
- **Problem sets**
  - Correct answers provided during the weekly review sessions
- **Reading assignment**
  - Read an academic paper and answer questions about the paper
  - We provide a list of papers
  - Deadline after the exam

Schedule

- **Lectures**
  - Tue: 14–16
  - Wed: 12–14
- **Problem set review sessions**
  - Wed: 14–16
  - First session next week, Jan 18
- **Exam**
  - Feb 22: 14–17

Textbook

- **Brueckner, J. 2011. *Lectures on Urban Economics*. MIT Press.**
- **Available as an Ebook through the Aalto library (aaltoReader)**
- **We will cover chapters 1–5 and 11, not the whole book**



Outline for the course

Lecture 1:	Introduction: (i) What is urban economics? (ii) Why cities exist?
Lecture 2:	Spatial Equilibrium within Cities – The Monocentric City Model
Lecture 3:	Monocentric City Model – Extensions
Lecture 4:	Urban Sprawl and Land-Use Controls
Lecture 5:	Congestion Externality
Lecture 6:	Hedonic Model
Lecture 7:	Low-Income Housing Policy
Lecture 8:	Segregation and Neighborhood Effects
Lecture 9:	Housing supply and Urban Planning
Lecture 10:	Spatial Equilibrium Across Cities
Lecture 11:	Spatial Equilibrium Across Cities - Extensions
Lecture 12:	Recap

Outline for this lecture

- **What is urban economics?**
- **Stylized facts about the distribution of production and people in space, and productivity and city size**
- **Why cities exist?**
  - Agglomeration benefits in production and consumption
  - Congestion problems
- **An empirical example of identifying agglomeration benefits**

What is urban economics?

What is urban economics?

- **Studies the economic forces that lead to the existence of cities and regional agglomeration and the urban structure within cities**
  - Want to understand the benefits from eliminating distance between people and firms (agglomeration economies)
  - But also, the costs and problems related to cities and increased density (congestion, pollution, noise, housing costs etc.)
- **Ultimately, the focus is on the underlying motives of people and firms making locational decisions**
  - Where to live and work, where to produce, how much land or space to consume etc.

What is urban economics?

- **Fundamental tool in the analysis is the notion of locational or spatial equilibrium**
- **Basically, means that there are no free lunches to gain by changing location**
  - Arises when people and firms can move freely and choose their optimal location as prices adjust
  - Positive attributes in each location are offset by negative attributes
  - Most simple version states that for households

    Income + Amenities – Housing costs – Commuting costs
  - is constant across space

What is urban economics?

- **Number of subfields including**
  - Housing economics, housing and urban policy, segregation and neighborhood effects, transportation/traffic, urban environment, local public economics, development, politics
- **Like most fields in economics these days, urban economics is highly empirical**
  - Availability and use of geocoded spatial data and GIS tools
  - Credibility revolution in empirical economics (econometrics): identification of causal effects and emphasis on research design
- **But theoretical models are also important**

Urban economics resources

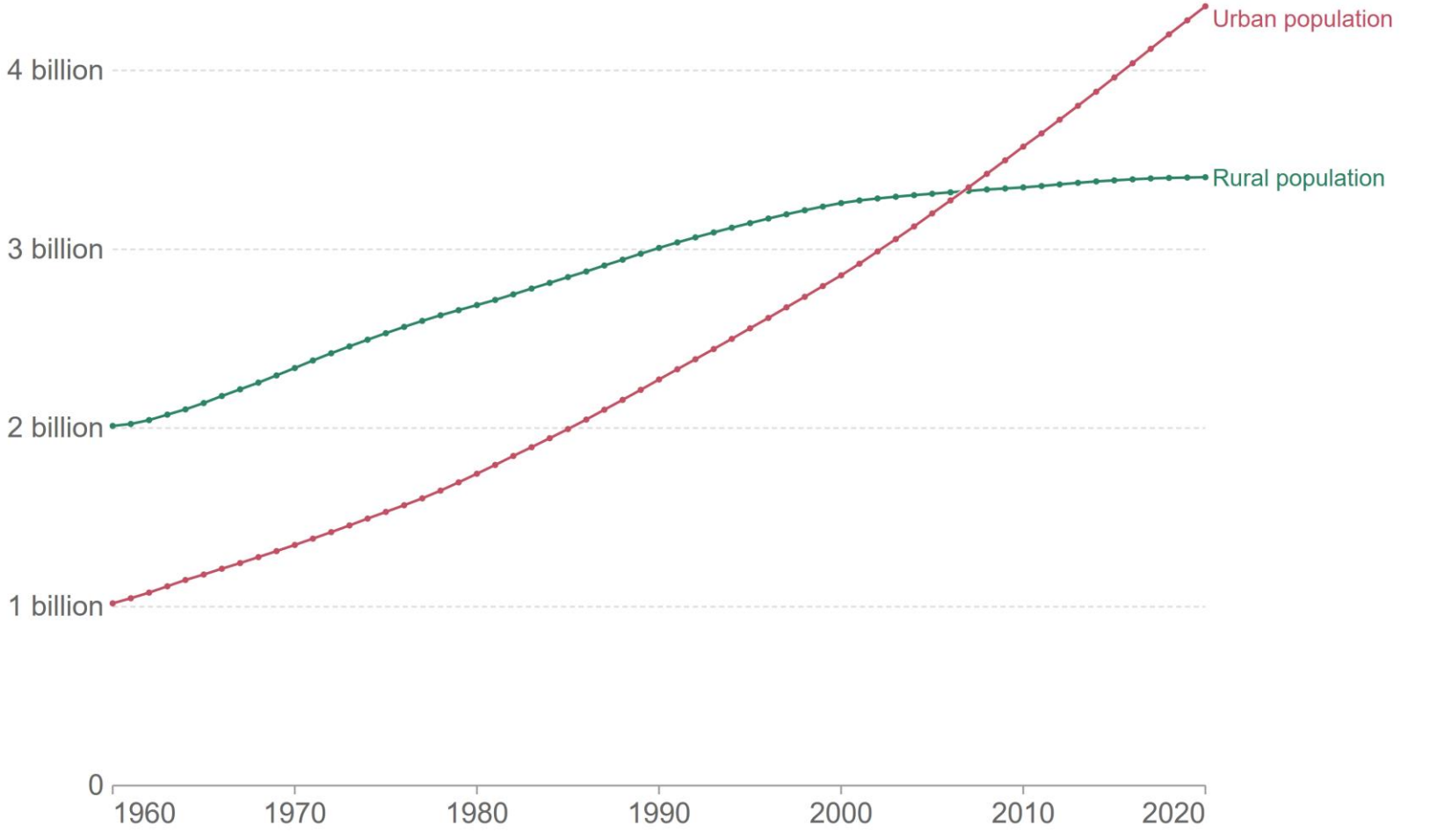
- **Handbook of Regional and Urban Economics:**
  - http://www.sciencedirect.com/science/handbooks/15740080
- **Journals:**
  - Leading field journals:
    - *Journal of Urban Economics, Regional Science and Urban Economics, Journal of Economic Geography, Journal of Housing Economics*
  - Urban economics papers are also regularly published in top general interest journals such as:
    - *American Economic Review, Econometrica, Journal of Political Economy, Quarterly Journal of Economics and Review of Economic Studies, Journal of the European Economic Association, Review of Economics and Statistics, Economic Journal, AEA's field journals etc.*
    - *Journal of Economic Perspectives by the American Economic Association also publishes articles on urban economic issues (free access, aimed at the general audience)*

Urban economics at Aalto

- **Three professors at the econ department**
  - Prottoy Akbar (joint BIZ and ENG), Tuukka Saarimaa (joint BIZ and ENG), Pablo Warnes (and Oskari Harjunen at ENG)
- **Prottoy and Pablo teach a PhD level urban economics course**
- **Prottoy teaches transportation economics (ENG) and Pablo teaches a master's level trade course**
- **We run an urban econ seminar at the Helsinki GSE**
- **We will start a GSE research group during the spring and start running PhD workshops**

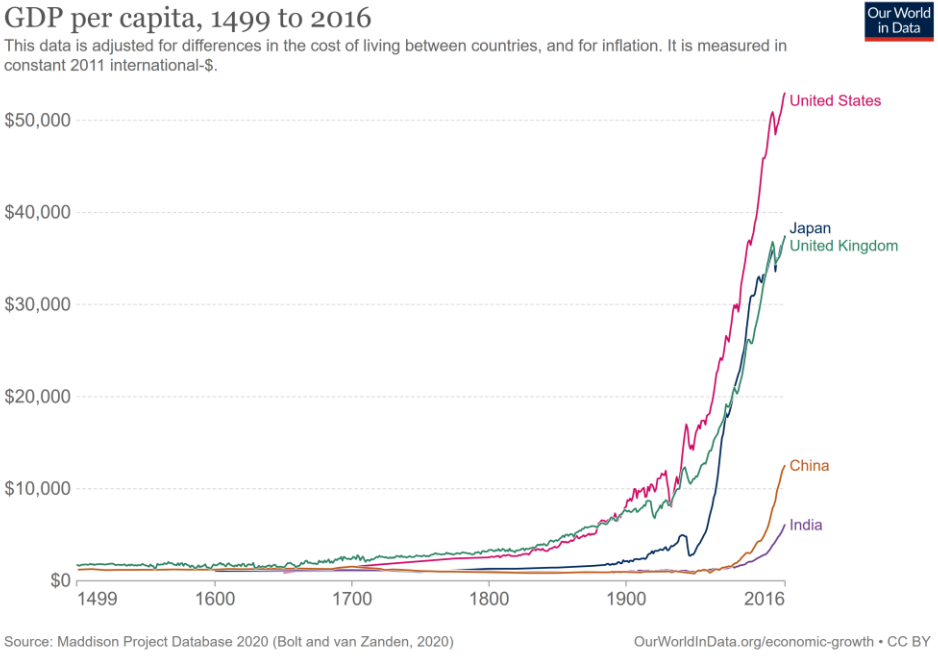
Spatial distribution of output and people – stylized facts

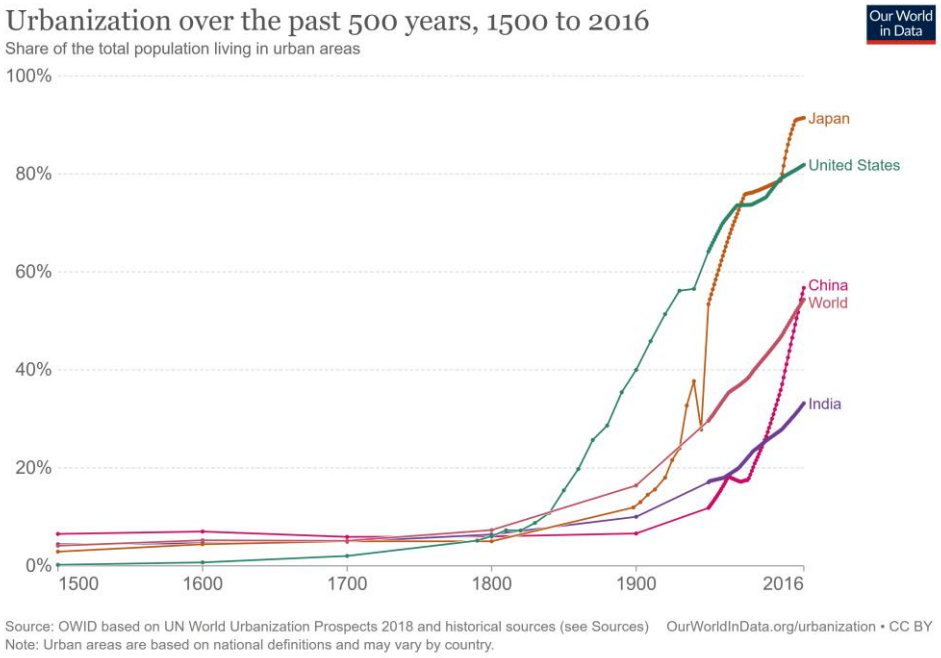
Number of people living in urban and rural areas, World



Source: World Bank based on data from the UN Population Division
Note: Urban populations are defined based on the definition of urban areas by national statistical offices.

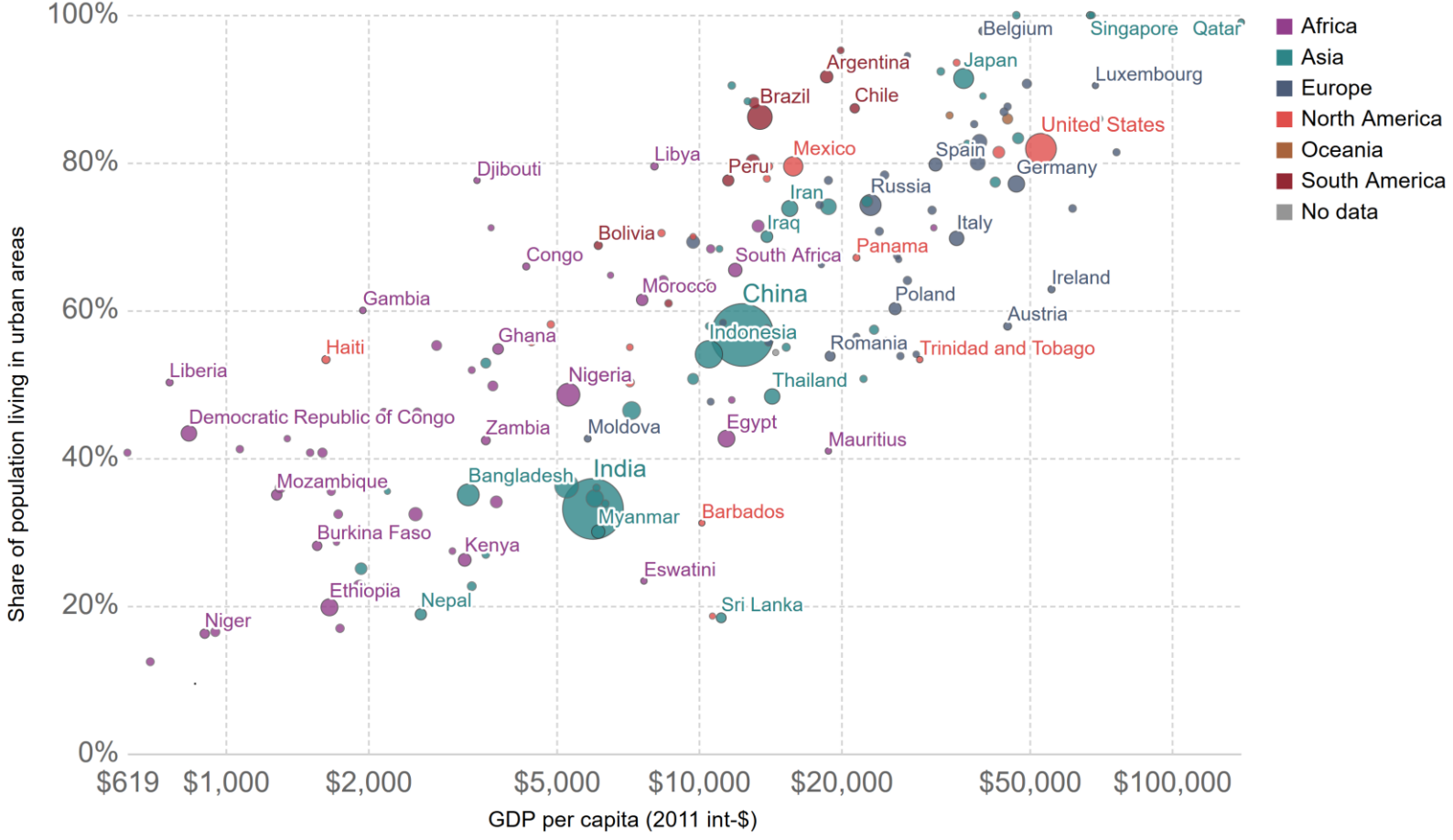
Kaupungistuminen ja talouskasvu





Urban population vs. GDP per capita, 2016

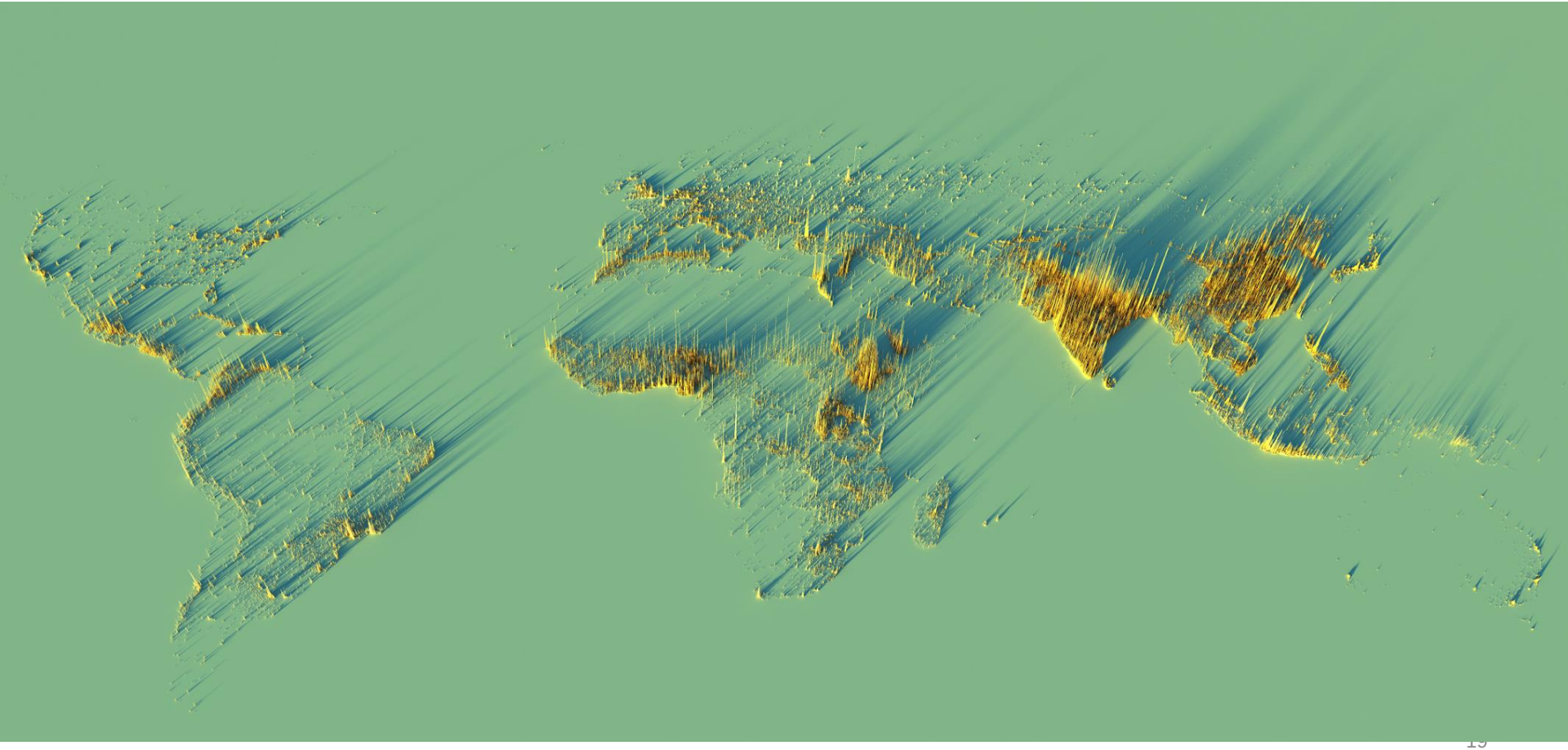
Share of the total population living in urban areas versus gross domestic product (GDP) per capita, measured in 2011 international-$.



Source: OWID based on UN World Urbanization Prospects (2018), Maddison Project Database (2018) OurWorldInData.org/urbanization • CC BY

Source: Our World in data. https://ourworldindata.org/urbanization

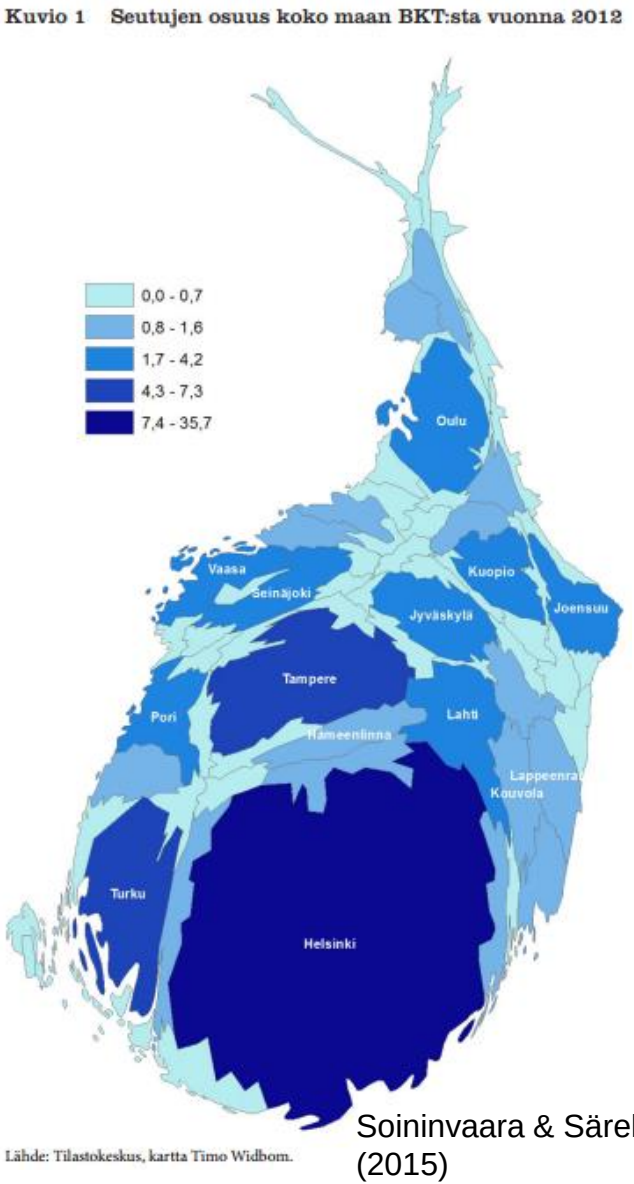
Spatial distribution of people globally



Source: http://www.statsmapsnpix.com/2020/11/how-to-make-3d-population-density.html

Spatial distribution of output and people

- **In 2010, 4.4% of Finland's land area was built-up or paved**
- **For the US, the figure is roughly 2%**
- **HMA (Helsinki, Espoo, Vantaa, Kauniainen):**
  - 0,2% of total land area
  - 19% of population
  - 30% of GDP
- **Hard to explain without some kind of agglomeration economies**



Soininvaara & Särelä (2015)

Spatial distribution of output – US

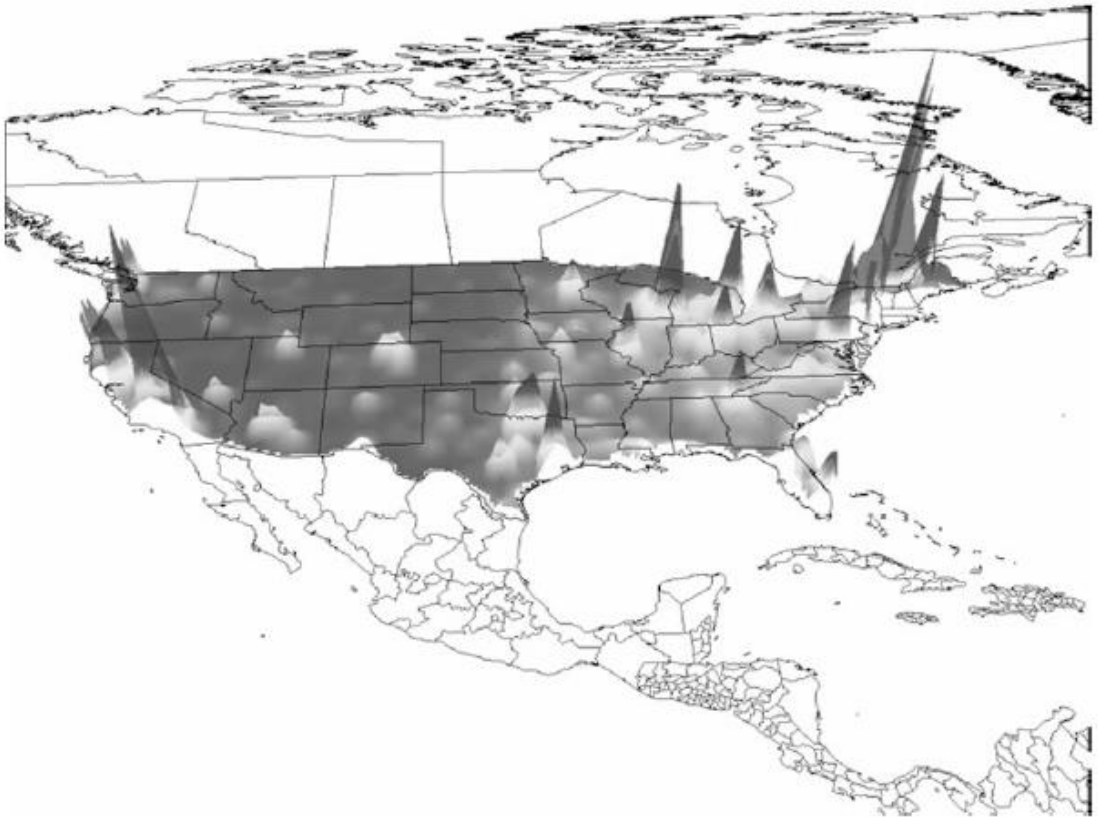


Figure 1 *Spatial distribution of economic output in the US, by square mile.* Notes: This figure reports the value of output produced in the US by square mile.

Moretti, E. 2011. Local Labor Markets. In D. Card, O. Ashenfelter (ed.), *Handbook of Labor Economics*, Vol. 4, Part B, 1237-1313

Spatial concentration of innovation activity – US

Panel A. Computer science

San Jose-San Francisco-Oakland, CA	0.261
New York-Newark-Bridgeport, NY-NJ-CT-PA	0.092
Seattle-Tacoma-Olympia, WA	0.082
Austin-Round Rock, TX	0.060
Boston-Worcester-Manchester, MA-NH	0.047
Los Angeles-Long Beach-Riverside, CA	0.039
Minneapolis-St. Paul-St. Cloud, MN-WI	0.034
Raleigh-Durham-Cary, NC	0.028
Denver-Aurora-Boulder, CO	0.023
San Diego-Carlsbad-San Marcos, CA	0.023
Portland-Vancouver-Beaverton, OR-WA	0.022
Washington-Baltimore-Northern Virginia, DC-MD-VA-WV	0.019
Dallas-Fort Worth, TX	0.015
Chicago-Naperville-Michigan City, IL-IN-WI	0.015

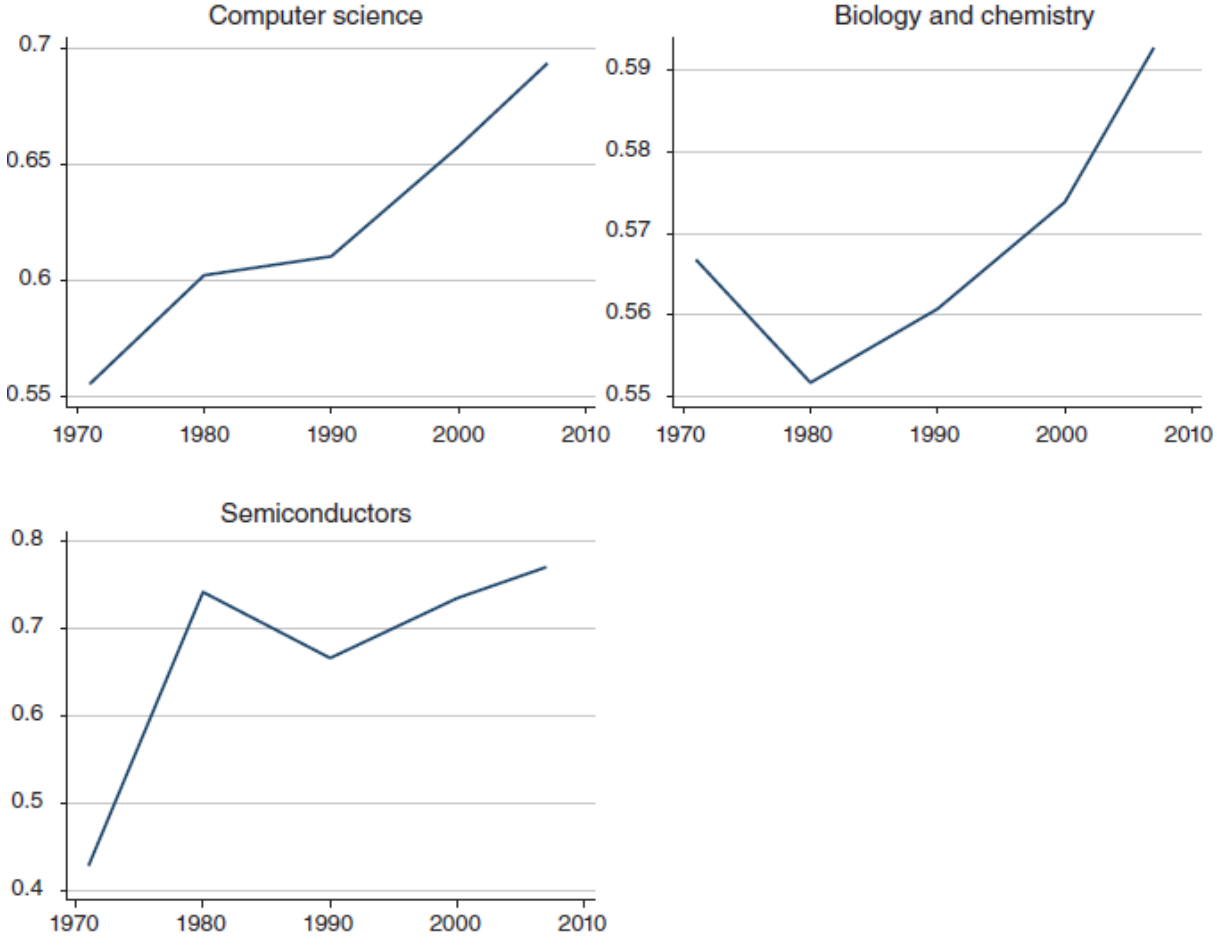


FIGURE 1. SHARE OF TOP TEN CITIES OVER TIME

Productivity and city size – US

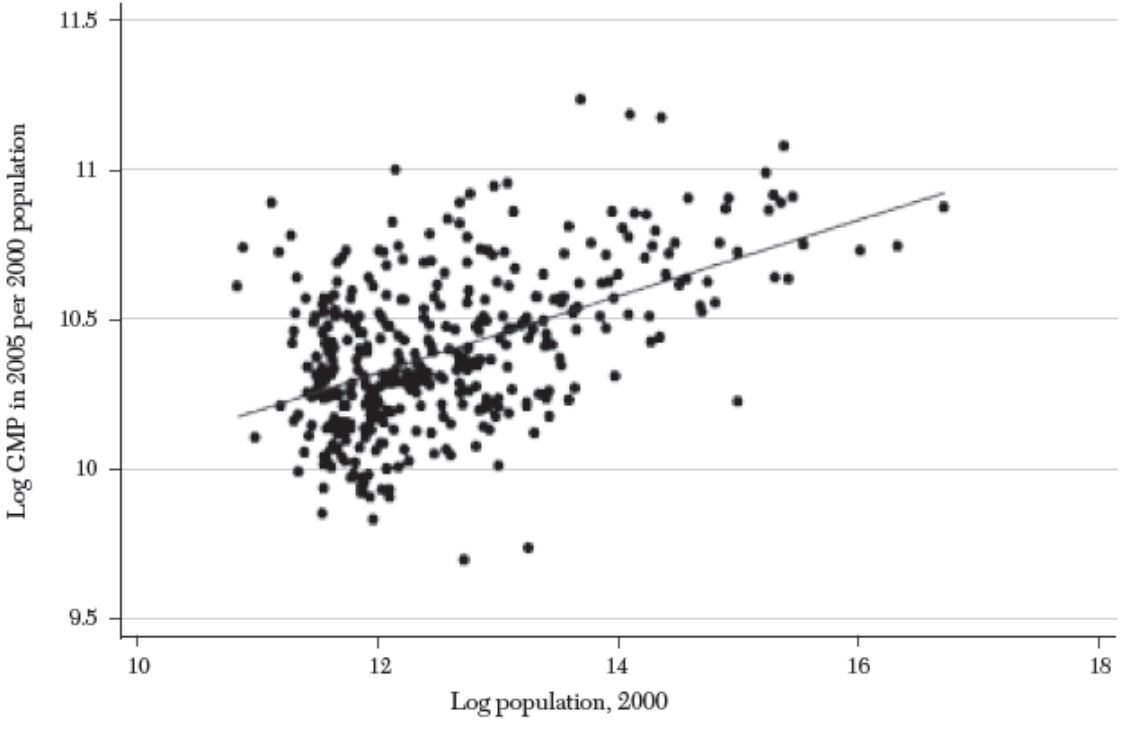


Figure 1. Productivity and City Size

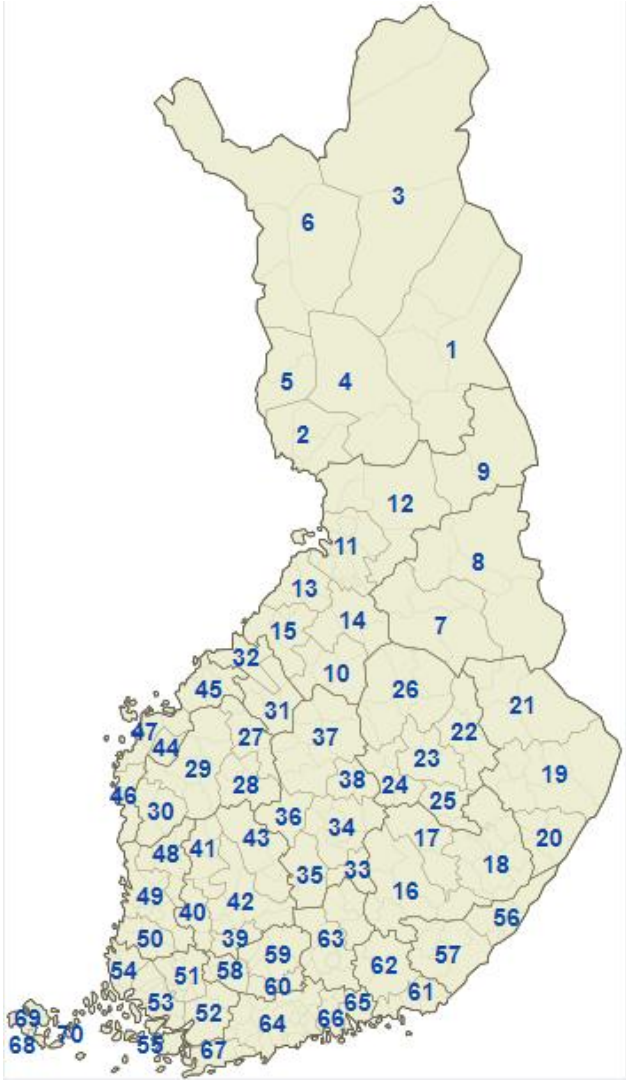
Notes: Units of observation are Metropolitan Statistical Areas under the 2006 definitions. Population is from the Census, as described in the Data Appendix. Gross Metropolitan Product is from the Bureau of Economic Analysis.

The regression line is log *GMP per capita* = 0.13 [0.01] × log *population* + 8.8 [0.1].
$R^2 = 0.25$ and $N = 363$.

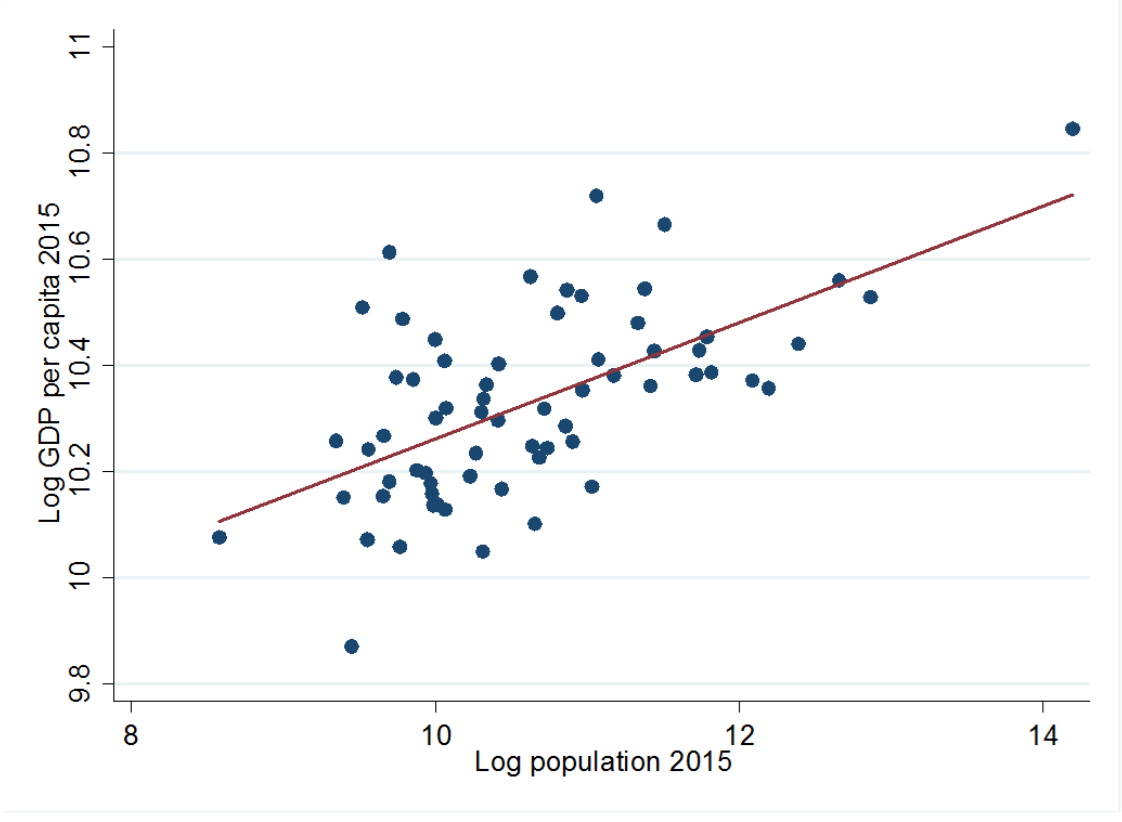
Glaeser, E. L., and J. D. Gottlieb. 2009. The Wealth of Cities: Agglomeration Economies and Spatial Equilibrium in the United States. *Journal of Economic Literature,* 47(4): 983-1028.

Local labor markets in Finland

- ***Seutukunta*** **division**
- **Idea: each *seutukunta* is a labor market area**
- **In order to work in the area, you need to live there**
- **Not a perfect division**

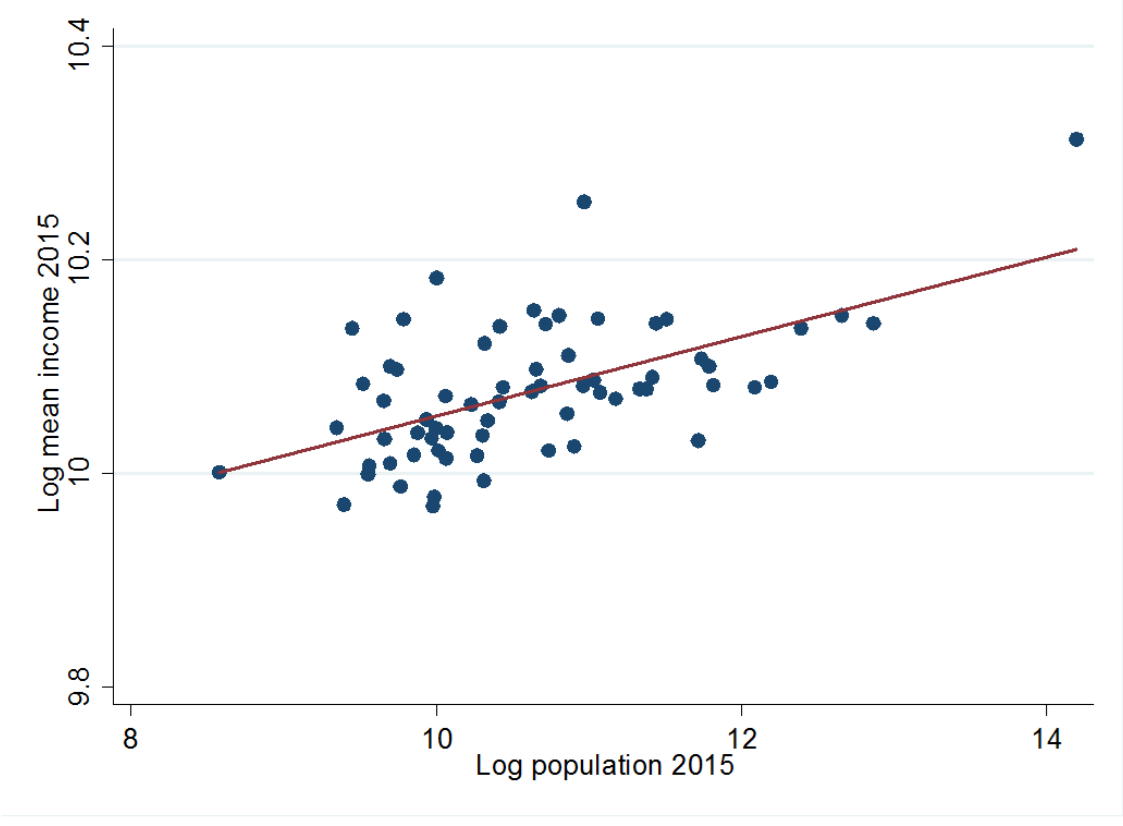


Productivity and city size – Finland



Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log GDP = 0.1095 [0.0161] * Log population + 9.167 [0.177]
R^2 = 0.37, N = 66.

Productivity and city size – Finland



Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log mean income = 0.037 [0.008] * Log population + 9.681 [0.081]
R^2 = 0.33, N = 66.

Income over time – US

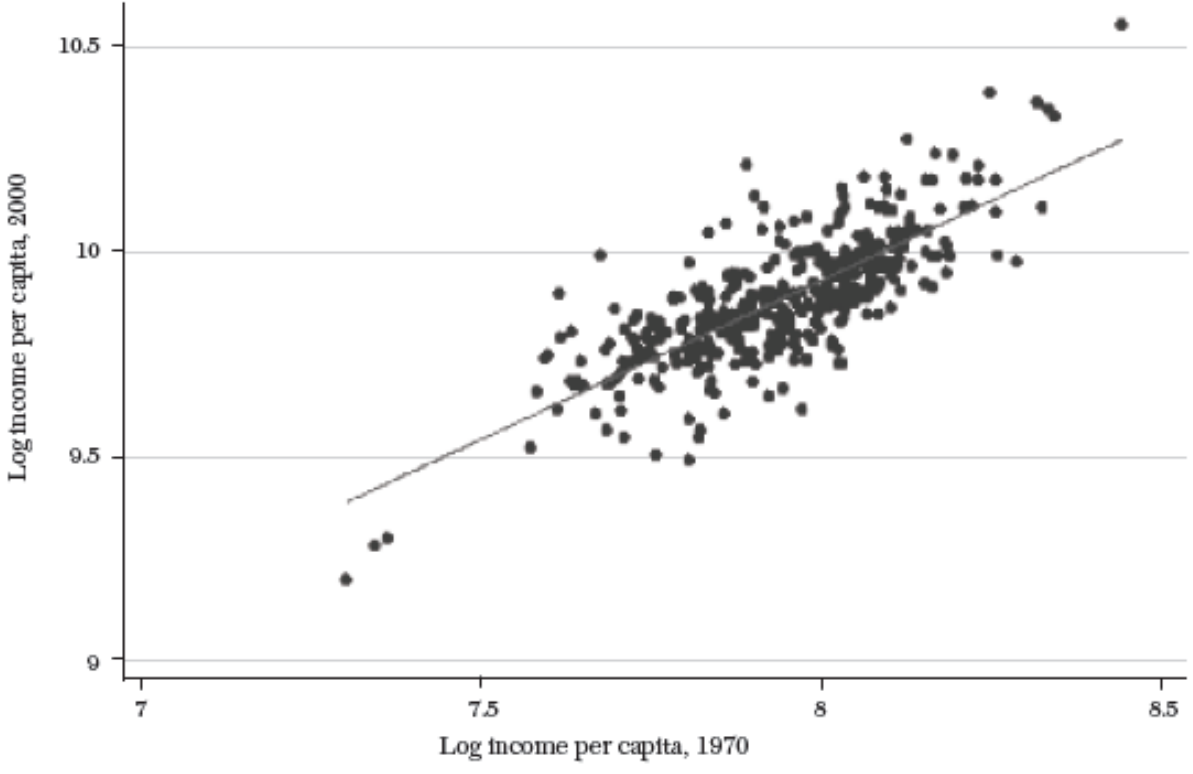
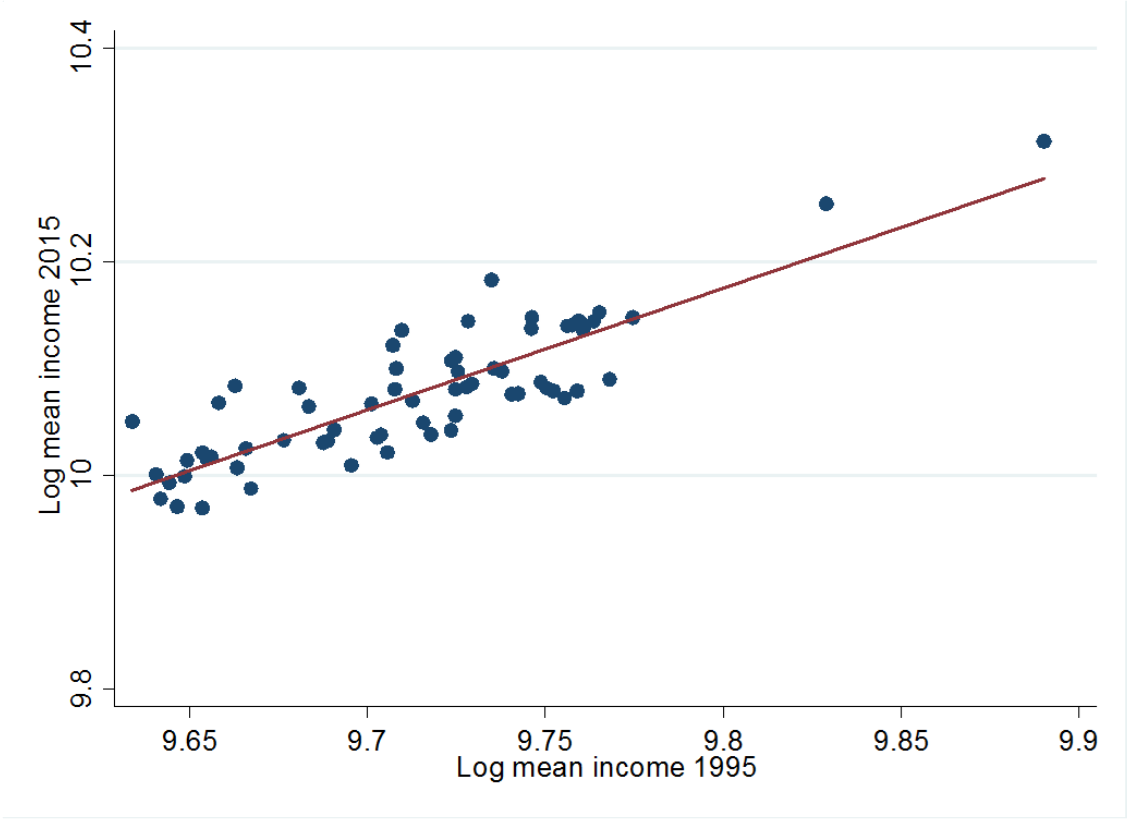


Figure 2. Income Over Time

Notes: Units of observation are Metropolitan Statistical Areas under the 2006 definitions, using Metropolitan Divisions where applicable. Data are from the Census, as described in the Data Appendix.

The regression line is *Income 2000* = 0.77 [0.03] × *Income 1970* + 3.75 [0.26].
$R^2 = 0.60$ and $N = 363$.

Income over time – Finland

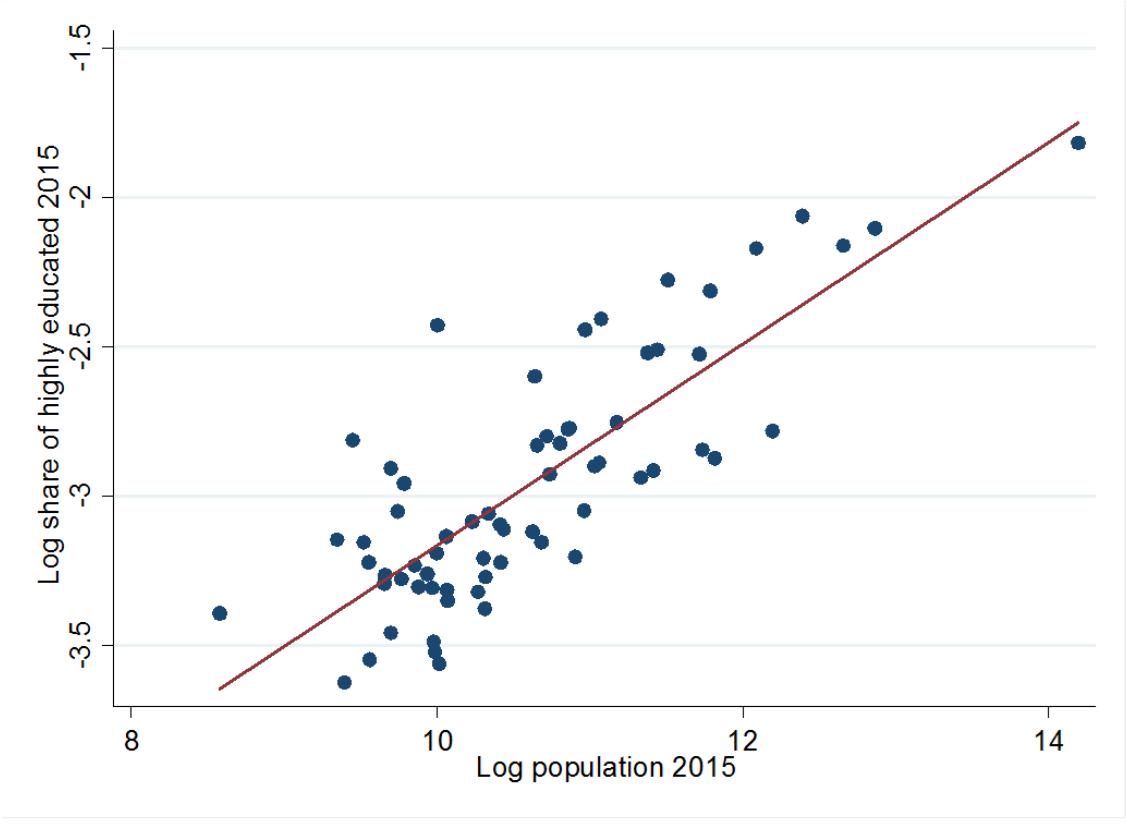


Notes: Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log mean income 2015 = 1.140 [0.0882] * Log mean income 1995 – 0.999 [0.8567]
R^2 = 0.74, N = 66.

Is this causal?

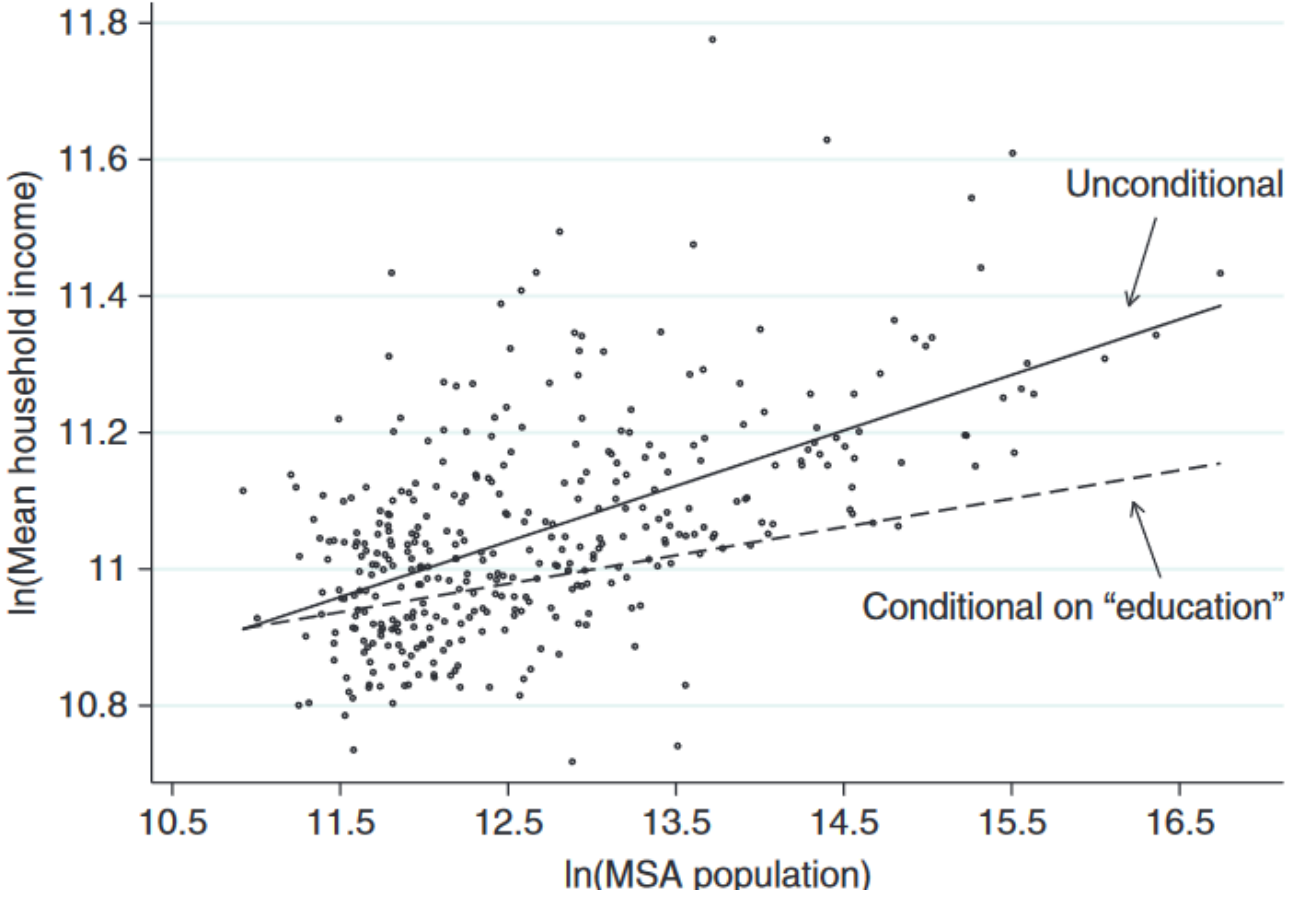
- **Do large urban areas make workers and firms more productive or are workers and firms in large cities different than their counterparts in smaller places?**
  - Agglomeration or sorting?
- **This a crucial question for urban and regional policy**
  - If workers are more productive in large cities, we may be able increase total productivity by simply allowing cities to grow

Human capital and city size – Finland



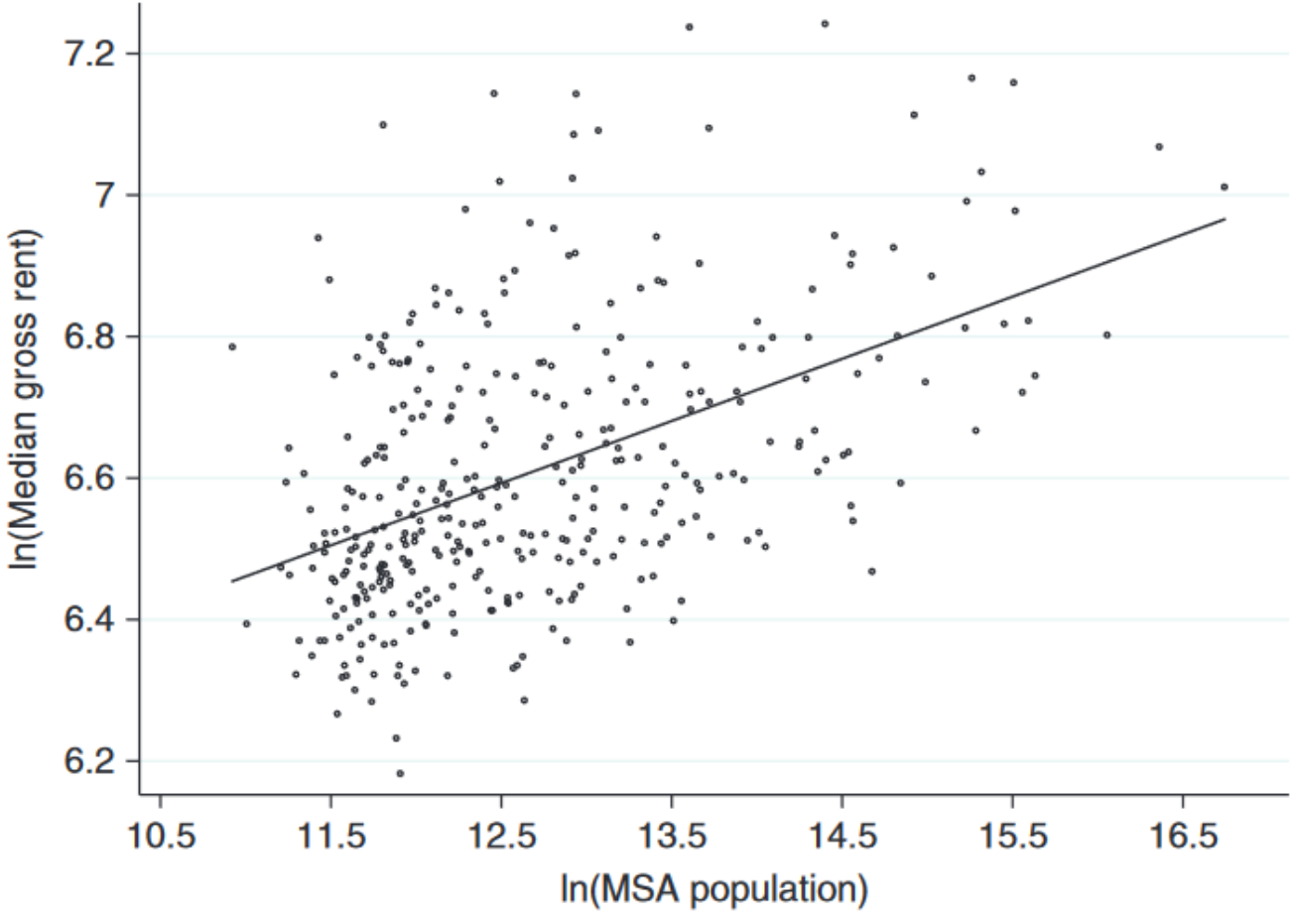
Notes: Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log share of highly educated = 0.337 [0.029] * Log mean income – 6.542 [0.308]
R^2 = 0.65, N = 66.

Income conditional on human capital – US



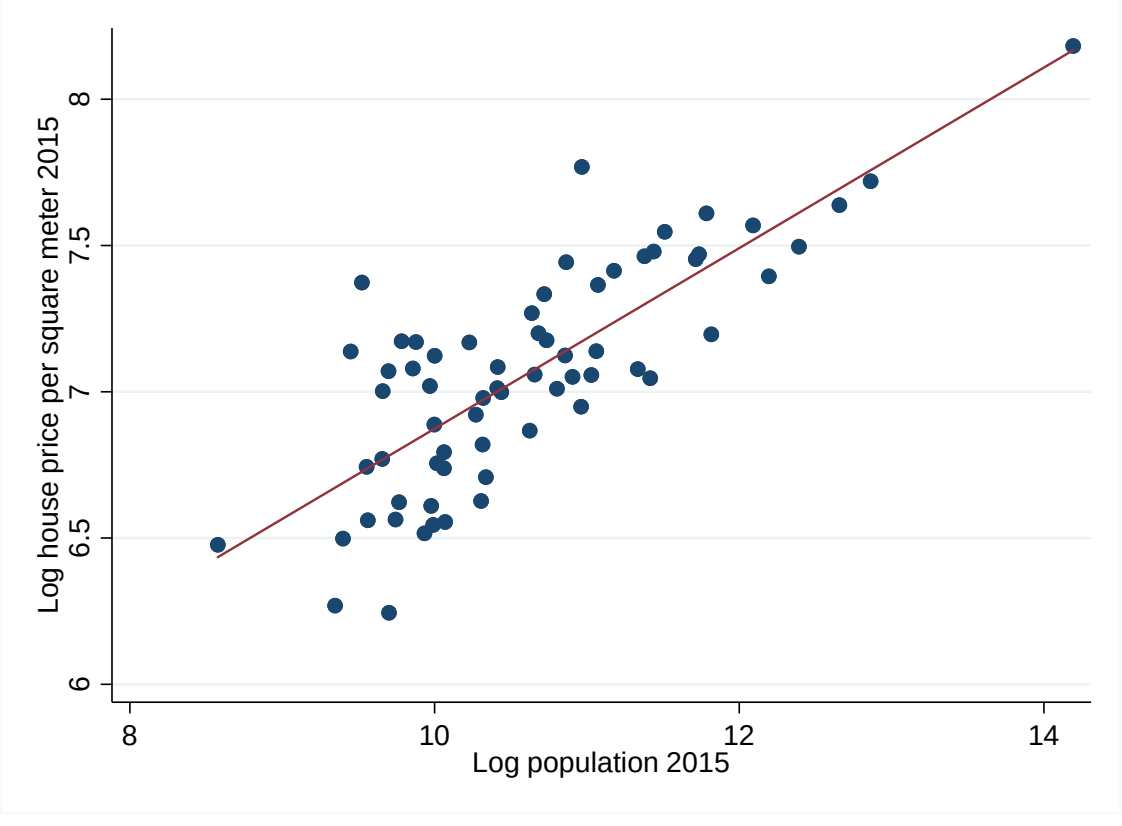
Behrens, K. and F. Robert-Nicoud. 2015. Agglomeration Theory with Heterogeneous Agents. In G. Duranton, J.V. Henderson, W.C. Strange (ed.), *Handbook of Regional and Urban Economics*. Vol. 5, 171-245

Rents and city size – US



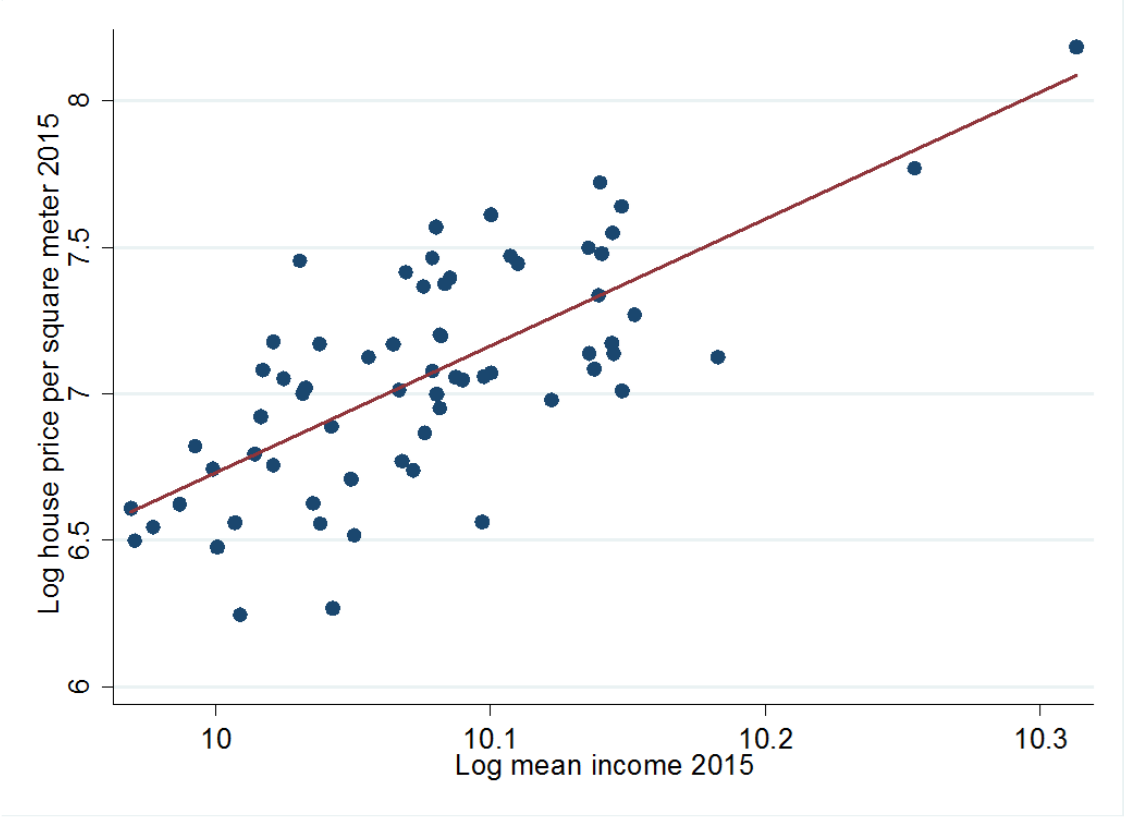
Behrens, K. and F. Robert-Nicoud. 2015. Agglomeration Theory with Heterogeneous Agents. In G. Duranton, J.V. Henderson, W.C. Strange (ed.), *Handbook of Regional and Urban Economics*. Vol. 5, 171-245

House prices and city size – Finland



Notes: Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log house price = 0.308 [0.025] * Log population + 3.787 [0.283]
R^2 = 0.63, N = 66.

Income and house prices – Finland



Notes: Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log house price = 4.332 [0.400] * Log mean income – 36.59 [4.036]
R^2 = 0.51, N = 66.

Income and house prices – Finland

Notes: Notes: Data come from Statistics Finland's Paavo and Statfin database. Units of observation are Seutukunta Areas under the 2015 definitions.
The regression line is Log house price = 4.690 [1.439] * Change in log mean income + 5.360 [0.517], R^2 = 0.17, N = 66.

Patterns

- **People and production are very unequally distributed across space**
- **Workers in bigger cities are more productive and they earn higher wages**
  - Productivity differences are only partly explained by sorting of different types of workers to different areas
- **These productivity and earnings differences across space seem to be persistent**
- **Bigger cities are also more expensive to live in**
  - Remember spatial equilibrium!

Why cities exist?

Why cities exist?

- **Different disciplines have different views**
  - A military historian might say it is easier to defend against attacks if populations are concentrated into cities
  - A sociologist might point out that people like to interact socially and in order to do that they must be spatially concentrated
- **Economist tend to focus on jobs and the location of employment and firms**
  - Economic forces cause employment to be concentrated in space
  - Concentration of jobs lead to concentration of residences as workers locate near their worksite => the result is a city
  - Cities are labor markets!

Scale economies

With scale economies, businesses become more efficient at large scales of operation

- More output per unit of input than at smaller scales
- Division of labor

Scale economies favor the formation of large enterprises or factories, and thus, spatial concentration of employment

- See Chapter 1 in Bruckner for details and examples

Agglomeration economies

Scale economies can explain how company towns form, but large cities require agglomeration economies

At their broadest level, agglomeration economies occur when individuals and firms benefit from being near others

- It is costly to locate into large labor markets, and thus, there must be some benefits from it as well
- Why would a firm producing tradable goods (sold to the whole country or world markets) locate into an expensive area?

Transportation costs also influence where a firm locates, and they can lead to, or reinforce, spatial concentration of jobs

Agglomeration economies in production

- **Spatial distribution of population and overwhelming evidence on productivity advantages of cities point to some sort of externalities**
  - Externality/spillover = cost or benefit that affects a third party who did not choose to incur that cost or benefit
- **These externalities are often referred to as agglomeration, but there are many different mechanisms at work**
- **An often-used taxonomy for the mechanisms is**
  - Sharing, matching and learning

Agglomeration economies in production

- **Brueckner divides agglomeration economies into pecuniary agglomeration economies and technological agglomeration economies**
  - Pecuniary agglomeration economies lead to a reduction in the cost of firm's inputs without affecting the productivity of inputs
  - Technological agglomeration economies raise the productivity of the inputs without lowering their costs

- **See Chapter 1 in Brueckner for more details and examples**

Sharing

- **Agglomeration through sharing occurs when large numbers of firms or workers benefit by drawing from a common pool of resources when organizing their activities**
- **A larger market allows for a more efficient sharing of**
  - Local infrastructure and facilities,
  - A variety of intermediate input suppliers,
  - A pool of workers with similar skills

Matching

- **The labor market matches different types of workers and firms**
  - The better the match, the higher the benefits to both (match value)
- **Due to search and matching frictions in the labor market, a larger market allows for better matching between employers and employees**
  - Better matching can take the form of improved chances of finding a match, a higher quality of matches, or a combination of both
  - Enhanced for married couples
- **This applies to matches between buyers and suppliers, and business partners as well**

Learning

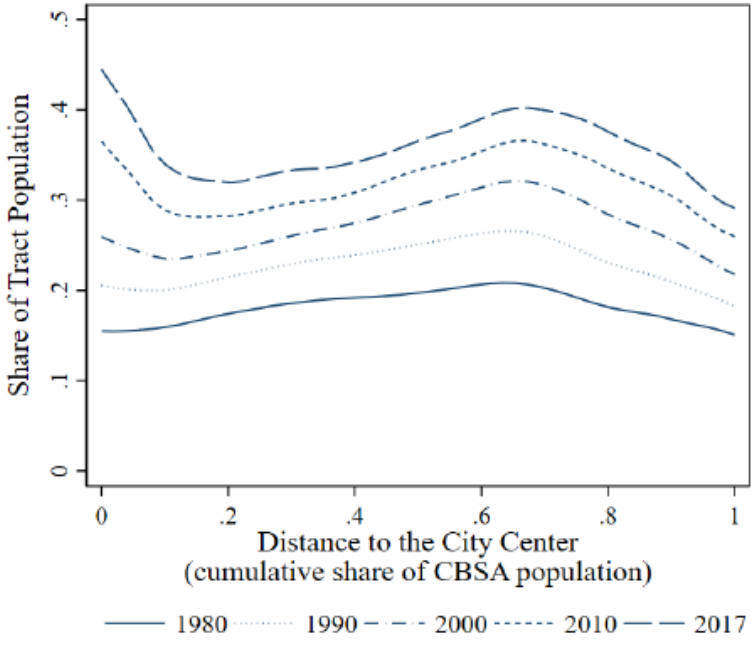
- **Even with modern communication technologies physical distance acts as a barrier to learning**
- **Knowledge or human capital spillovers arise when spatially concentrated firms or workers are more easily able to learn from one another than if they were spread out over space**
  - Large cities provide more opportunities for people and firms to learn from each other and from the environment around them
  - For instance, by promoting the development and widespread adoption of new technologies and business practices
- **We will deal with agglomeration issues further when we analyze local labor and spatial equilibrium across cities**

Consumer city

- **The "old view" of cities was that they provide workers high salaries and employment opportunities, but these come at the cost of commuting, crime and pollution**
- **But now it seems that urbanization is driven more and more by consumer benefits**
  - Cities have become centers of consumption as cities provide consumer benefits through variety
  - Restaurants, theaters, sports teams, marriage market
- **Glaeser, Kolko and Saiz (2001):**
  - "Scale economies mean that specialized retail can only be supported in places large enough to have a critical mass of consumers"

Urban revival

Figure 1: College Share by Distance to City Center

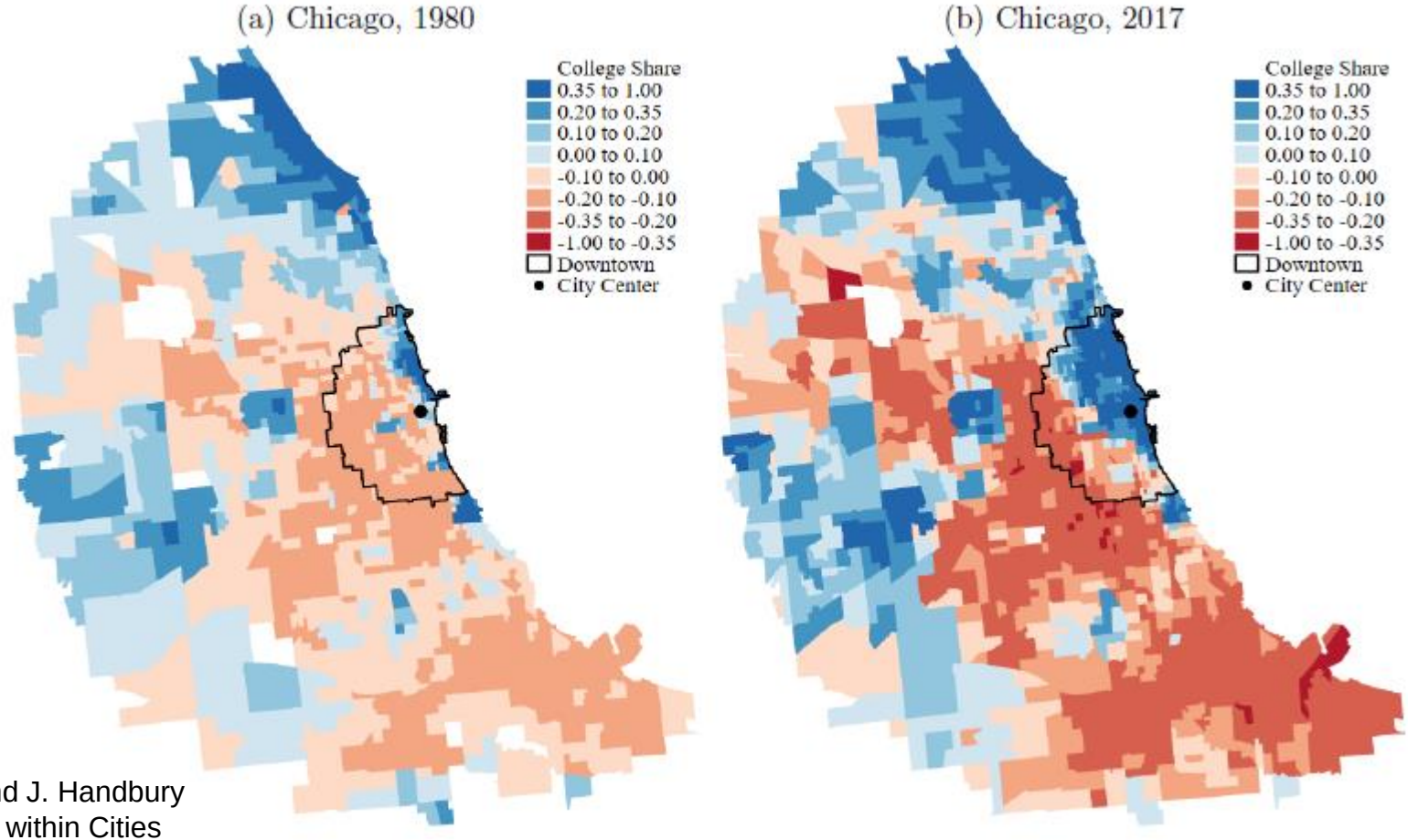


Notes: This figure plots the college-educated share of the Census tract population by distance to the city center in each decade from 1980 to 2017. Each line is a nonparametric kernel regression of Census tract-level demographic data from the largest 100 cities, defined as the Core-Based Statistical Areas (CBSAs) with the highest populations in 2000. Each kernel regression observation is weighted by tract population. Distance is measured as the share of the city residents that live at least as close to the city center, which is 0 at the center and 1 at the furthest point in the metropolitan area.
Sources: NHGIS Census (1980, 1990, 2000) & American Community Survey (2008-2012, 2015-2019) (Manson et al., 2022); Longitudinal Tract Data Base (Logan et al., 2014); Holian (2019).

Source: Couture, V. and J. Handbury (2022): Spatial Sorting within Cities

Urban revival

Figure 3: Variation in College Share Across Census Tracts



Source: Couture, V. and J. Handbury (2022): Spatial Sorting within Cities

Why do we have multiple cities?

- **Urban life has its downsides**
  - Housing costs (housing supply)
  - Commuting costs, congestion
  - Crime and other social problems
  - Health costs through pollution, poor air quality, noise and spreading of infectious diseases
- **Cities are an outcome of the trade-off between agglomeration benefits and costs of urban life**
- **Local land use and housing supply regulations also prevent city growth**

Recap

- **When economists think about the distribution of households and firms across cities, we concentrate on the**
  - Wage and productivity differences,
  - Amenity differences and
  - Housing cost differences between cities
- **When thinking about the inner structure of cities we pay less attention to wages**
  - In a city, basically all jobs are available to all city residents, even though access comes with commuting costs

Causal evidence on agglomeration forces

Causal evidence on agglomeration forces

- **What evidence do we have that for agglomeration forces?**
  - Locations differ in many ways: accessibility, natural amenities etc.
  - Firms and workers differ across locations

Causal evidence on agglomeration forces

- **What evidence do we have that for agglomeration forces?**
  - Locations differ in many ways: accessibility, natural amenities etc.
  - Firms and workers differ across locations
- **This is important for policy:**
  - Agglomeration is an externality/spillover: by locating into a particular city a firm or a worker may increase the productivity of existing firms and workers in the city
  - At the same time, they may increase congestion problems, which is also an externality
  - Firms and workers are unlikely to take these externalities into account in their decisions so there may be room for policy measures

Example - Greenstone, Hornbeck and Moretti 2010 (GHM)

THE UNIVERSITY OF CHICAGO PRESS JOURNALS

Identifying Agglomeration Spillovers: Evidence from Winners and Losers of Large Plant Openings

Author(s): Michael Greenstone, Richard Hornbeck and Enrico Moretti

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GHM

- **Test for and quantify agglomeration spillovers in manufacturing by asking**
  - How the productivity of incumbent plants changes when a large plant opens in their county?

- **Incumbent plants = the plants that already are in the county**

Empirical problem

- **The empirical problem is that firms do not choose their locations randomly**
  - They maximize profits and choose to locate where their expectation of the discounted value of future profits is greatest
  - Location choice depends on several local characteristics, which are often unobservable to the researcher
  - If a given plant is expected to make large profits at a given location, also incumbent plants are likely to make large profits there
  - A naive comparison of the productivity of incumbents in counties that experience a plant opening with the productivity of incumbents in counties that do not experience a plant opening yields biased estimates

Empirical problem

- **The key issue is to create a plausible counterfactual, i.e. ask**
  - What would have happened to incumbent plants in winning counties in the absence of the plant openings?
  - But we as researchers cannot observe this counterfactual!
- **What we observe is either**

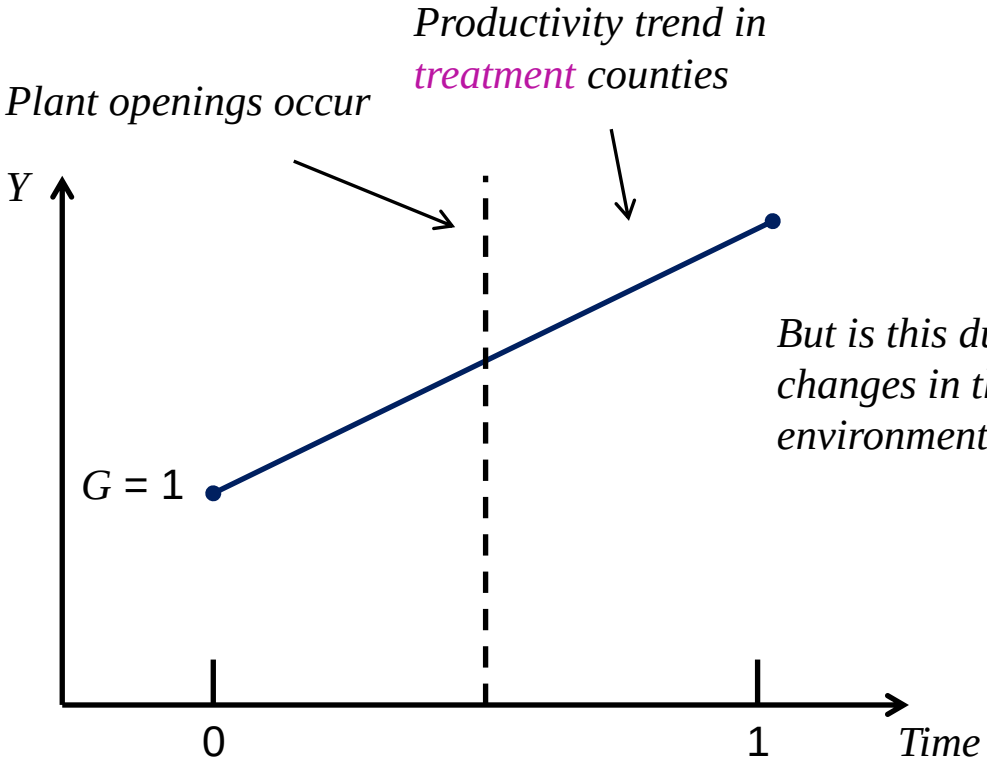
  a) what a place is like before and after a new plant or

  b) what one place is like with a new plant and another is without it
- **Thus, we cannot be sure that the effects we observe are not due to some non-plant opening related differences over time or across places**

Research design – "Million dollar plants"

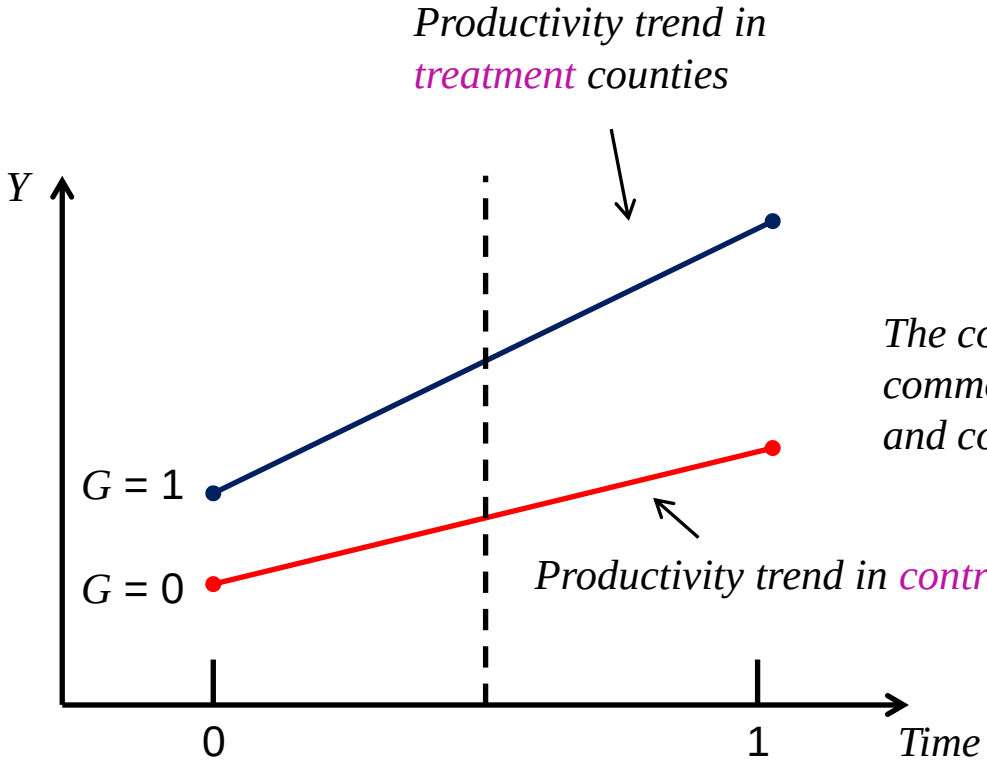
- **GHM rely on the reported location rankings of firms from the corporate real estate journal *Site Selection***
  - Each issue of this journal includes an article titled "Million Dollar Plants" that describes how a large plant decided where to locate
  - Articles report the county that the plant chose (treatment group) and usually report the runner-up county or counties (control group)
  - GHM use the control group to identify what would have happened to the productivity of incumbent plants in the treatment group in the absence of the plant opening (counterfactual)
- **GHM compare the incumbent plants in the treatment and control groups before and after the plant openings**

Research design – Difference-in-differences



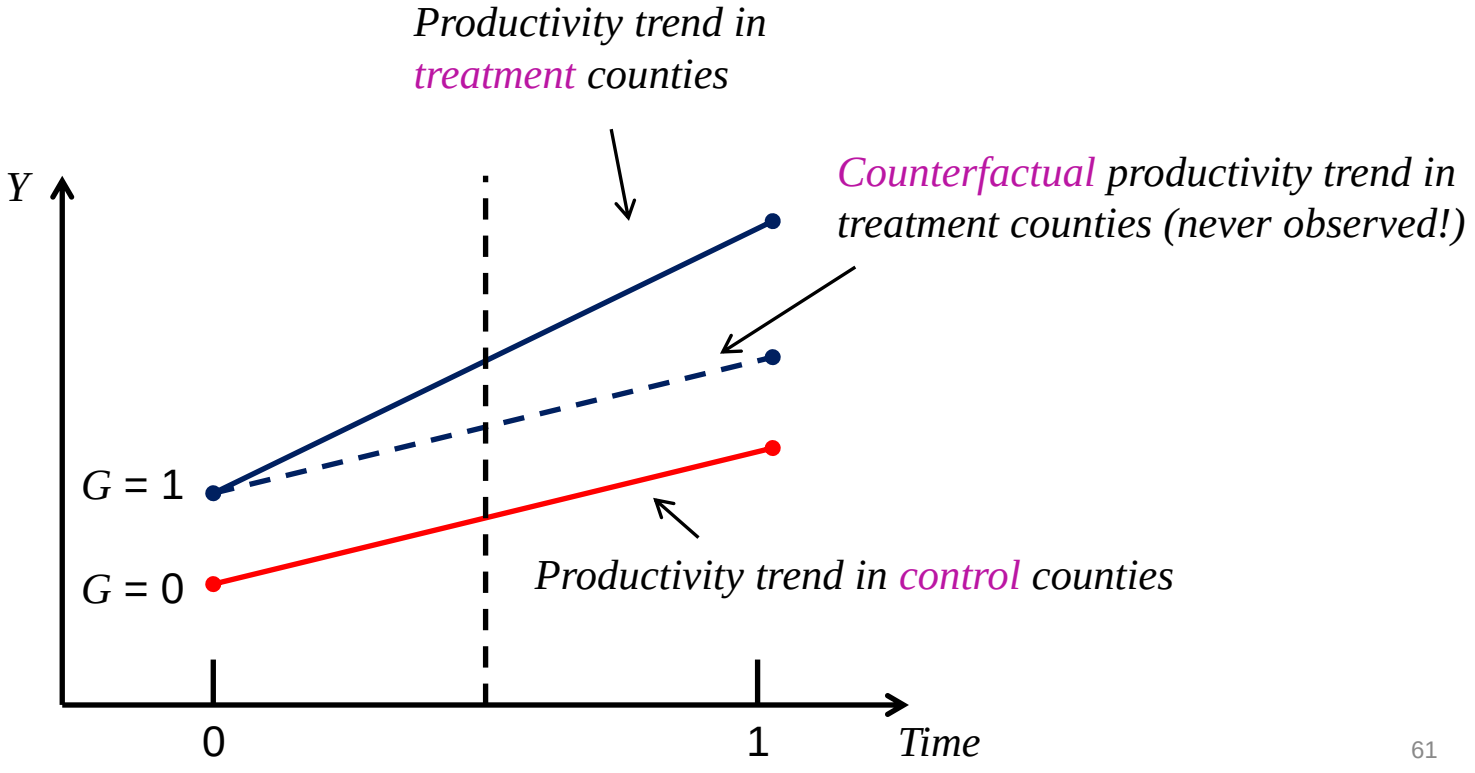
But is this due to plant openings or just to changes in the general macroeconomic environment for example?

Research design – Difference-in-differences

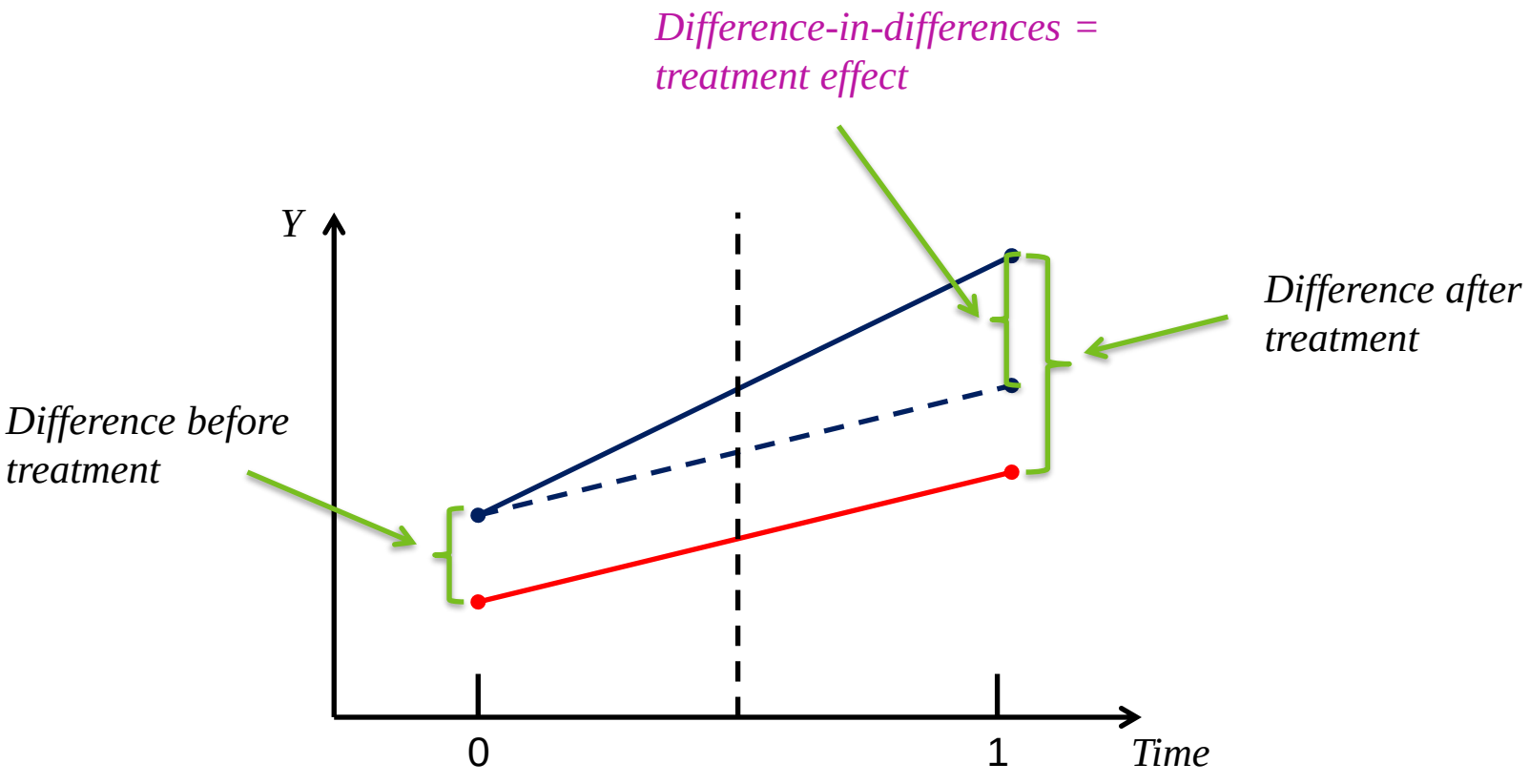


The control group captures any common changes in the treatment and control groups

Research design – Difference-in-differences



Research design – Difference-in-differences



Research design – Difference-in-differences

- **The key assumption for any DID strategy is that the outcome in treatment and control groups would follow the same time trend in the absence of the treatment**
  - This common trend assumption is impossible to test because you never observe the counterfactual
  - One often uses pre-treatment data to show that the trends have been the same in past
- **Additional assumptions include that there are no spillover effects from the treatment group to the control group and no other policy changes that coincide with the treatment**

Million dollar plants

TABLE 1
THE MILLION DOLLAR PLANT SAMPLE

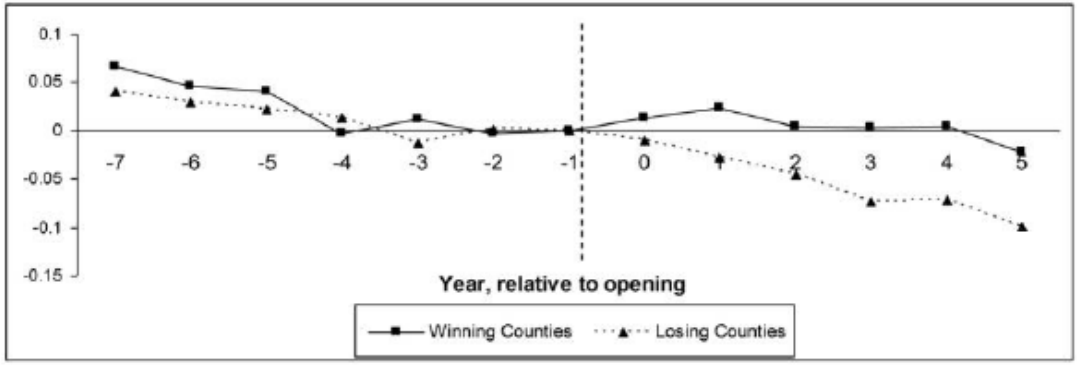
	(1)
Sample MDP openings:[a]	
Across all industries	47
Within same two-digit SIC	16
Across all industries:	
Number of loser counties per winner county:	
1	31
2+	16
Reported year − matched year:[b]	
−2 to −1	20
0	15
1 to 3	12
Reported year of MDP location:	
1981–85	11
1986–89	18
1990–93	18
MDP characteristics, 5 years after opening:[c]	
Output ($1,000s)	452,801
	(901,690)
Output, relative to county output 1 year prior	.086
	(.109)
Hours of labor (1,000s)	2,986
	(6,789)

Treated counties

Control counties

Results

All Industries: Winners vs. Losers



Difference: Winners – Losers

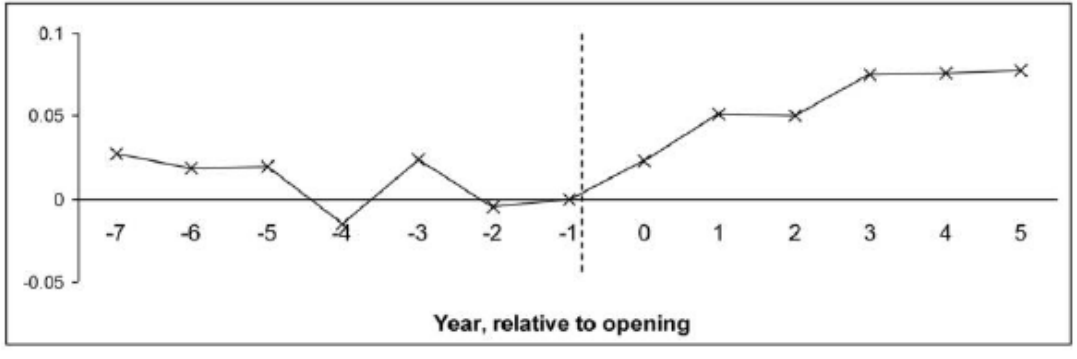


FIG. 1.—All incumbent plants' productivity in winning versus losing counties, relative to the year of an MDP opening. These figures accompany table 4.

Recap

- **GHM document substantial increases in productivity among incumbent plants following the opening of Million Dollar Plants => evidence of spillovers**
- **Spillovers are larger between plants that share labor pools and similar technologies**
  - Consistent with learning externalities, to the extent that they occur among firms that use similar technologies or are embodied in workers who move between firms
  - And improved efficiencies of worker-firm matches
  - Firms also appear to pay higher costs in order to receive these productivity spillovers

Other estimates from the literature

- **Rosenthal, S.S., W.C. Strange. 2004. Evidence on the Nature and Sources of Agglomeration Economies. In J.V. Henderson, J.-F. Thisse (eds), *Handbook of Regional and Urban Economics*, Vol. 4, 2119-2171:**
  - When the size of a city doubles, productivity increases by 3–8%
  - When density doubles, productivity increases by 5%
  - When the size of an industry in an urban area doubles, productivity increases by 4.5%
- **However, you should take these exact numbers with a grain salt as quantifying the size of agglomeration benefits is hard**