



北京城市实验室
Beijing City Lab

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35



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How to cite

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Big Data and Collaborative Urban Research via a Visual Research Lab

The strength of weak ties

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&
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Student Member
Beijing City Lab

Outline

- **An introduction to BCL**
- **Big data: What, Why and How**
- **Some examples:**
 - Big data and urban research**
 - Big data and Urban China**
- **Summary**
- **Q&A**



BCL

Beijing City Lab

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Projects

Members

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Slides

Data released

Blogs

About

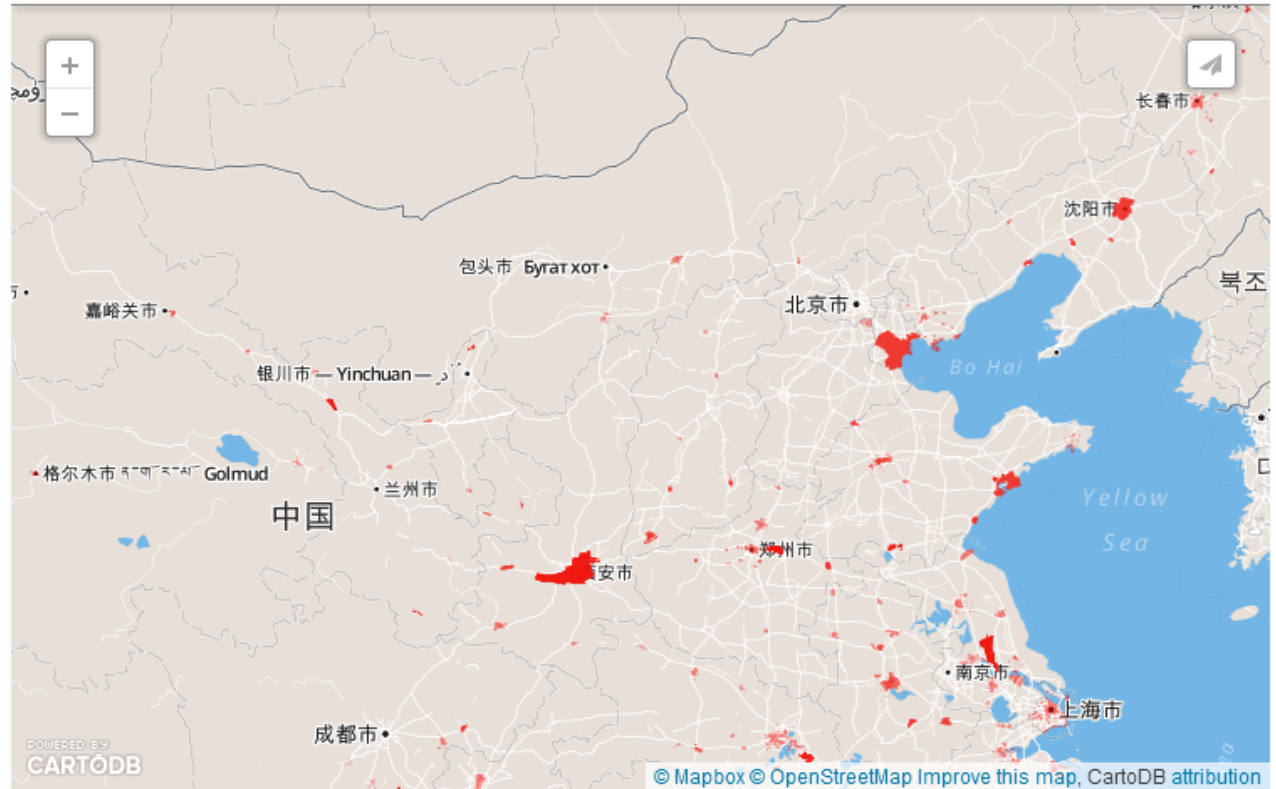
Maintained by Dr Ying Long
BeijingCityLab(at)gmail(dot)com



The Beijing City Lab (BCL) is a virtual research community, dedicated to studying, but not limited to, China's capital Beijing. The Lab focuses on employing interdisciplinary methods to quantify urban dynamics, generating new insights for urban planning and governance, and ultimately producing the science of cities required for sustainable urban development. The lab's current mix of planners, architects, geographers, economists, and policy analysts lends unique research strength.

Urban Growth Boundaries of 176 Chinese Cities

Full process hand made from planning drawing collection to digitization. Courtesy of students in Zhejiang University.
longying1980@gmail.com



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Beijing City Lab

Initiated in Oct 2013 by Dr. Ying Long



- **Organization structure**

- Lead researchers (× 7)
- Honorary Directors(× 11)
- Core researchers(× 24)
- Student members(× 38)
- Followers (6000+)

- **Missions**

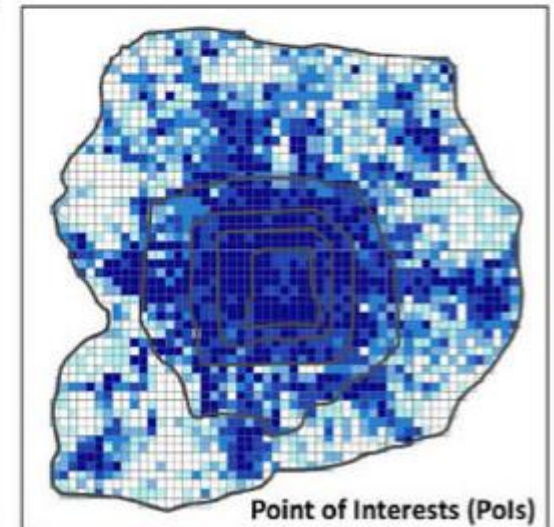
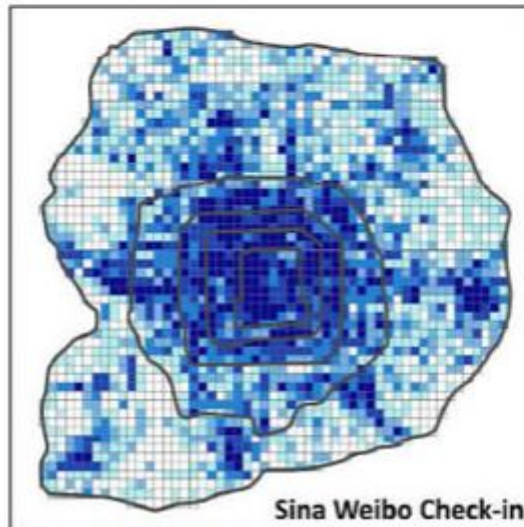
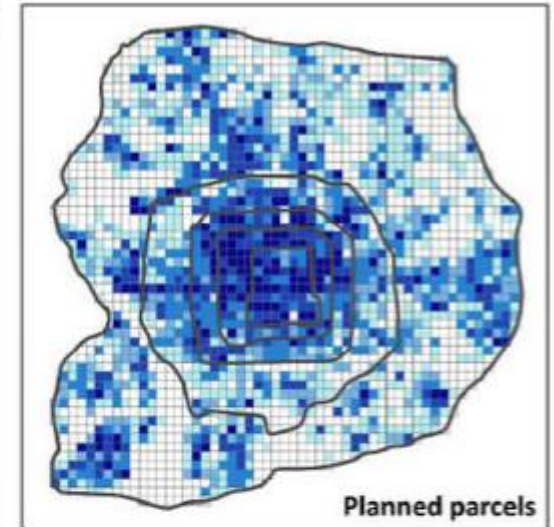
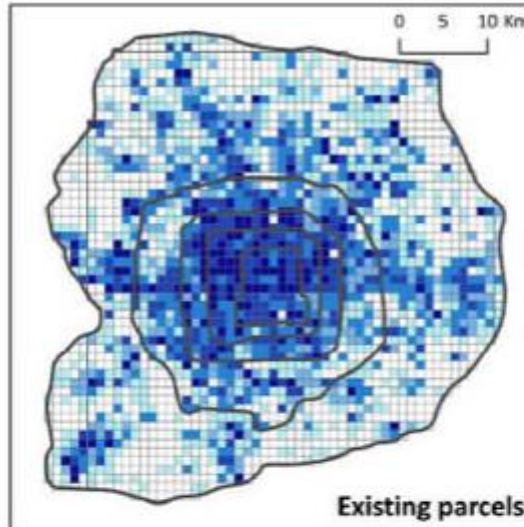
- A network for quantitative urban studies
- A platform for sharing (40 working papers+24datasets)
- An attempt to scientifically understand cities
- Visuals involving public participation
- Concentration on Beijing but care for China and beyond

Sample projects by BCLers

(Traditional, big, open and big open data)

Projects

- 1 BUDEM
- 2 Urban Growth Boundaries
- 3 Bus Landscapes
- 4 Population China
- 5 Planning Support Systems
- 5 Urban Form
- 6 Population Synthesis
- 7 Social Network Mining
- 8 Big Model
- 9 Beijing Parking
- 10 Urban Network Analysis



Sample Data by BCLers

Physical-demographic:

- Chinese cities' administrative boundaries, road network, existing parcels, urbanized areas, planning permission(not all cities), land use maps, DEM, water, urban land by RS and natural features
- Population
- Street-level density, parcel-level population and associated attributes

Quality of life evaluation

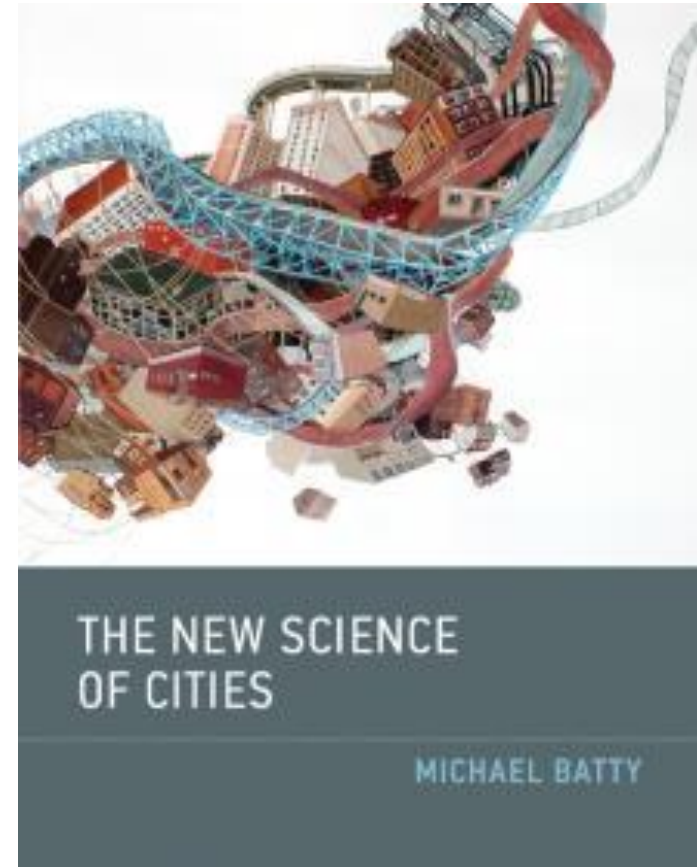
Urban environmental info (including PM2.5) POI, public facilities, housing prices, bus routes and stations and restaurants

BCL's Open Data and Big Data

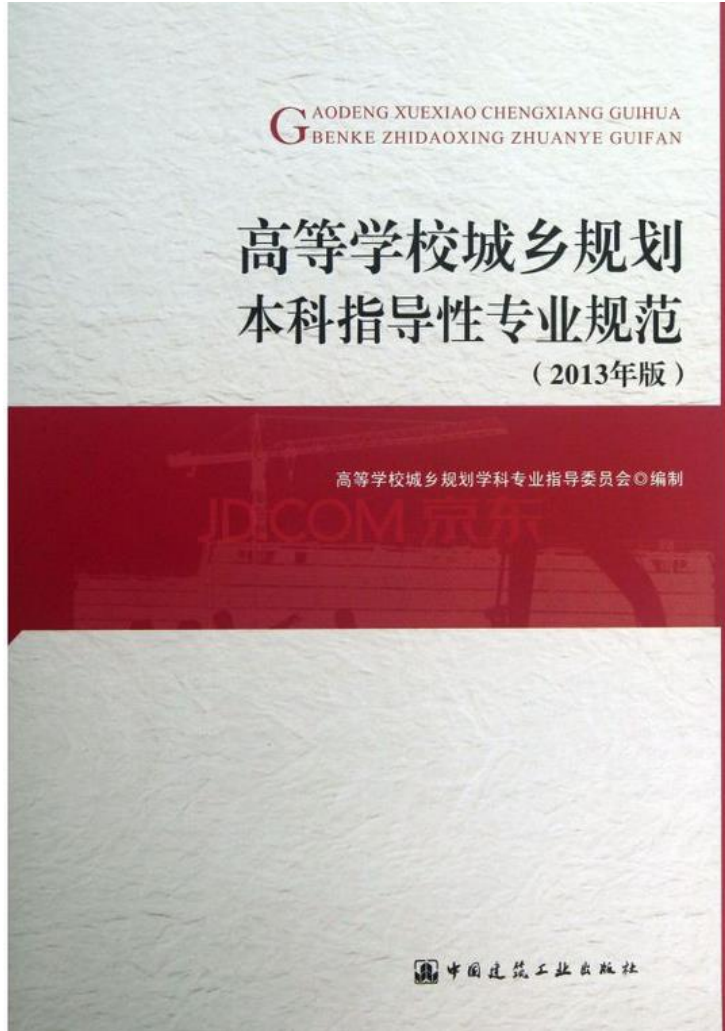
- **Human activities and movements**
 - Hotspots, check-ins, location-exposed Weibos, traffic flows between cities, smartcard data for transit(Beijing), household travel surveys (Beijing) and taxi travel data
 - Forecasts
 - Master plans (200+ cities)
 - Scenarios for urban expansion

Attempt to scientifically understand cities

- Informationized planning ?
✘
- New planning technologies
✘
- A Science of Cities? ✔



4、6、10 years from now?



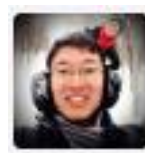
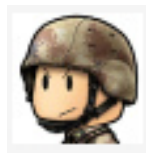
- GIS, urban system analysis, urban modes, etc. (Core courses and important contents)
- Planning support=education, not urban studies scholars
- Broadly and narrowly planning supports

BCL visitors



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龙瀛a1_b2 规勒个划 大小刘胖子 放小浪 沐洲 淮大包MAXX 周江评

Big data: What, Why and How

What is big data?

- **Spreadsheets that MS Excel cannot handle?**
- **Data we generate since we have the Internet? (The data we generate daily are the same as those our ancestors did for hundred of years)**
- **User-generated data (Some call them people sensing data)?**

What is big data?

- **Regardless small or big, the end goal for us to collect and analyze big data is to generate knowledge and wisdom**
- **Big data are not the only way to generate knowledge and wisdom (e.g., we have numerous great scientists and philosophers before big data emerged)**
- **We need to better/first understand how knowledge and wisdom are produced to put big data to best use**

Why we need big data?

- **Big data is like teenage sex: everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it...**

Why we need big data?

- **We want to more information, knowledge, wisdom and efficacy from data**
- **A far from complete list of areas:**

Transportation, environment, public health, land-use, housing, economic development, labor markets, social justice, population demographics, urban ecology, energy, community development and public participation

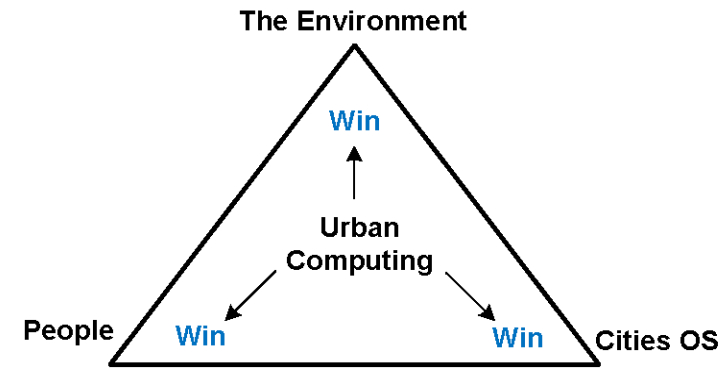
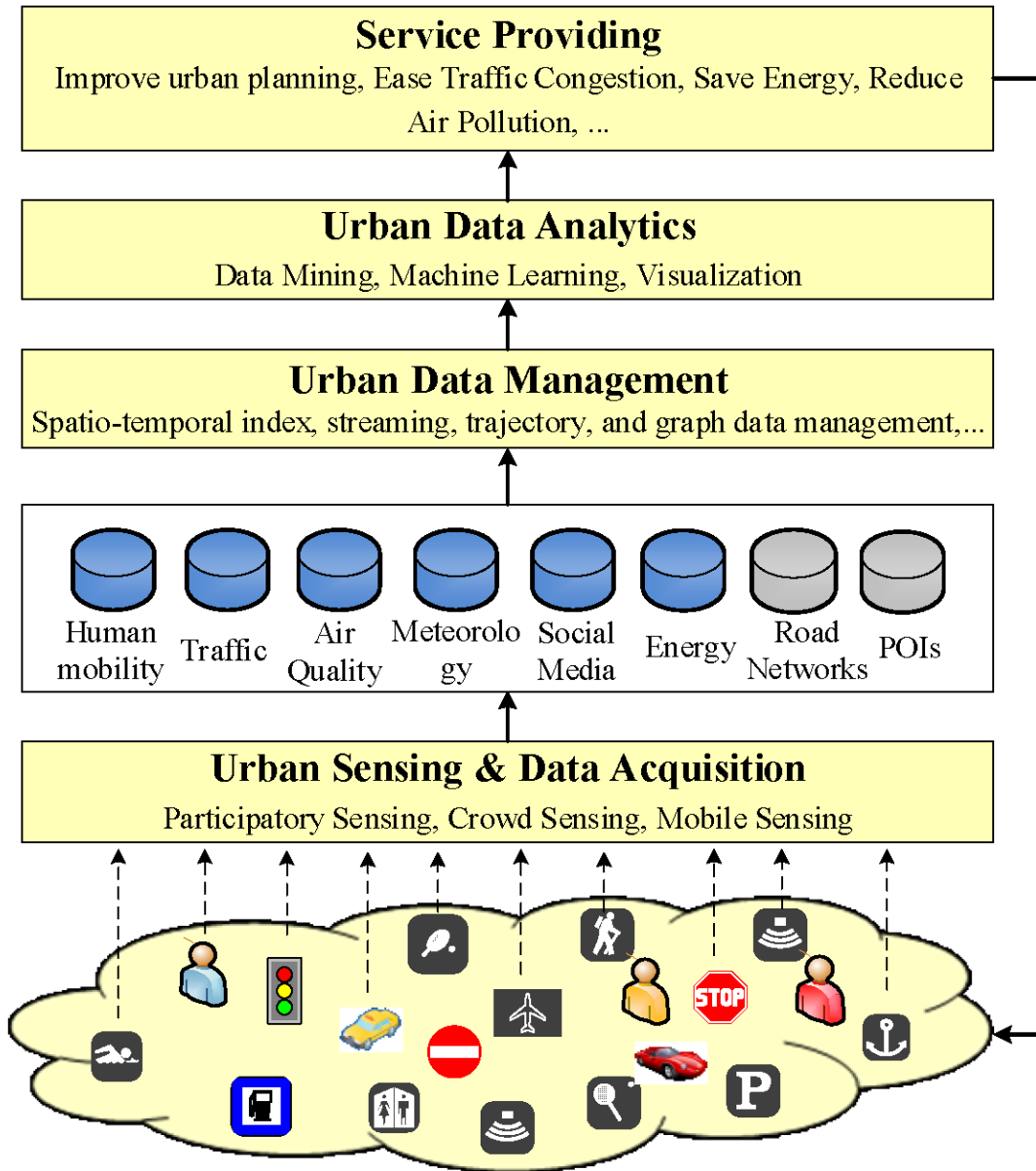
Data-Driven Transportation

- **Improve Level of Service**
- **Enhance sustainability**
- **Modeling, Predicting, Controlling**
- **Personalization**
- **Optimization**

How we can best use big data?

- **Theoretical developments about data**
- **Mechanisms of knowledge discovery**
- **Big data standard, transferability, scalability, measurement, analysis and methodological questions**
- **Institutional issues, e.g., organizations, networks and infomediaries**

Big data and urban research



*Tackle the **Big** challenges
in **Big** cities
using **Big** data!*

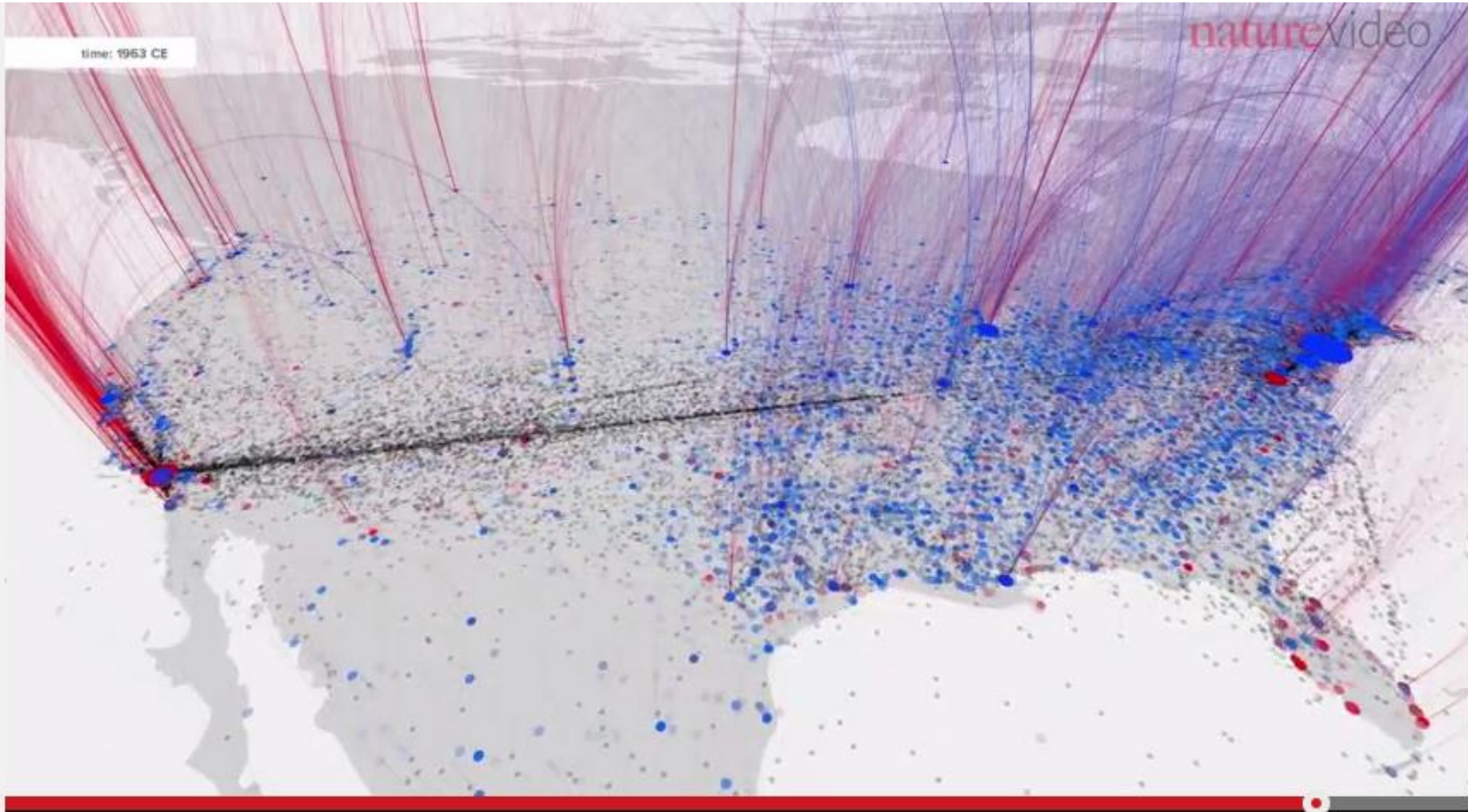
Big data and urban research

- **Theoretical developments and knowledge discovery in urban systems**
- **Planning and operational uses of big data**
- **Information management for urban informatics**



*Visualization of Taxi Pick-ups (Orange) and Drop-offs (Blue) in New York City
(NYU Center for Urban Science and Progress)*

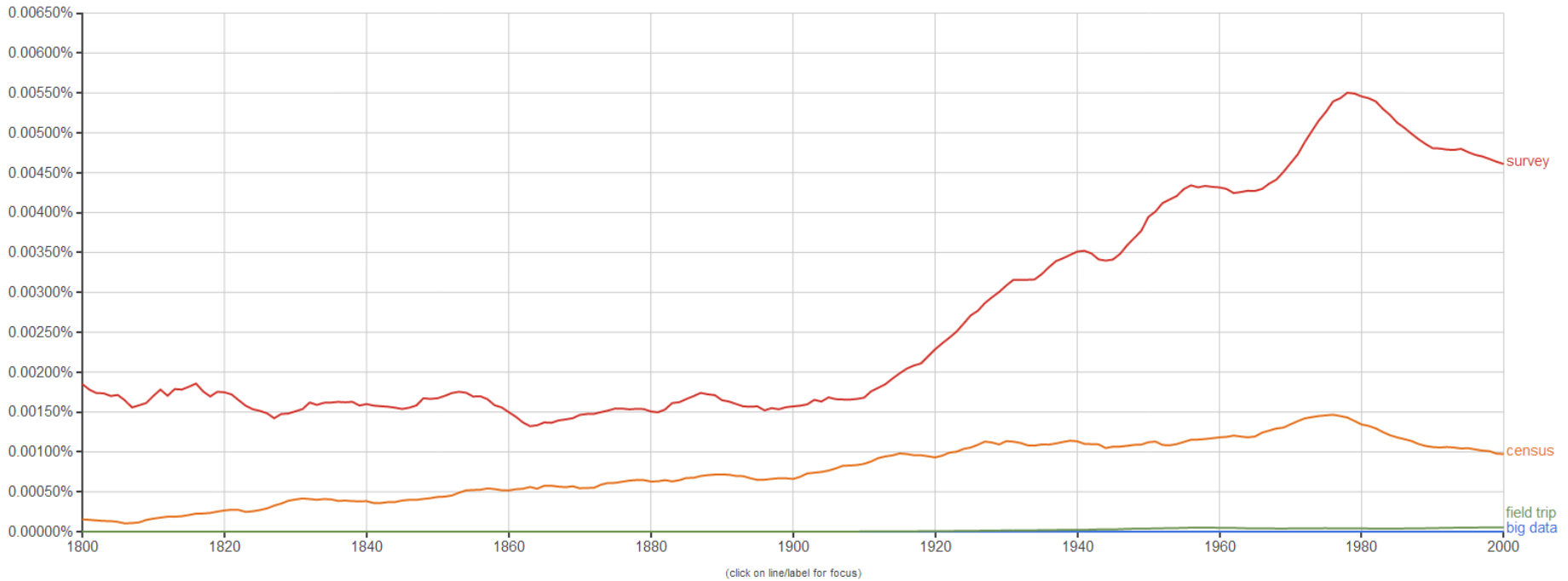
Humanity's migration and cultural history



<https://www.youtube.com/watch?v=4glhRkCcD4U#t=95>

Google books Ngram Viewer

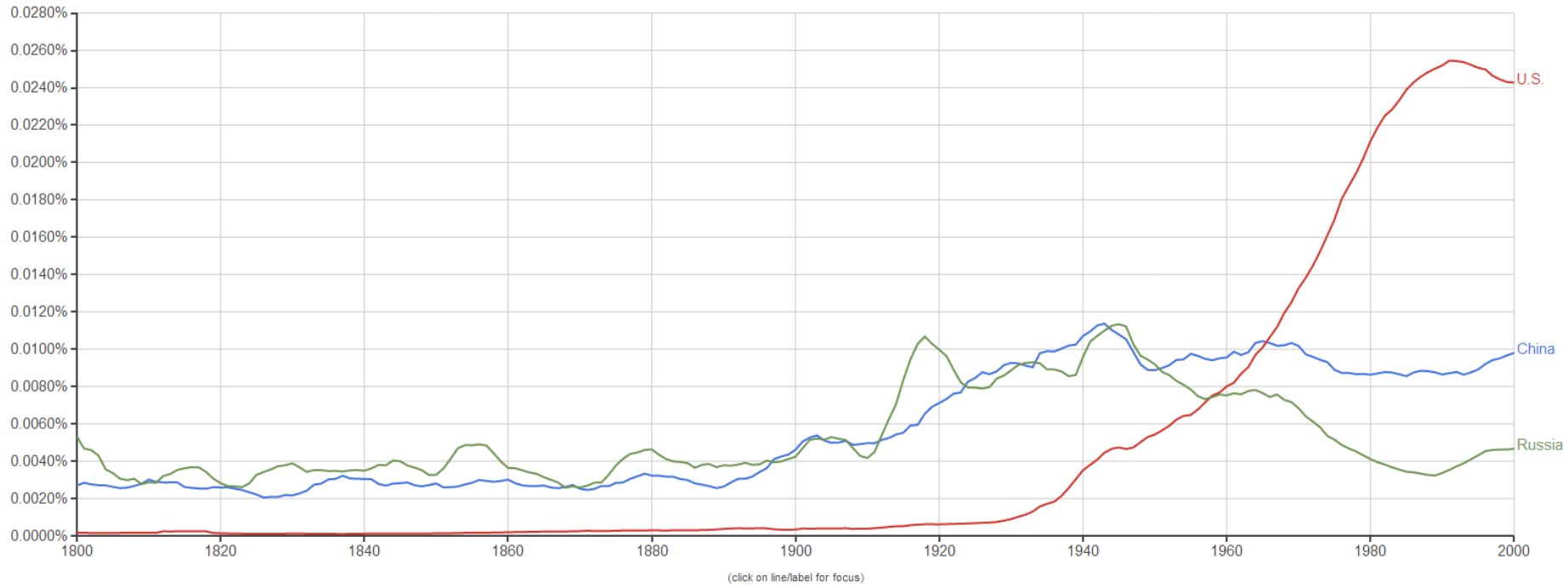
Graph these comma-separated phrases: case-insensitive
between and from the corpus with smoothing of [Search lots of books](#)



Emergence of big data

Google books Ngram Viewer

Graph these comma-separated phrases: case-insensitive
between and from the corpus with smoothing of [Search lots of books](#)

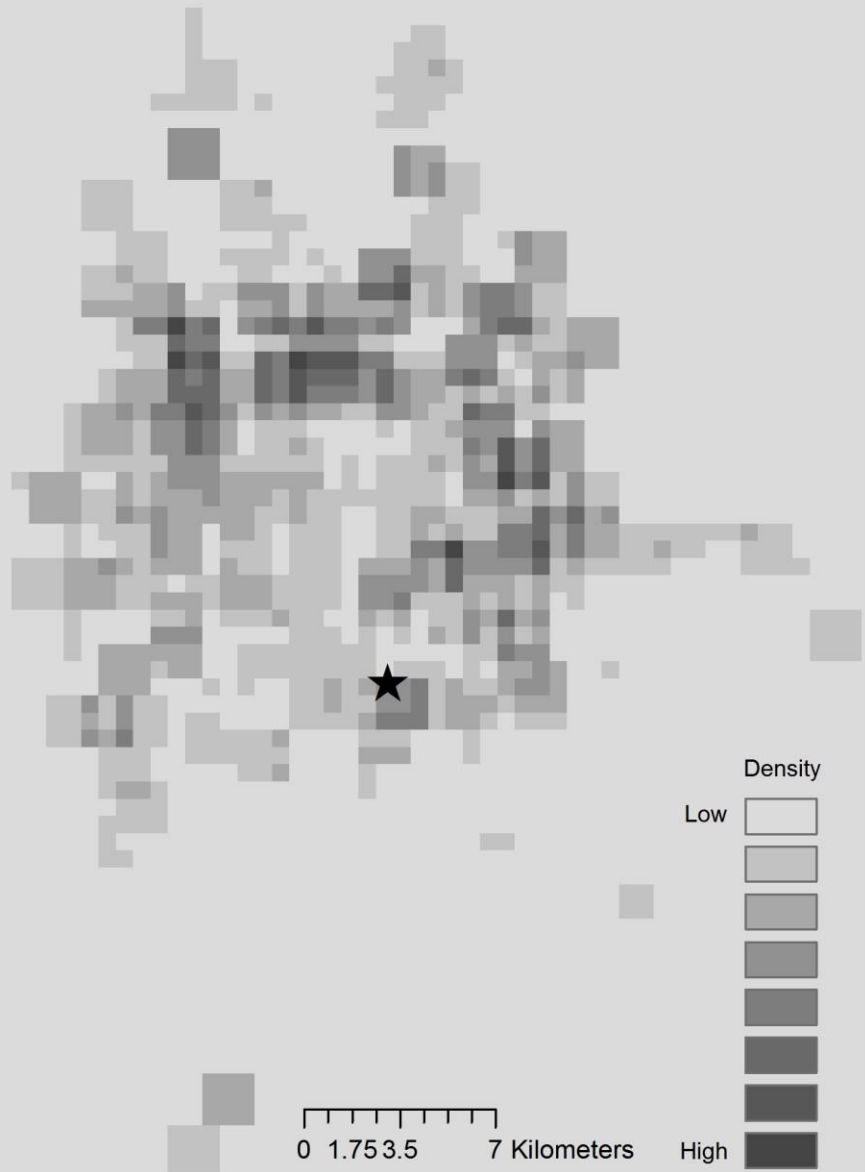


Resurgence of China?

Big data and Urban China

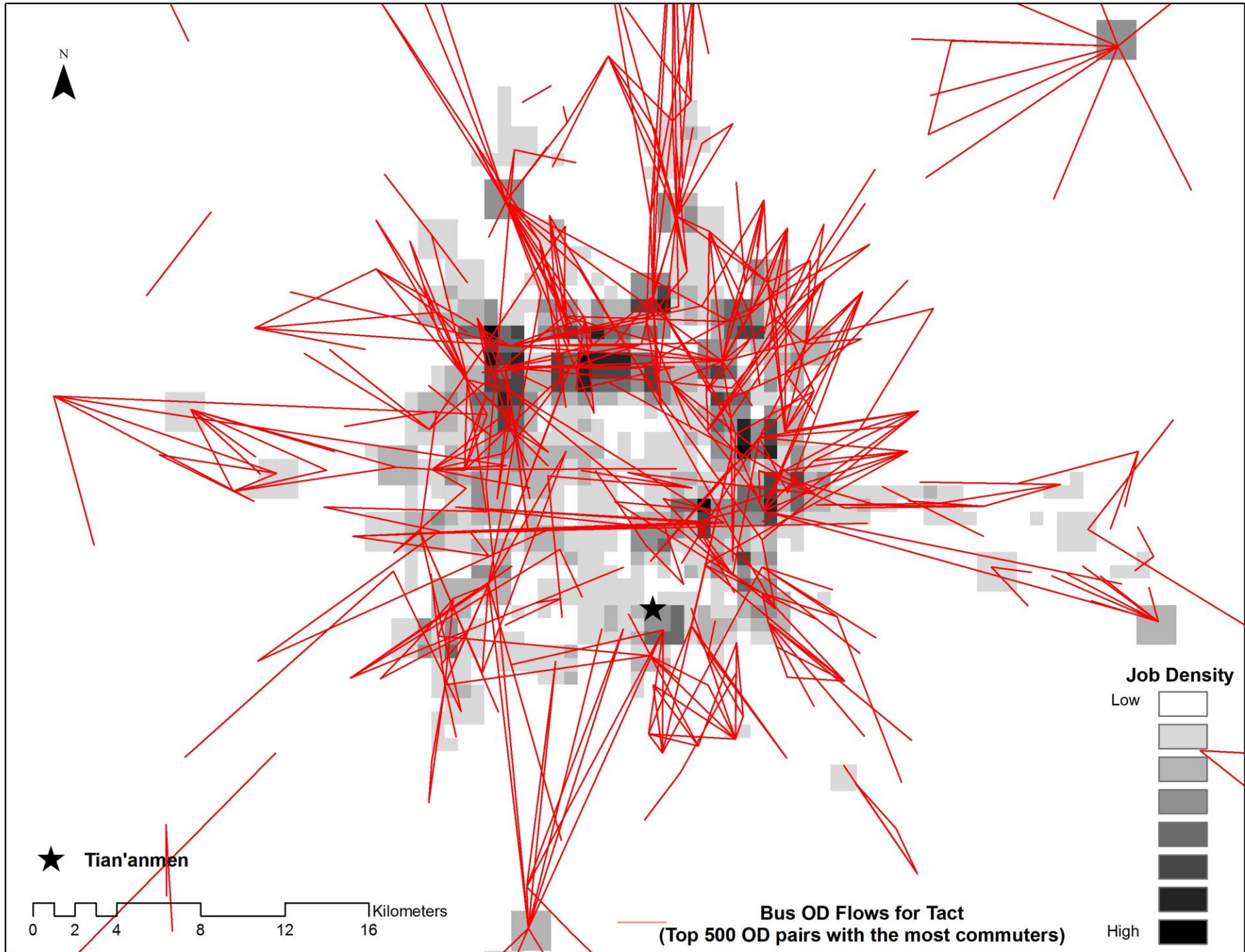
Spatial patterns of human settlements/movements

Jobs



Residences





● Both Employment and Residential Subcenter

Employment Subcenter (Employment #)

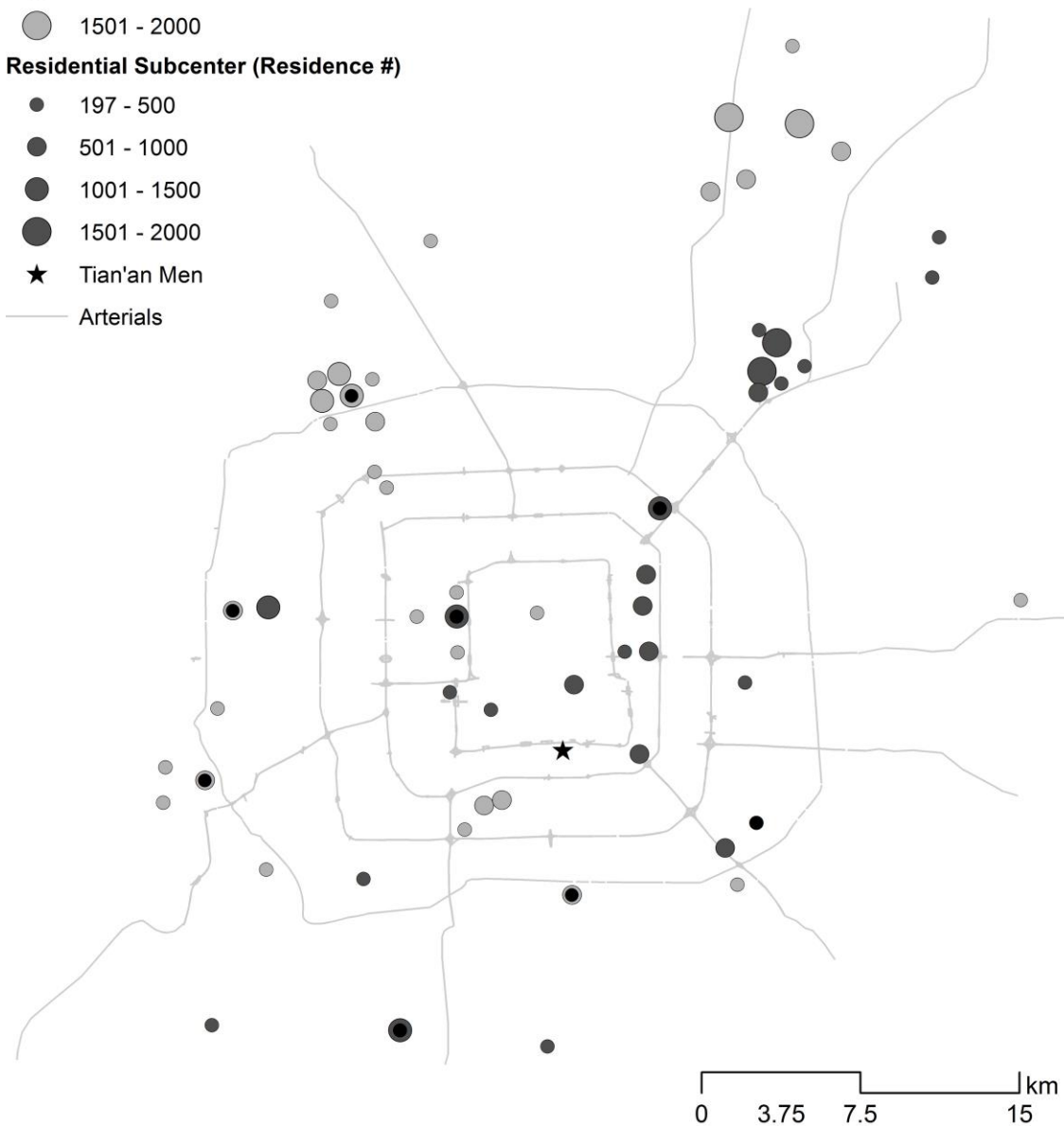
- 197 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000

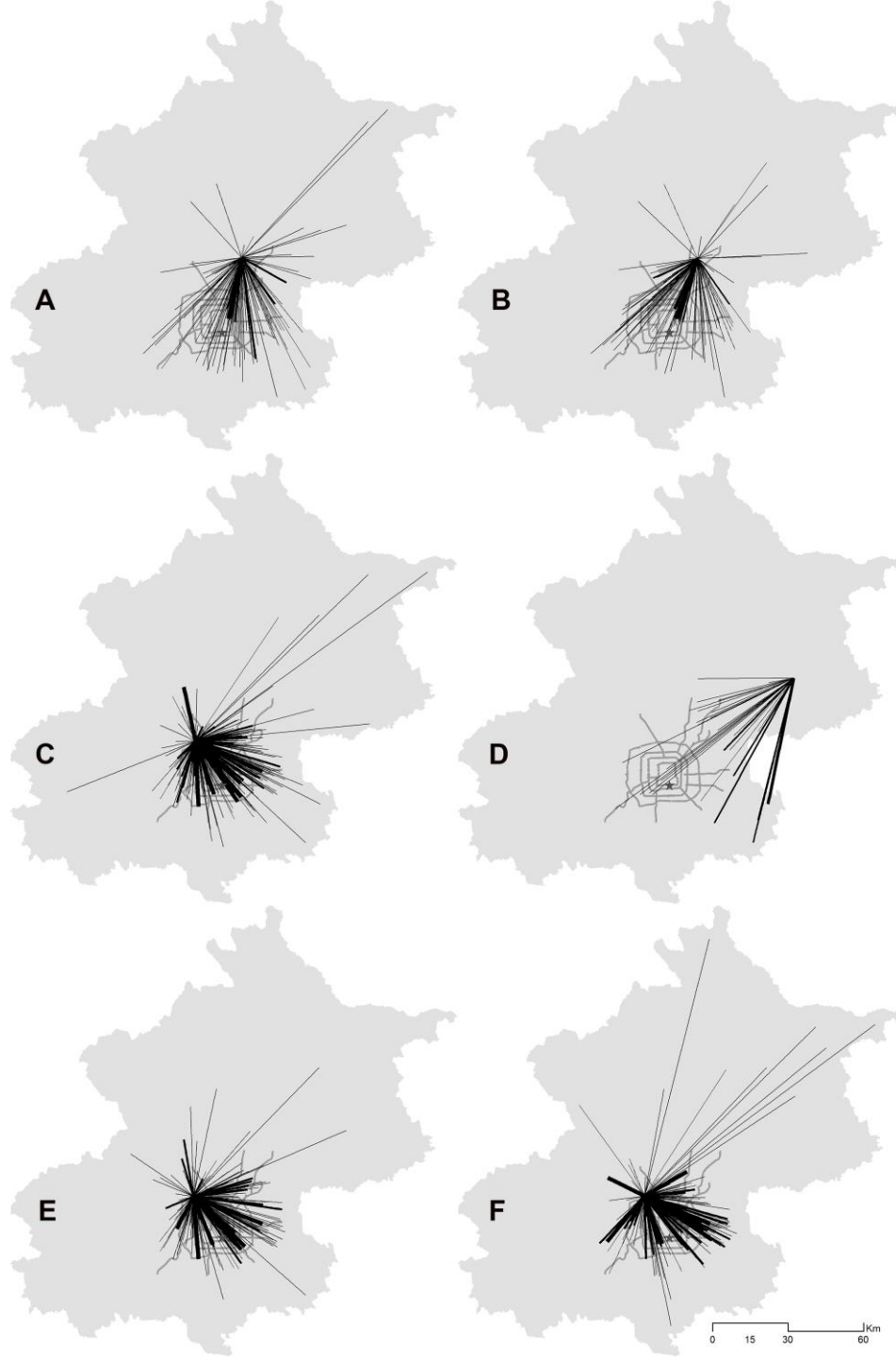
Residential Subcenter (Residence #)

- 197 - 500
- 501 - 1000
- 1001 - 1500
- 1501 - 2000

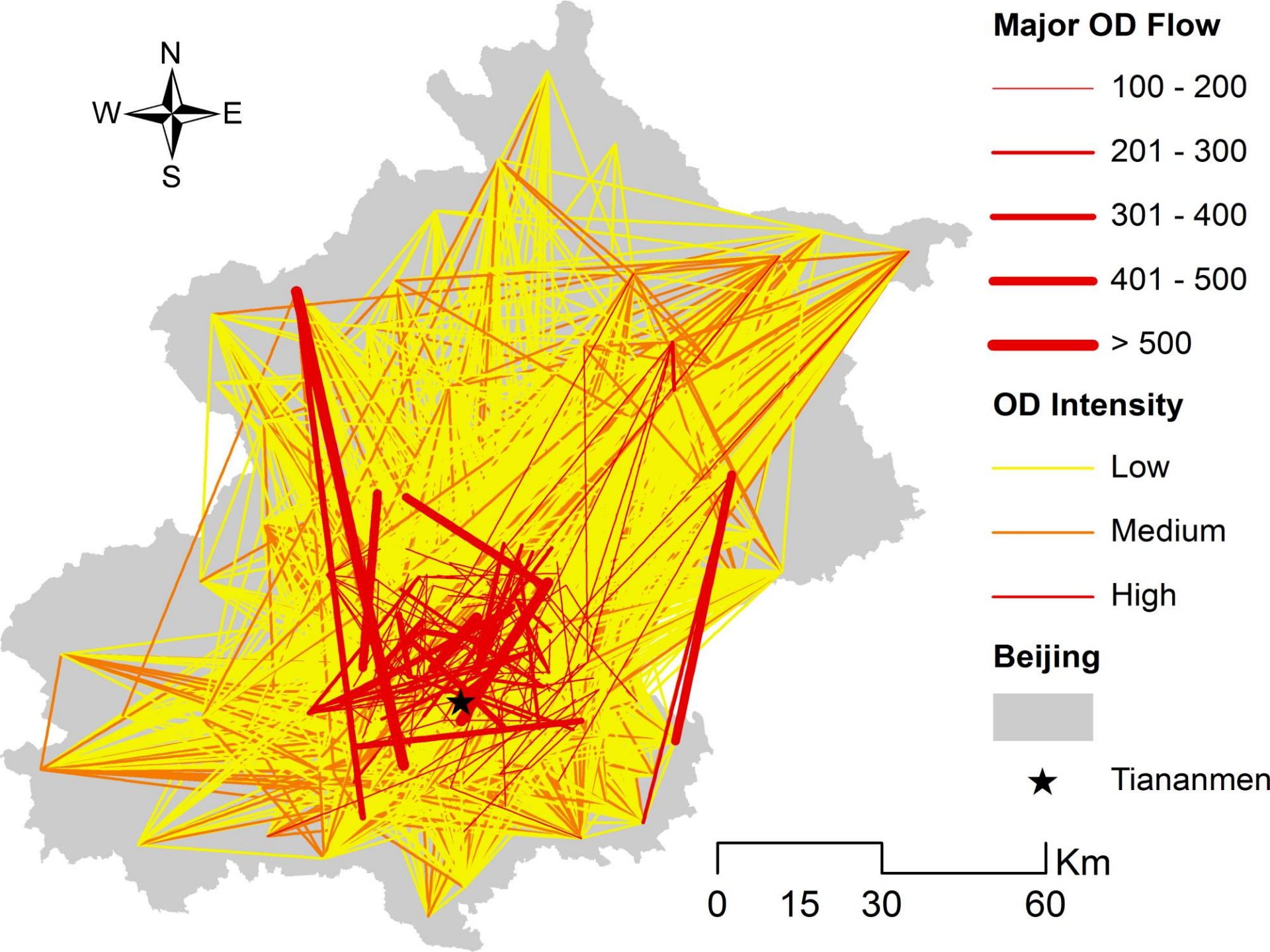
★ Tian'an Men

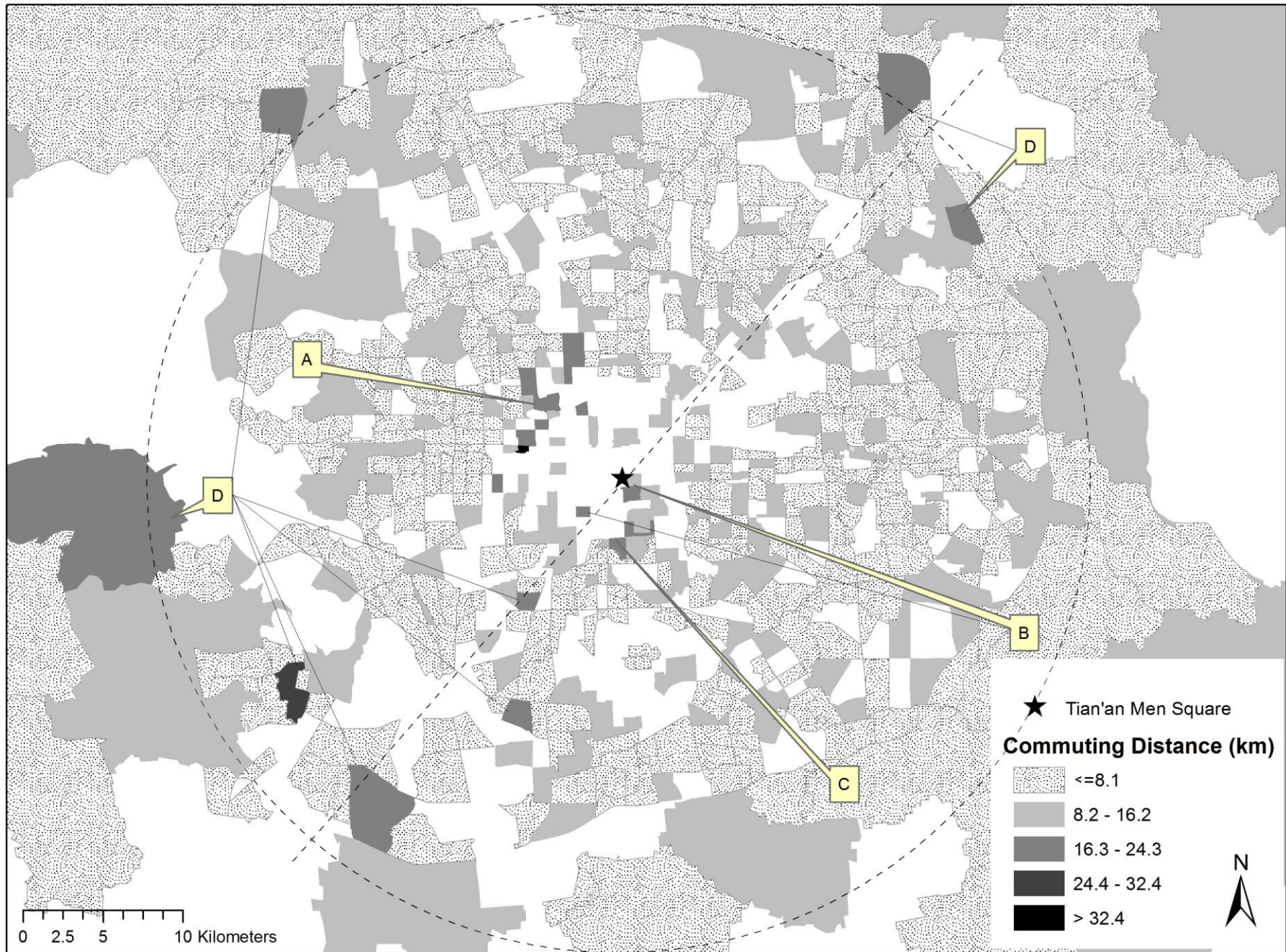
— Arterials





Hot spots where there are problems





Even with big data, we cannot forget
traditional and open data



United States[™]
Census
Bureau





Sakura Park

Manhattan School of Music theory and...

Teachers College, Columbia University office of admissions...

Barnard College students study - student computing services

Columbia Business School

Columbia University Ivy League school founded in 1754

South Lawn

Columbia Law School greene hall - sexuality and gender

Morningside Park

Morningside Pond

West 111th Street People's Garden

Harlem Tavern

Hudson River

Henry Hudson Pkwy

New York State Reference Rte 907V

Riverside Dr

Claremont Ave

La Salle St

W 127th St

W 128th St

W 122nd St

W 120th St

Hancock Pl

W 123rd St

W 116th St

W 115th St

W 119th St

W 118th St

Morningside Ave

Saint Nicholas Ave

Riverside Dr

Broadway

W 114th St

W 113th St

W 115th St

W 112th St

W 111th St

W 113th St

Manhattan Ave

Riverside Dr

West End Ave

W 109th St

W 108th St

Riverside Dr

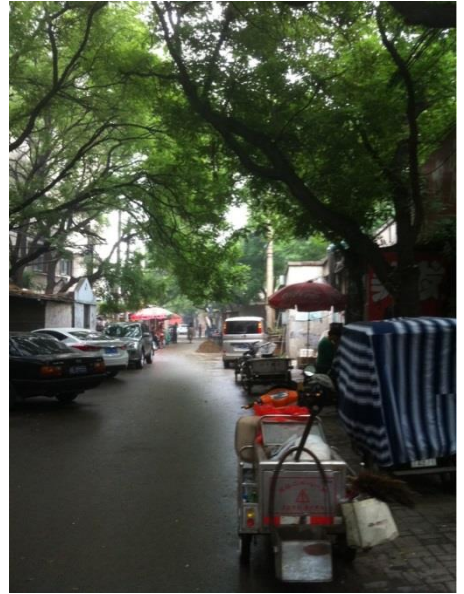
Broadway

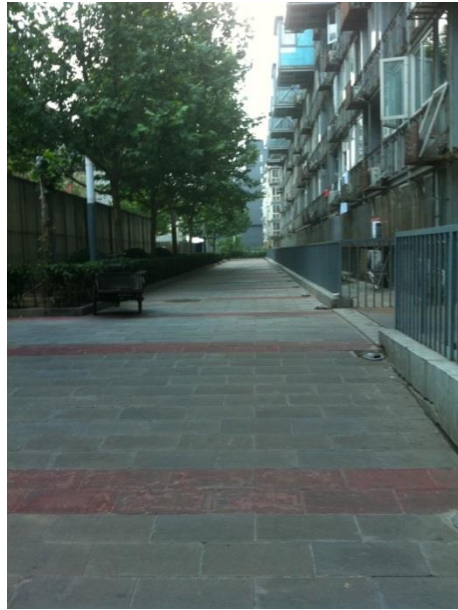
W 114th St

W 115th St

W 113th St

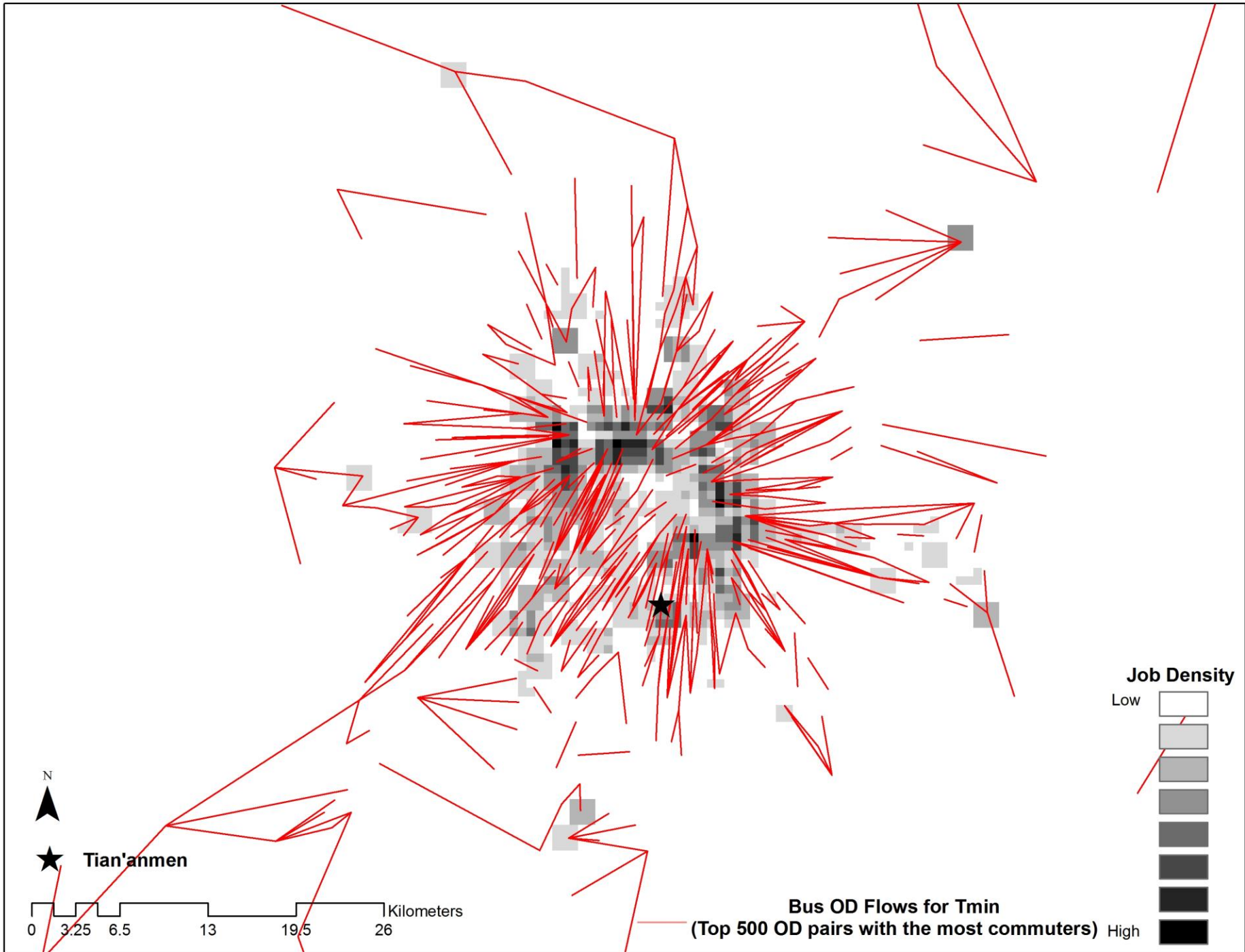
Saint Nicholas Ave





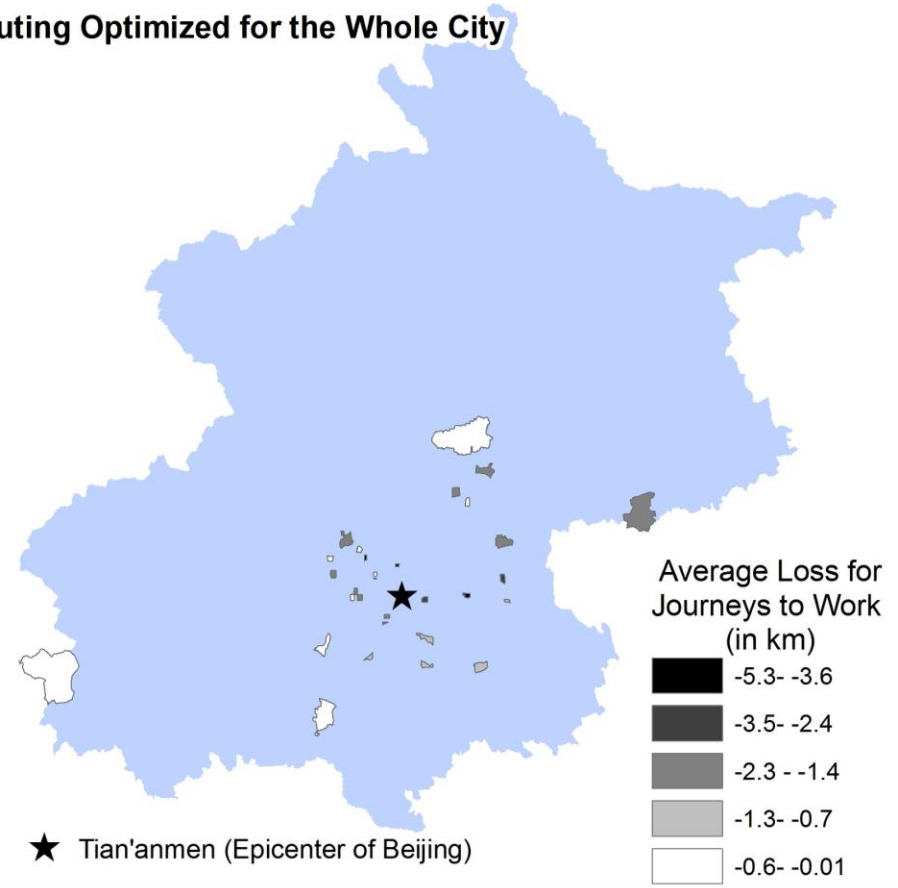
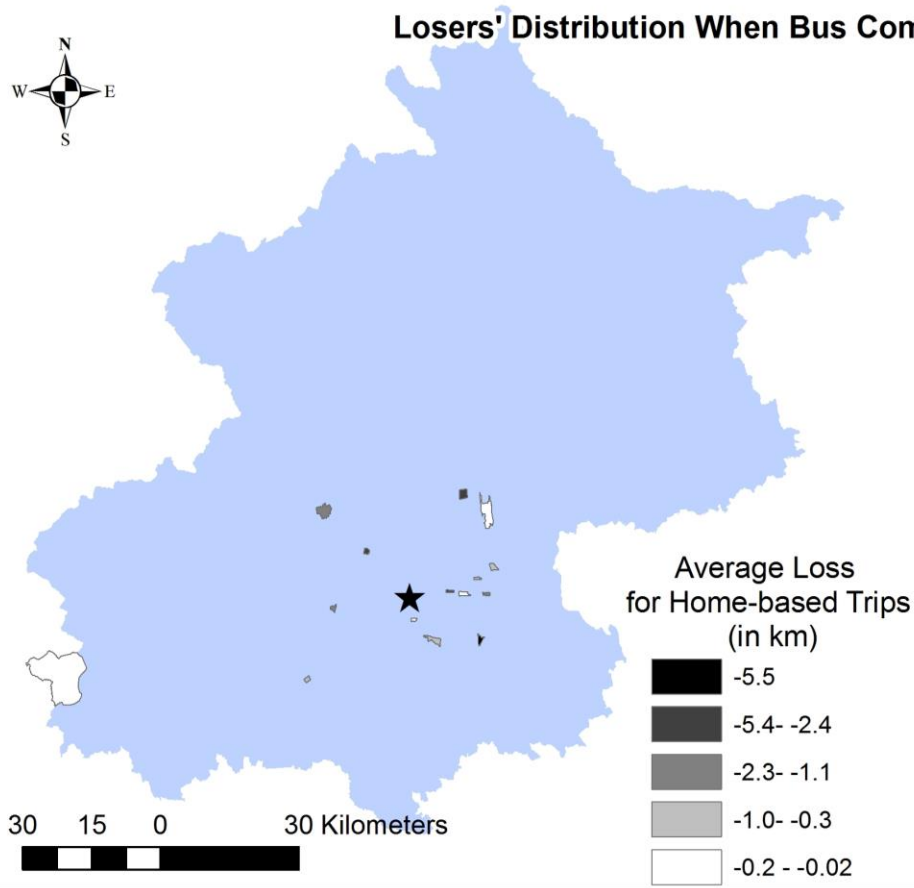
Prototype	Characteristics	Landmarks and Directions	Spatial Index in Figure
1	University campuses, hotels and old Danwei compounds left with mostly apartment buildings	Minzu and Jiaotong Universities and areas in between; Beijing Technology and Business University and Capital Normal University (east campus) and areas adjacent to them; Beijing University of Aeronautics and Astronautics and Beijing University of Science and Technology and adjacent areas	A (Areas around and areas to its northeast)
2	Parks with luxury hotels, high-end apartments, specialized research institutes, hospitals and some mixed-use residential areas	Areas north to Yu Yuan Tan Park; Area adjacent to Tian Tan Park in the east	A (South to A, the darkest area); The U-shaped area south to the star
3	Traditional Hu'tong with old, cheap, small, shared and underserviced rental housing units	Areas in between Qian Men Da Jie and Zhu Shi Kou Da Jie	B
4	Residential areas with mixed-age housing units adjacent to freeway interchanges or arterials, railways within the fifth ring road	Areas near Yong Ding Men and Nan Sha Wo Bridges	C
5	Low density, developing areas with relatively cheap housing units in the suburb	Areas adjacent to the sixth ring road and Jingshi Freeway interchange; Areas adjacent to Yan Chun Railway Station	D

Optimize commuting and traffic



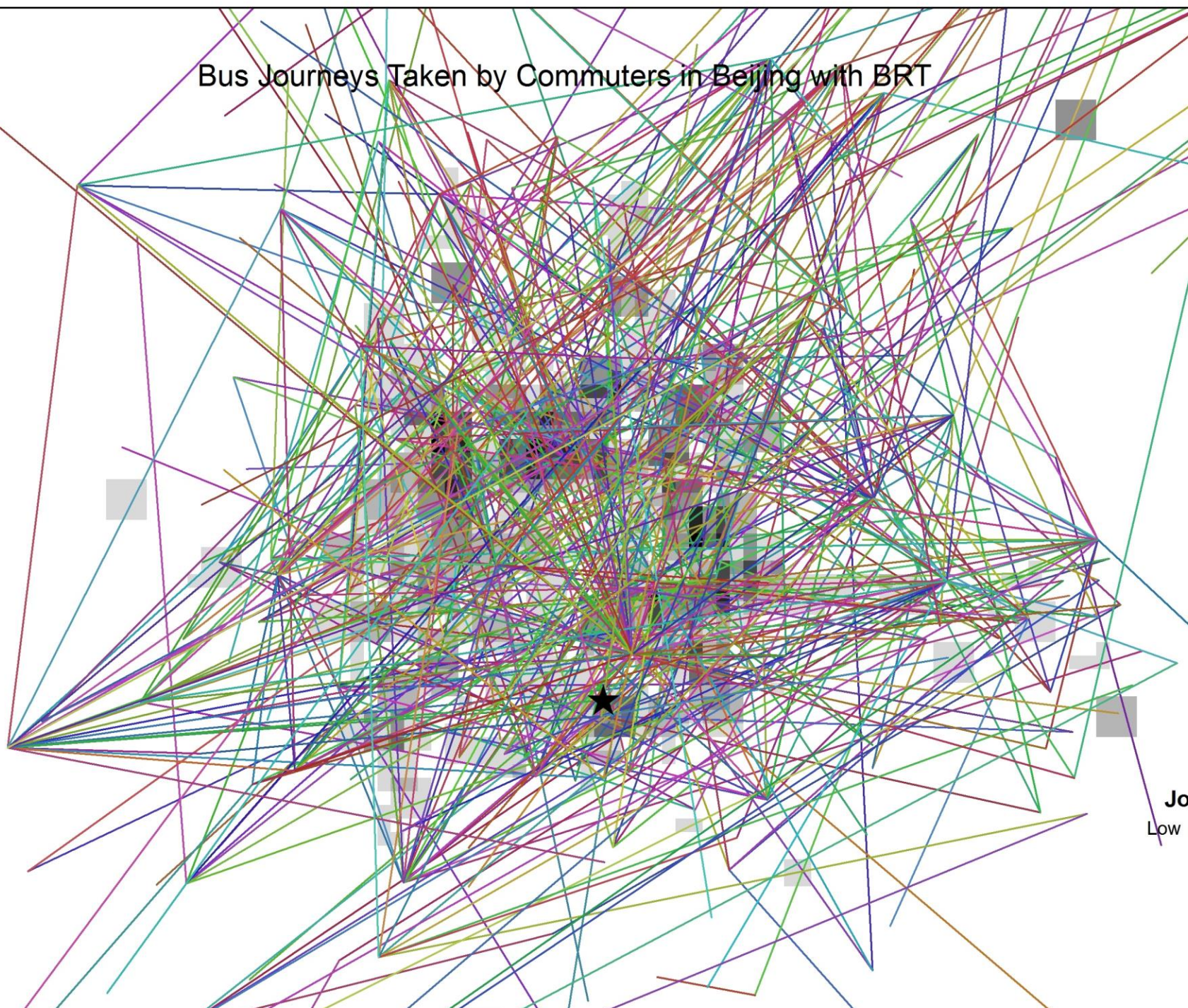
Identify losers and winners in optimization

Losers' Distribution When Bus Commuting Optimized for the Whole City



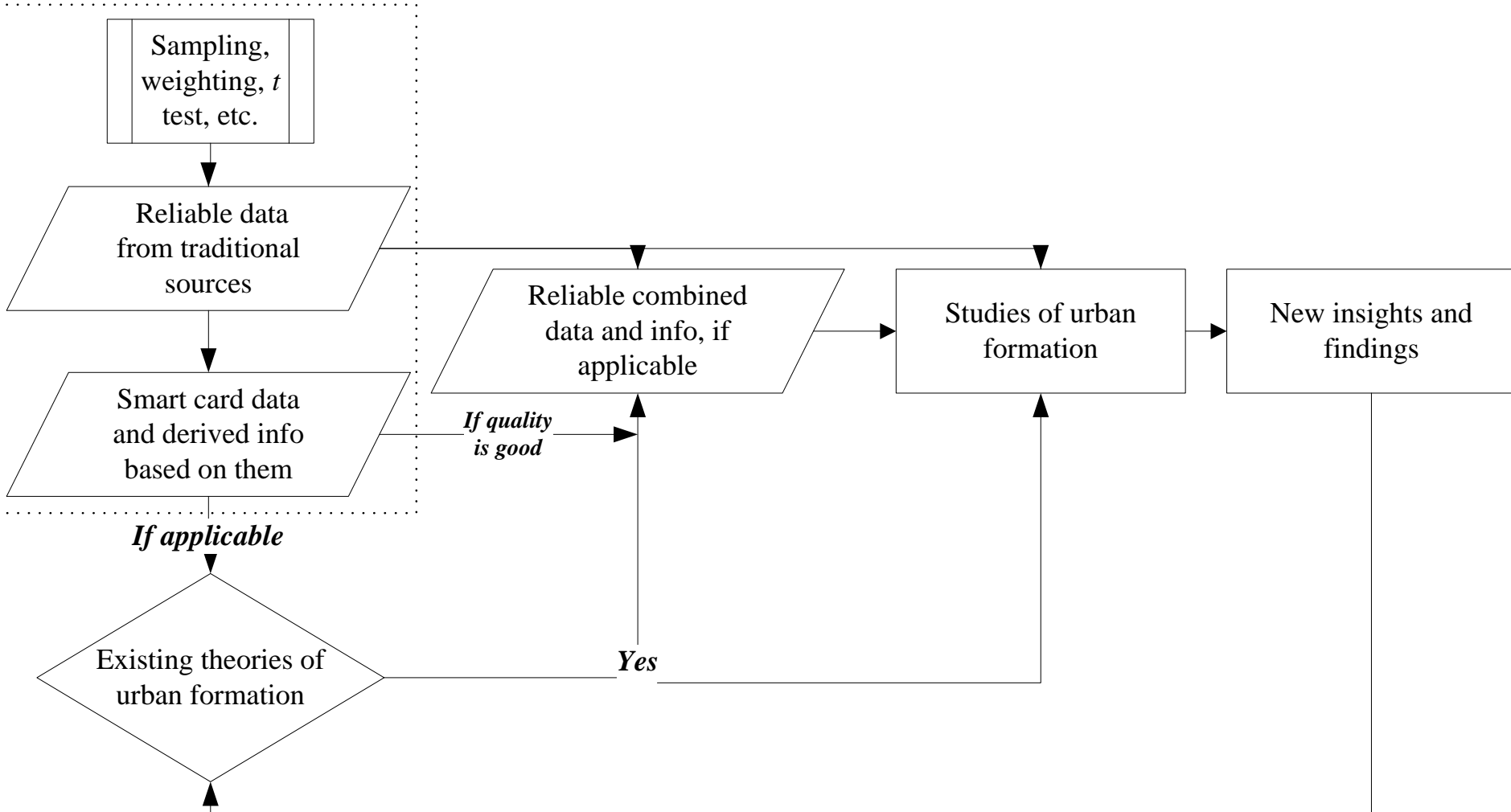
Construct policy scenarios to understand
impacts of different policies

Bus Journeys Taken by Commuters in Beijing with BRT



Jo
Low

Verify and even extend theories



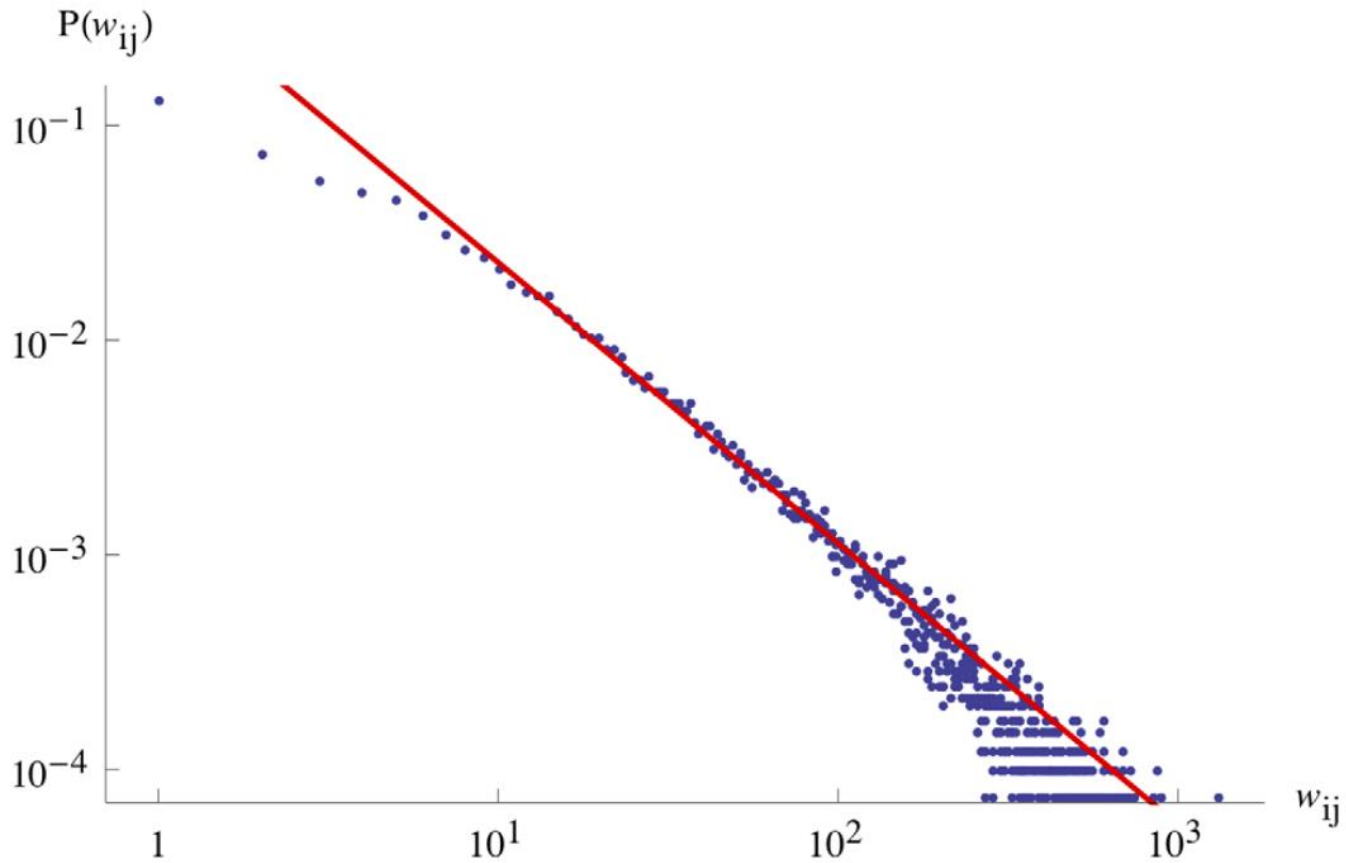
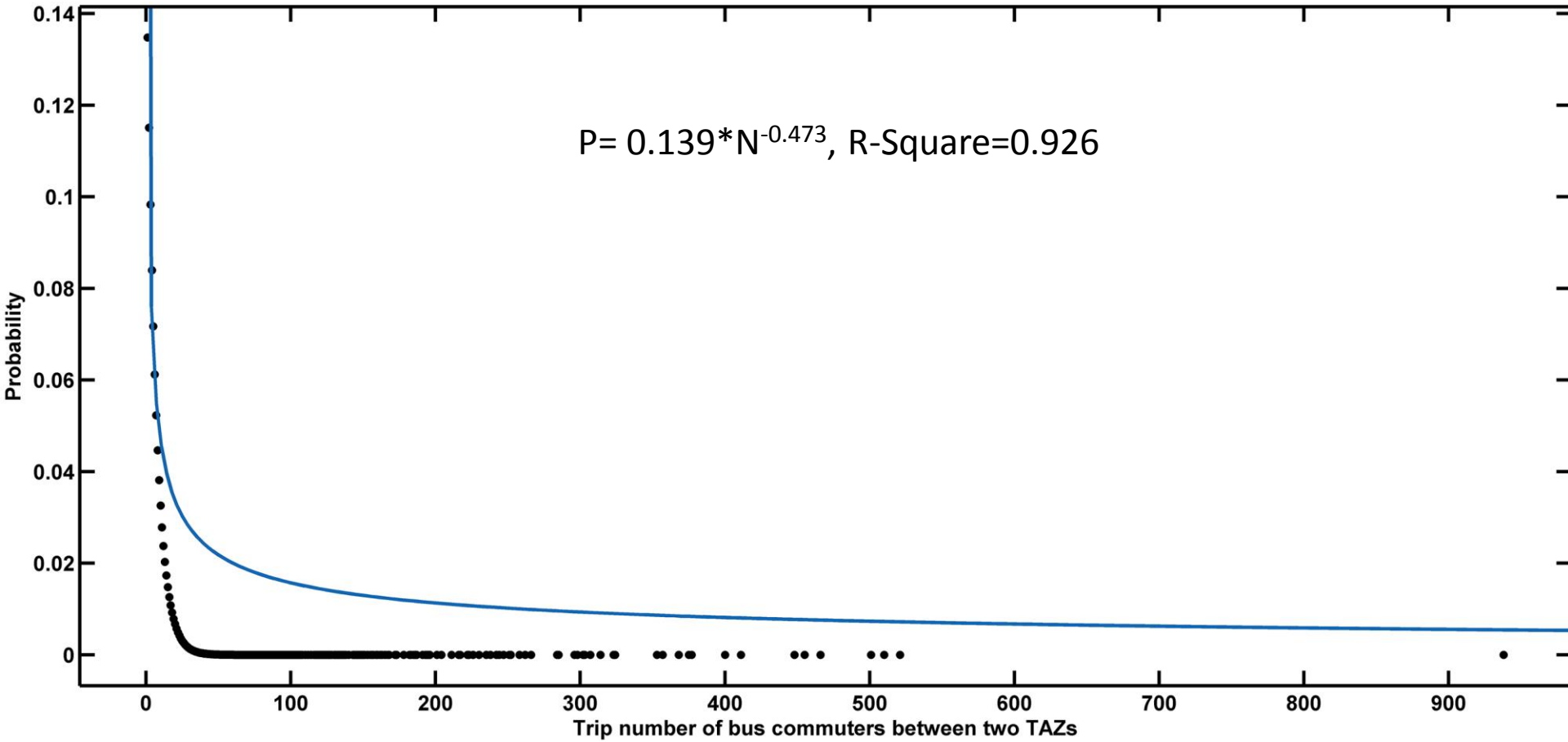
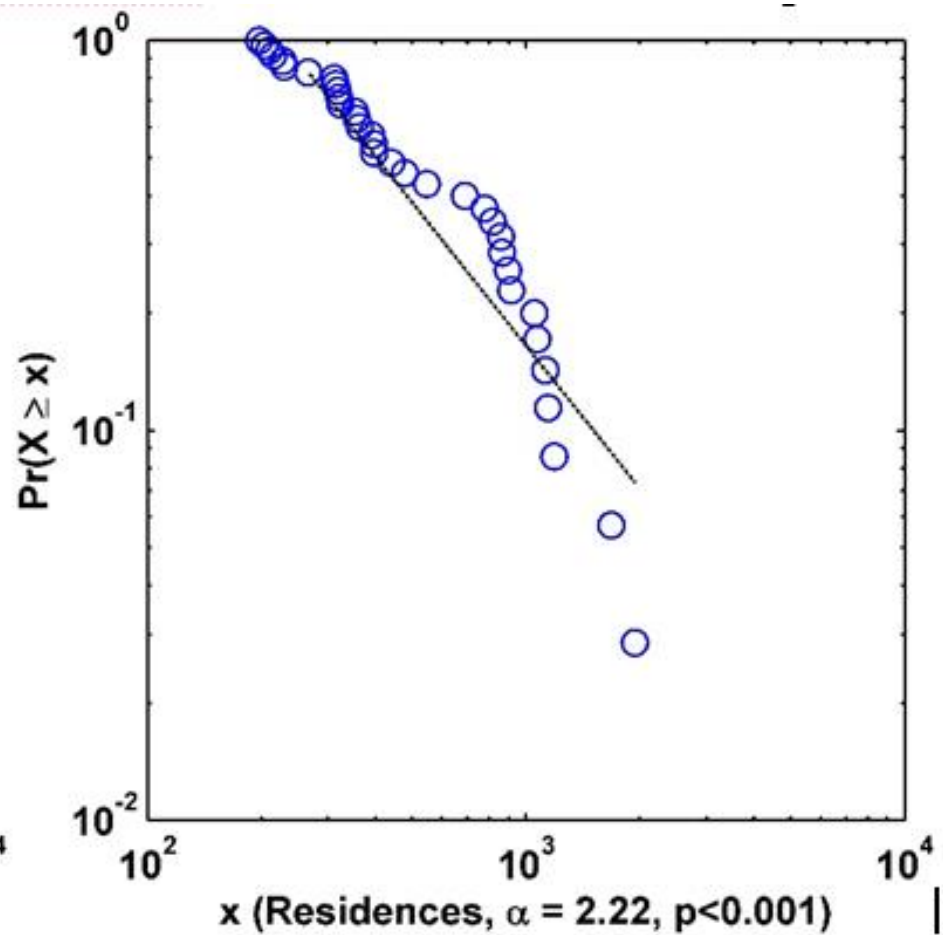
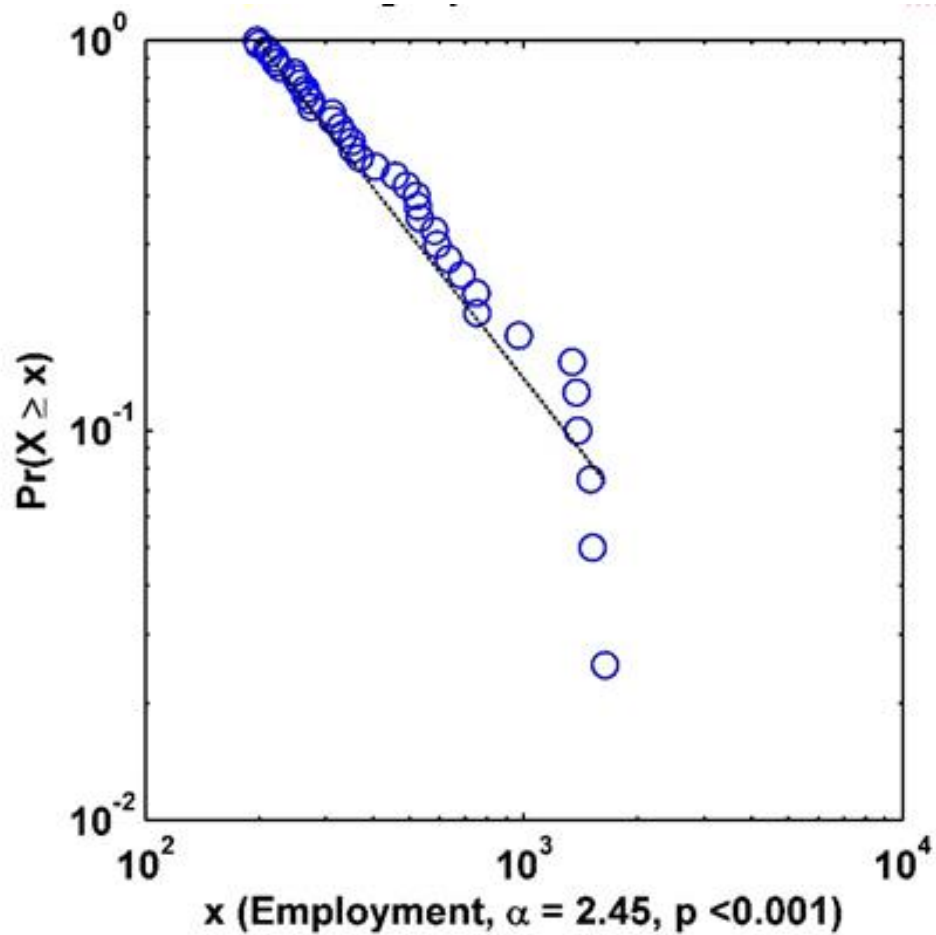


Figure 1. Flow distribution. Loglog plot of the histogram of the number of trips between two stations of the tube system. The line is a power law fit with exponent ≈ 1.3 .
doi:10.1371/journal.pone.0015923.g001





Summary

- **Big data have the potential to be a much more dynamic source of data for planning and policy studies than traditional data**
- **When enhanced by traditional data, big data can be used to generate new knowledge and insights**
- **Geo-visualization can help publicize the above knowledge and insights**

Summary

- **Urban China provides unlimited opportunities for those interested in big data and associated studies**
- **Visual labs/communities like BCL would enable us to take full advantage of those opportunities (“The strength of weak ties”!)**

