Urbanizing China

A reflective dialogue

11.S945, MW9:30-11:00 Professor: Jinhua Zhao, TA: Liyan Xu
Cases

1. Preface
   - Urbanization Out of Sync
   - Is China an Outliner?
   - Fundamentals: Hukou and Migration

2. Land & Money
   - Land Use and Public Finance Institutions
   - Quota Market in Chongqing and Chengdu: De-spatialize Land Transfer
   - Brownfield in Beijing: How Cities Recycle Industrial Land?
   - Property Tax

3. Hardware
   - Dispersion of Urban Agglomeration through High Speed Rail
   - Managing Car Ownership
   - Costs of Air Pollution: Human Health Damage
   - Progress in Energy Efficiency: Technology, Policy and Market
   - Financing Urban Access: Transportation, Urban Form and Land Grabbing
   - Untangling Complex Urban Issues through Emerging Big Data

4. Software
   - Drifting and getting stuck: Migrants in Chinese cities
   - Urbanization vs. Citizenization: Migrants in Wangjingxi Market
   - Spatial Justice in Affordable Housing Design in Ningbo
   - Preserving Beijing’s Spatial Tradition in Rapid Urban Development
   - Aging Society: Offering Care to the Elderly in the Confucius Society
   - Forging Greater Xi’an: New Regional Strategies
Managing Cars in China
Beijing 2010

Photograph courtesy of ding_zhou on Flickr.

Beijing 1982

Photograph of bicyclists in Beijing streets removed due to copyright restrictions.
Bicycle Mode Share in Beijing

Ming Yang, Maggie Wang, Jinhua Zhao and John Zacharias (2013) The Rise and Decline of the Bicycle in Beijing, submitted to TRB 2014
Map of Beijing subway lines removed due to copyright restrictions.
Source: Image by Hat600 on Wikimedia Commons.
Map of Beijing subway lines removed due to copyright restrictions.
Source: Image by Ran and Hat600 on Wikimedia Commons.
Map of Beijing subway lines removed due to copyright restrictions. Source: Image by Ran and Hat600 on Wikimedia Commons.
Motor Vehicles in Beijing

Graph removed due to copyright restrictions.

<table>
<thead>
<tr>
<th>Country</th>
<th>Cars Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>18,350,000</td>
</tr>
<tr>
<td>USA</td>
<td>12,775,346</td>
</tr>
<tr>
<td>Brazil</td>
<td>3,400,000</td>
</tr>
<tr>
<td>Germany</td>
<td>3,170,000</td>
</tr>
<tr>
<td>Japan</td>
<td>2,689,074</td>
</tr>
<tr>
<td>Russia</td>
<td>2,600,000</td>
</tr>
<tr>
<td>France</td>
<td>2,204,200</td>
</tr>
<tr>
<td>India</td>
<td>1,950,000</td>
</tr>
<tr>
<td>UK</td>
<td>1,939,275</td>
</tr>
<tr>
<td>Italy</td>
<td>1,750,000</td>
</tr>
</tbody>
</table>

The story of two billion cars…

Source: Sperling and Gordon 2009 Two Billion Cars: Driving Toward Sustainability
Overall growth conceals variation among cities! and associated policy interventions
Shanghai vs. Beijing

Motor vehicles

<table>
<thead>
<tr>
<th>Year</th>
<th>Shanghai</th>
<th>Beijing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>5.0</td>
<td></td>
</tr>
</tbody>
</table>
Households owing a car in 2011

Shanghai
- Owners: 18%
- NonOwners: 82%

Beijing
- Owners: 38%
- NonOwners: 62%
Four Cases

• Bidding to Drive: Shanghai’ Auction
• Superficial Fairness: Beijing's Lottery
• Price as a Policy Signal: Gauging the Public
• Purposeful Policy Leakage: Non Local Vehicles
Bidding to Drive

Shanghai’s License Auction Policy
Bidding to Drive: License Auction in Shanghai

Photograph of auction removed due to copyright restrictions.
4-6 Billion CNY Annual Revenue

- **Annual revenue**
- **Transit Subsidy**: 2.5 billion

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Revenue (Billions CNY)</th>
<th>Annual Licenses Issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>1.9</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>2.3</td>
<td></td>
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<tr>
<td>2005</td>
<td>2.3</td>
<td></td>
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<tr>
<td>2006</td>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>4.0</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>5.0</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>6.7</td>
<td></td>
</tr>
</tbody>
</table>
A Great Policy?

• Demand management: dampen growth of cars

• Financing tool: provide a large, stable and growing source of revenue
Do people accept it?

Photograph of Chinese registered license plate removed due to copyright restrictions.

The most expensive piece of iron in China!

Core policy drivers

- Effectiveness (perceived)
- Affordability
- Equity

{ Public Acceptance }
Framework of Public Acceptance

- Congestion
- Awareness
- Effectiveness
- Affordability
- Equity

Core policy drivers:
- Private vehicle auction
- Government vehicle
- Comparison to other cities
- Transparency

Implementation:
- Overall licensing process
- Information provision
- Bidding process
- Speculation
- Non Local license

Implementation Process:
- Unintended Consequences

Preference Variations:
- Car ownership
- Car use
- Car dependence
- Car pride
- Transit Access
- Commuting distance
- House location

Socioeconomics:
- Income
- Residence
- Age
- Gender
- Having Children
- Education

Other Policy Options:
- Congestion charges
- Parking charges
- Fuel taxes

License Auction Policy Acceptance:
- Current Acceptance
- Change of Acceptance
- Expectation of Others’ Acceptance
Primary Data Collection in Shanghai

- **2011 survey**
  - Purposeful sampling
  - Personal contacts
  - 1100 employees from nine companies
  - Not weighted
  - 524 valid responses

- **2012 survey**
  - Professional survey company

- **Data weighting**
  - 6th Census in 2010: Local and migrants
  - Age, Gender, Income, Education, Location, Hukou

- **Final dataset**
  - 1389 valid responses
  - Representative along the above 6 dimensions
High congestion level

Government intervention necessary

<table>
<thead>
<tr>
<th>Agreement Level</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>High congestion</td>
<td>50%</td>
<td>60%</td>
<td>38%</td>
<td>45%</td>
<td>25%</td>
</tr>
</tbody>
</table>

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## Psychometric Measurement of Public Acceptance

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>X9</td>
<td>I support the quota auction policy in Shanghai.</td>
</tr>
<tr>
<td>X10</td>
<td>I hope the auction policy can continue to be implemented in Shanghai.</td>
</tr>
<tr>
<td>X11</td>
<td>Shanghai government should not use the quota auction policy to mitigate congestion.</td>
</tr>
<tr>
<td>X12</td>
<td>I cannot accept the quota auction policy since there are a lot of problems existing in the policy.</td>
</tr>
<tr>
<td>X13</td>
<td>If voting, I won't want the quota auction policy to continue implemented.</td>
</tr>
</tbody>
</table>

Reliability of measurement (Cronbach’s alpha = 0.75)
Overall Acceptance

43% negative
30% neutral
27% positive

Fully unacceptable

Fully acceptable
Core policy drivers

- **Effect**: Strongly Positive
- **Affordability**: Strongly Negative
- **Equity**: Strongly Positive

- Effectiveness
- Affordability
- Private vehicle auctions
- Government vehicles
- Comparison with other cities
- Transparency in revenue usage
Preference Variation

Dependent Variables
- Acceptance
- Effectiveness
- Affordability
- Equity

Independent Variables
- Car ownership and license, car mode share
- Eagerness to buy a car
- House location, commuting distance
- Age, gender, income, education, hukou, household size, # of children

Structural Equation Model: implementation: Mplus; CFI/TLI > 0.9; RESEA/SRMR < 0.05

Overall Attitude

Perception on government vehicles
Transparency on revenue usage
Equity compare to other cities
Equity in auction
Acceptance
Acceptance Change
Effectiveness
Affordability

Center: positive
Car Owners (18%) vs. Non-Car Owners (72%)

Shanghai License (80%) vs. Non-local License (20%)
Car owners as a supporting constituency?!

- Owner’s club
- The more owners, the more the policy is supported
- 1994
- Who bought cars first?
- Irreversible
Superficial Fairness of Beijing’s License Lottery Policy
Shanghai vs. Beijing

• Shanghai
  – Early intervention
  Since 1994
  Ownership control
  – Auction

• Beijing
  – No intervention
  • Until 2008
  • Use control
  – Lottery in 2011
Beijing’s License Lottery Policy

- Fixed quota: 20k
- Equal probability of winning
- No entry cost
- Require local hukou or PR*

*For temporary migrants, it requires proof of five year income tax and social security fee.

Zhao, J., T. Chen and D. Block-Schachter (2013) Superficial Fairness of Beijing’s Car License Lottery Policy
Beijing’s Lottery Policy

• Effectiveness
• Efficiency
• Equity
Motor Vehicles in Beijing

Graph removed due to copyright restrictions.
Beijing’s Lottery: Effectiveness

Annual Motor Vehicle Growth Rate in Beijing

Beijing’s Lottery: Efficiency

• Macro level

• Micro level
  – No cost of entry
  – Everybody joins
  – Odds: 1:80
  – Distortion of resource allocation
  – Detached from travel need
Willingness to Pay

vs.

Financial Ability to Pay
Beijing’s Lottery: Fairness

Photograph of slot machine removed due to copyright restrictions.
Dimensionality of equity

• Classic Dimensions
  – Rich vs. poor (income)
  – Existing vs. new owners (time)
  – Revenue transfer (cross modes)

• Unique Dimensions in China
  – Local vs. migrant (Hukou)
  – Private vs. public (Ownership)

• Unintended Dimensions (Policy Loopholes)
  – Public perception of corruption
  – Transparency in the process
  – Black market: shadow price
3.1.1 Rich vs. Poor
Current & future car buyers

3.1.2 Prior vs. New
Prior car buyers

3.1.3 Revenue Transfer
Resource redistribution

3.1.4 Space
Inner vs. Outer City

3.2.1 Local vs. Migrant
Different social class

3.2.2 Government Vehicles

3.3.1 Corruption
3.3.2 Information Asymmetry

PRIVATE

PUBLIC

LOCAL

MIGRANT

CAR OWNERS

NON-CAR OWNERS

Future car owners
Shadow Price of Beijing license

Free → Over CNY100k

Shanghai license 70~90k
Shadow Price of Beijing license

Photograph of Depression Breadline (Segal) and photograph of stack of coins removed due to copyright restrictions.
Beijing’s Lottery Policy

- Effectiveness: Extraordinary
- Efficiency: Disaster
- Equity: Superficial
Gauging the Public

Price as a Signal for Policy Fine-tuning
Policy making in China is Easier?

- Fewer regulatory constraints
- Stronger government power
- Richer resources
- Elite-driven
- Lack of public participation

Authoritarian decision making

- Straightforward
- One-directional
Do governments gauge the public opinions?

- Lack of mechanism
  - Formal public participation

- Consequences
  - Implicitly gauging public opinion
    - No feedback / ignore feedback
    - Over react
    - Drama
Mechanism of Quota Decision Making

Supply → Quota → Price
Multivariate Autoregressive and Moving Average Model (ARMA)

- Vector
  - # Bidder
  - Bidding Price
  - # Quota
- Granger causality
- Multivariate ARMA

\[ y_t = \begin{pmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \end{pmatrix} = \begin{pmatrix} \text{quota}_t \\ \text{bidders}_t \\ \text{bid}_t \end{pmatrix} \]

\[ y_t = B x_t + \sum_{i=1}^{p} \Phi_i y_{t-i} + \sum_{j=1}^{q} \Theta_j \varepsilon_{t-j} + \varepsilon_t \]
Mechanism of Quota Decision Making

• Hypothesis 1: If the road infrastructure expands, the government allows more vehicles in the streets and therefore issues a higher quota.

• Hypothesis 2: Public transportation has an influence on the quota, but there are two conflicting possibilities: a) investments in public transportation can be considered a disincentive to driving, and in order for transportation policies to be consistent the quota should not increase; or b) public transportation investment attracts certain car users to switch to transit, and releases more road space for automobiles, so more quota can be allowed. We will test which possibility dominates in the paper.

• Hypothesis 3: The government issues more license plates to satisfy a larger demand, i.e., number of bidders has a positive impact on quota.

• Hypothesis 4: The government issues more license plates to control (reduce) the price so as to relieve the public pressure and keep the policy within the range of public acceptability, i.e., bid price has a positive impact on quota.

• Hypothesis 5: The government wants to maximize the total revenue and therefore releases more license plates when the price is high, i.e., bid price has a positive impact on quota.
Mechanism of Quota Decision Making

Quota (t) = 1.354 RoadArea +

0.808 Quota (t-1) +

40.4 Price (t-1) + ...

Supply → Quota → Price

Bidding Price as a Signal for Policy Adjustment
Mechanism of Quota Decision Making

• Quota as a function of
  – Supply
  – Last month quota
  – Price

• Two interpretations
  – Relieve public pressure
  – Maximize revenue
Beijing: Secrecy and Suddenness

• 1994 vs. 2011

• Beijing
  – Lottery as a tight secret
  – Dec 2010: car sale rush: 24 hour services
  – Any chance of public participation
  – Not concerned or over concerned?
Evaluation of Shanghai and Beijing’s Policies

<table>
<thead>
<tr>
<th></th>
<th>Shanghai’ Auction</th>
<th>Beijing’ Lottery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness</td>
<td>The same</td>
<td>The same</td>
</tr>
<tr>
<td>Efficiency</td>
<td>High</td>
<td>Very low</td>
</tr>
<tr>
<td>Equity</td>
<td>Mixed</td>
<td>Superficial</td>
</tr>
</tbody>
</table>
Citizen’s preference

• Beijing Transportation Research Center
• What would citizens choose?
  – Lottery or Auction
Public Acceptance (Shanghai vs. Beijing)

<table>
<thead>
<tr>
<th></th>
<th>Shanghai on Auction</th>
<th>Beijing on Lottery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>38%</td>
<td>25%</td>
</tr>
<tr>
<td>Neutral</td>
<td>25%</td>
<td>13%</td>
</tr>
<tr>
<td>Positive</td>
<td>0%</td>
<td>38%</td>
</tr>
</tbody>
</table>
Auction or lottery? Public preference in Beijing

Salience in Policy Design
Advantages of Chinese Government

• Sensible policy vs. public mentality
• Dilemma and Difficulty
• Beijing: shy away
  – Over concerning the public opinion?
Public preference: BJ vs. SH

- **Beijing**
  - Auction: 100%
  - Lottery: 0%

- **Shanghai**
  - Auction: 75%
  - Lottery: 25%
Purposeful Policy Leakage

Legitimacy and Intentionality of Non-Local Vehicles
How many cars in Shanghai?

Official # of cars: 1.25 million

Over 20% of Shanghai cars are Non-local!

Total # of cars: 1.6 million?
Consequences of leakage

- Effectiveness
- Revenue
- Traffic management
- Fairness
- Trustworthiness of government
Effectiveness vs. Openness

- Congestion Management
- Shanghai as a global center
City State vs. City in a Region

- **Singapore**
  - No domestic car industry
  - City-state
    - Closed system with no non-local vehicle problems

- **Shanghai**
  - Car as pillar industry
  - City of region
    - Open city allowing non-local vehicles entering
Motivations for Non-Local License

• Behavioral Factors
  – Financial
    • Cost: Time horizon of ownership
  – Convenience: Peak hours, elevated
  – Social image: Perceived status
  – Feasibility: Connection
  – Respect: Government Regulation

No dominant strategy!
Primary Data Collection

• Two waves of questionnaire surveys
  – Original: Sep-Oct, 2012 (1000 samples)
  – Booster survey: Nov-Dec 2012 (500 samples)

• 51Polls: survey consulting firm in Shanghai

• Filtering and Re-weighting
  – Sixth Census on Shanghai in 2010
  – Local and migrants
  – Age, Gender, Income, Education, Location, Residence

• Final dataset
  – 1389 records
  – Representative sample along above 6 dimensions
Behavior
- NLV penetration
- Methods of getting NLV
- Variation: by year, income, residence

Attitude
- Overall level of NLV
- Convenience, Effectiveness
- Further restriction, Total ban

Perception
- Social image; status concern
- SH vs. NL, Anhui vs. Jiangsu
- License and car price

Legitimac
- Violation and incidence
- Legitimacy of NLV
- Respect of Law

Intention
- Future purchase plan
- % switching from SH to NLV

Public Responses
Behavior: % of NLV

- All SH Hukou
- SH Hukou
- NL Hukou
Should Shanghai change the current NLV restriction?

- **Strengthen restriction**: 49%
- **No Change**: 34%
- **Weaken restriction**: 17%
Trade off with Openness

As a metropolitan, Shanghai should welcome vehicles from other cities to enter and drive freely in Shanghai.

Shanghai should loosen the restriction on nonlocal vehicles since it has continuous tradings with other Chinese cities.

Shanghai government should totally ban non-local vehicles driving on Shanghai's road.
Respect of Government Regulation

It's ok to disobey government regulation since the government's enforcement and punishment on violation of regulation is not harsh.

I will do the things that I think is right even it may has conflict with government regulation.

I think it's fine to disobey some rules if I think it doesn't make sense.
EFFECT OF CURRENT RESTRICT

R2 = 11.6%

-0.139 0.176 -0.125 0.195 -0.202 -0.099

SHANGHAI NON-LOCAL MALE MIGRANT LICENSE

FURTHER RESTRICT

R2 = 21.5%

0.330

-0.202 -0.099

NON-LOCAL LICENSE

MALE

MIGRANT

SHANGHAI LICENSE
Do you perceive Shanghai residents getting NLL as a legitimate alternative or as an illegitimate activity?

- 35% fully legitimate
- 28% fully illegitimate
- 20% 4
- 13% 5
- 3%
Do you perceive Shanghai residents getting NLL as a legitimate alternative or as an illegitimate activity?

<table>
<thead>
<tr>
<th>Category</th>
<th>Illegal</th>
<th>Neutral</th>
<th>Legal</th>
</tr>
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<tbody>
<tr>
<td>All</td>
<td>0%</td>
<td>75%</td>
<td>25%</td>
</tr>
<tr>
<td>SH license</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>NonLocal License</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Legend:
- **Illegal**
- **Neutral**
- **Legal**
Non-local Vehicles

- As a problem?
- As purposeful leakage?
Government Response I: internal

Banned vs. Allowed

Non local vehicle restriction
• Peak hour
• Elevated road
Government Response I: internal

- Strengthened enforcement
- Video camera monitoring
- Fine: 200 Yuan

Photograph of traffic camera and sign removed due to copyright restrictions.
Government Response II: regional collaboration

- 15 cities in the Yangtze River Delta
- Restricting car license registration for Shanghai residents

Political cartoon of removing a non-local car from traffic flow removed due to copyright restrictions.
Government Response: Timeline

- **1995**: Introduction of car license auction policy
- **1997**: Non-local vehicle owners start to pay road construction tolls as Shanghai car owners
- **1999**: Peak hour driving ban on elevated expressway
- **2001**: Regional collaboration on controlling Shanghai residents getting non-local licenses
- **2003**: Government vehicle auction starts
- **2005**: Introduction of Green Mark Policy
- **2007**: Dealership announced local vehicle purchased only register with local license
- **2009**: Electronic cameras enforcement on elevated expressway

Image by MIT OpenCourseWare.
Shanghai Government

- Technical and Institutional Capacity
- Policy Intent
# Legitimacy and Intentionality

<table>
<thead>
<tr>
<th></th>
<th>Government</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legitimacy</strong></td>
<td>• Mixed signals</td>
<td>• NLL seen as reasonable reaction to policy</td>
</tr>
<tr>
<td></td>
<td>• Choice to restrict but not completely ban confers implicit legality</td>
<td>• But inconvenient and lower status</td>
</tr>
<tr>
<td><strong>Intentionality</strong></td>
<td>• Intentional in general</td>
<td>• Maintain current choice</td>
</tr>
<tr>
<td></td>
<td>• Unintentional on specifics</td>
<td>• Potentially more NLL</td>
</tr>
</tbody>
</table>
Four Cases

- Bidding to Drive: Shanghai’s Auction
- Superficial Fairness: Beijing's Lottery
- Price as a Policy Signal: Gauging the Public
- Purposeful Policy Leakage: Non Local Vehicles
Shanghai Government

- Congestion mitigation vs. openness as a city
- Inconvenience but not ban
- Enforcement capacity vs. purposeful choice
- Intentionality
  - Yes about the direction
  - Not about specifics
Public

- NLL seen as reasonable reaction to policy
- But inconvenient and lower status
- Maintain current choice and potentially more NLL
- Trade-off between open city and congestion
Policy Making in China

• Sophistication of policy design in China
  – Framing of the question: Pro- or Con- policy
  – As result of
    • Multiple goals
    • Policy developments over time

• Dynamic interaction
  – Policy making by the institution vs. behavioral response from the public
Policy Leakage

• Scope matters! Incomplete as a matter of perspective – gov’t has many aims, and effectiveness requires acceptance.

• Actors matters! The policy maker is not the only actor – the acceptance of the person being regulated must be measured

• Legitimacy and intentionality are lenses to evaluate the interplay between policy actors.
Hybridizing the car ownership bidding and lottery in Guangzhou

Wenfei Xu
Next class

Costs of Air Pollution: Focusing on its Human Health Damage

Kyng-Min Nam
