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

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

Beijing 2010

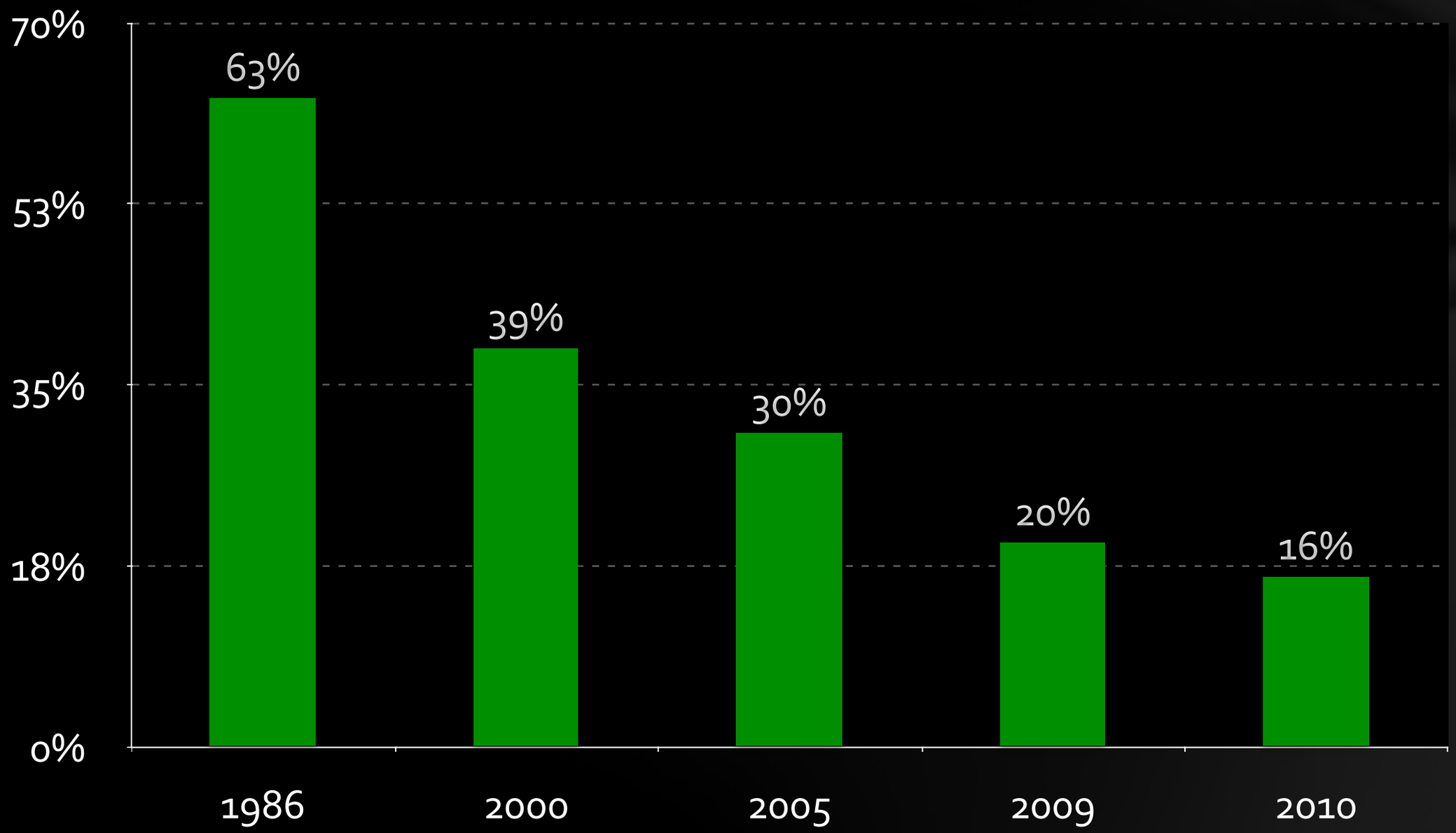
Photograph courtesy of ding_zhou on Flickr.

Beijing 1982

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

Source: Wang Wenlan, Wen's Lens, http://www.chinadaily.com.cn/photo/wangwenlan/2009-12/07/content_9128656.htm

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

2000

Map of Beijing subway lines removed due to copyright restrictions.
Source: Image by Hat600 on Wikimedia Commons.

2011

Map of Beijing subway lines removed due to copyright restrictions.

Source: Image by Ran and Hat600 on Wikimedia Commons.

2015

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.

Source: World Bank (2011) Sustainable Development: Call for Action on Urban Congestion, Air Quality Decline, Mounting Accidents, and GHG, http://go.worldbank.org/EBV45P0U50

WHICH COUNTRIES BUY THE MOST CARS?

Infographic removed due to copyright restrictions.

CHINA	USA	BRAZIL	GERMANY	JAPAN	RUSSIA	FRANCE	INDIA	UK	ITALY
18,350,000	12,775,346	3,400,000	3,170,000	2,689,074	2,600,000	2,204,200	1,950,000	1,939,275	1,750,000

Source: http://parts.olathetoyota.com/2011-car-sales-statistics.html

The story of two billion cars…

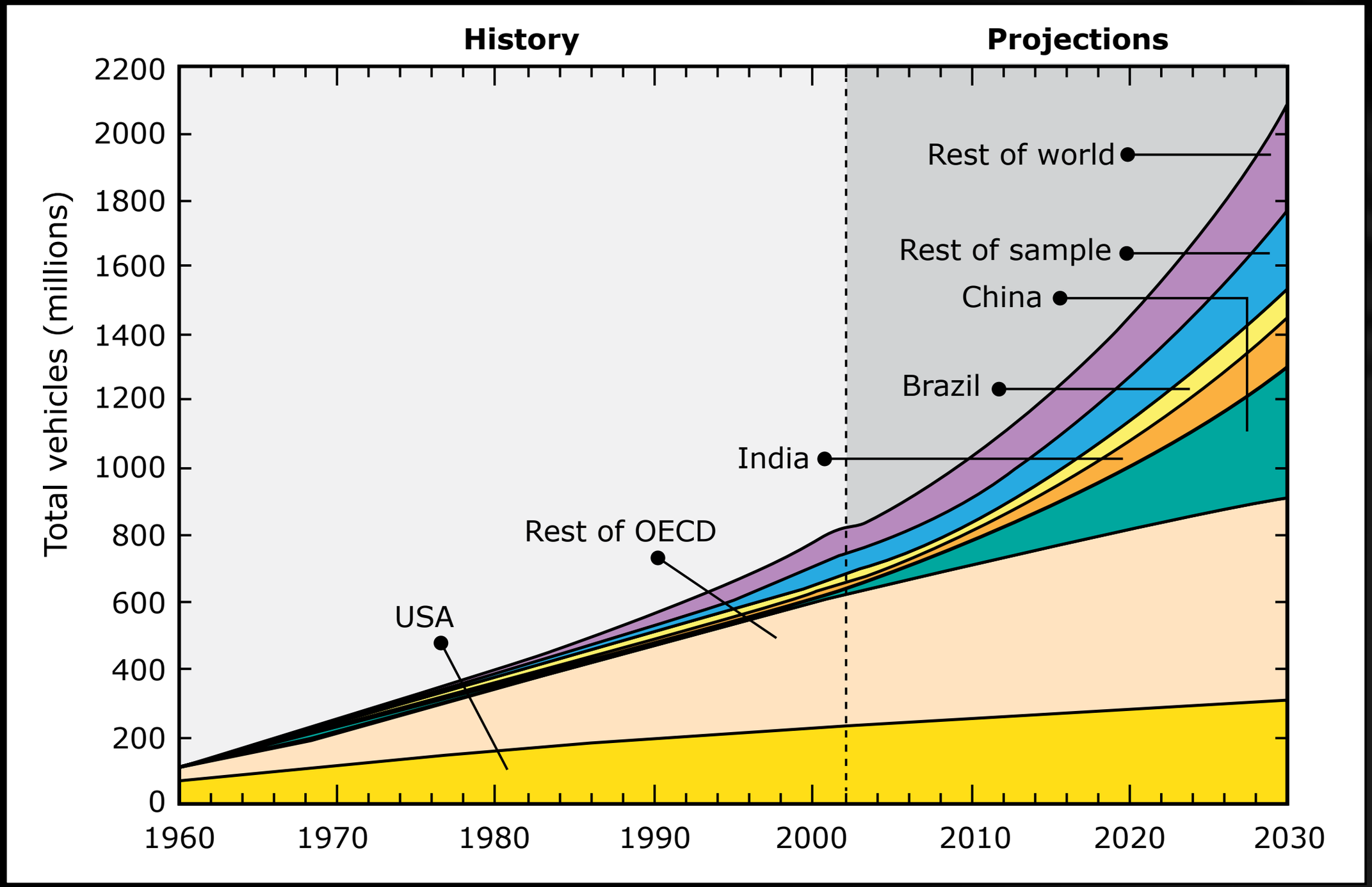


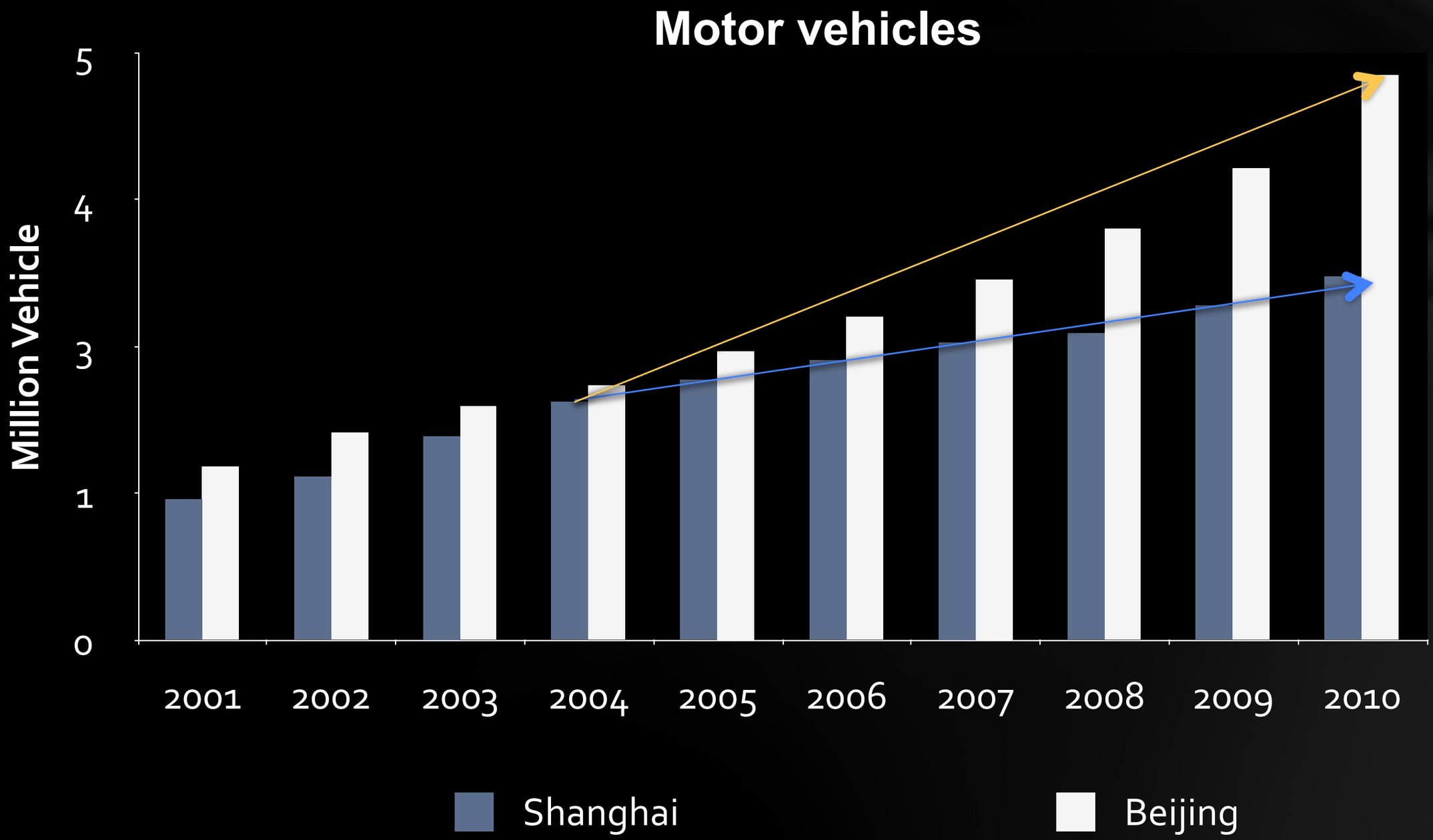
Image by MIT OpenCourseWare.

Source: Sperling and Gordon 2009 Two Billion Cars: Driving Toward Sustainability

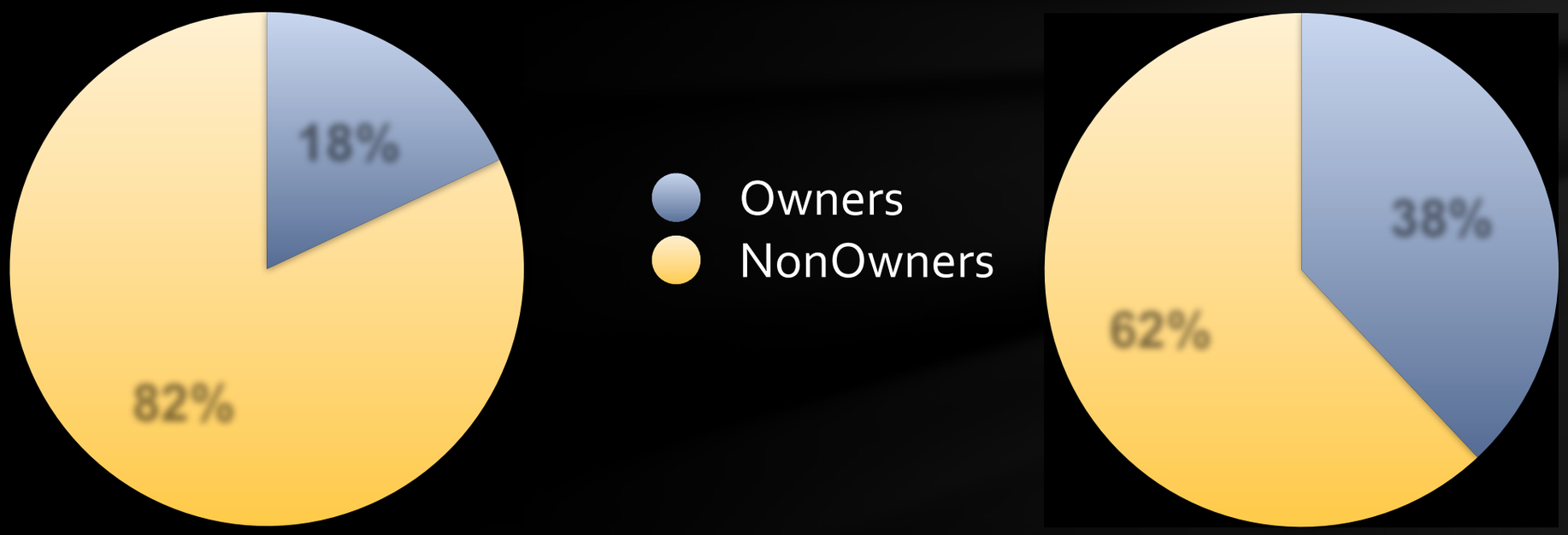
Overall growth conceals variation among cities!

and associated policy interventions

Shanghai vs. Beijing



Households owing a car in 2011



Four Cases

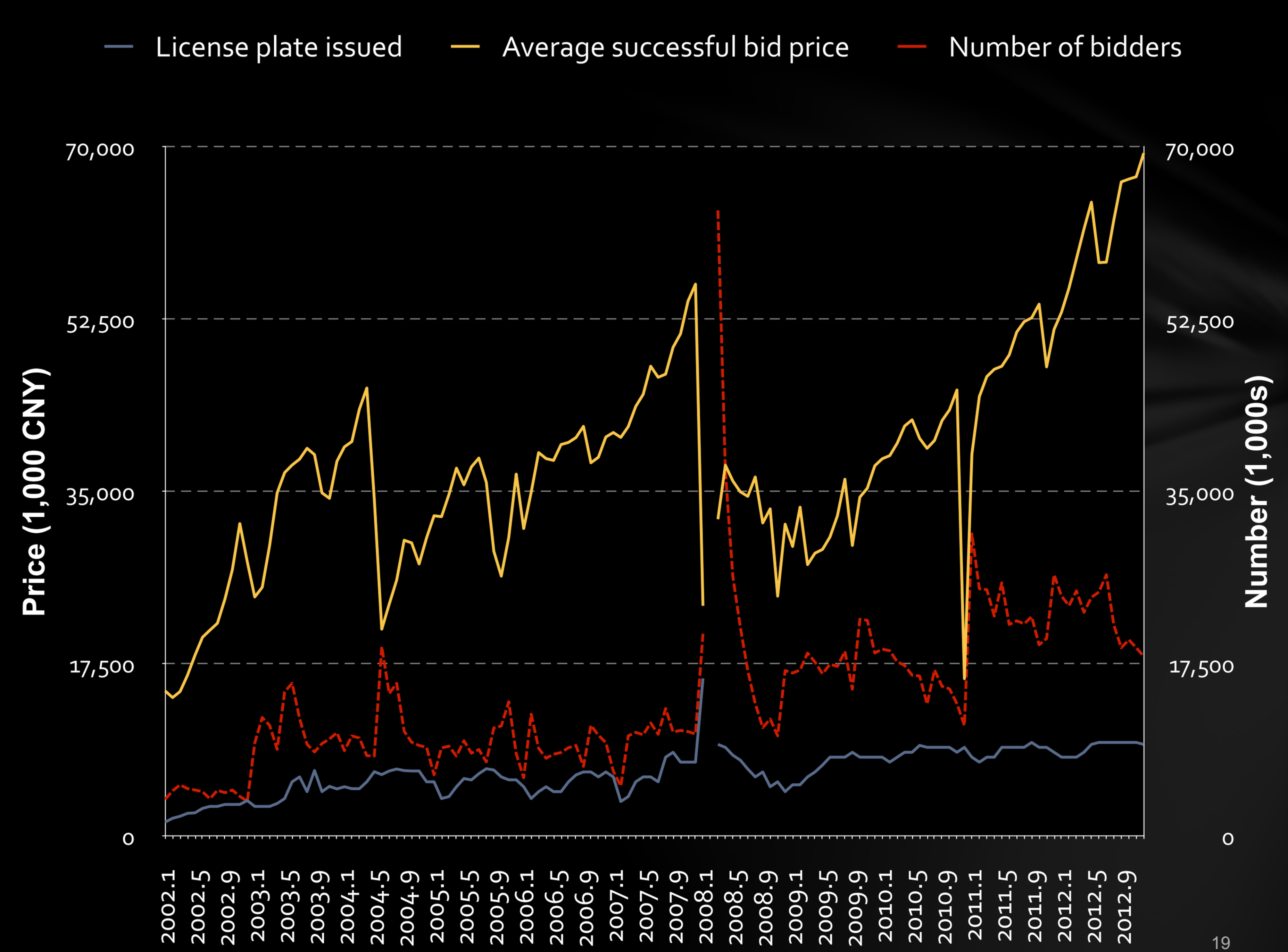
- Bidding to Drive: Shanghai’ Auction
- Superficial Fairness: Beijing's Lottery
- Price as a Policy Signal: Gauging the Public
- Purposeful Policy Leakage: Non Local Vehicles

Bidding to Drive

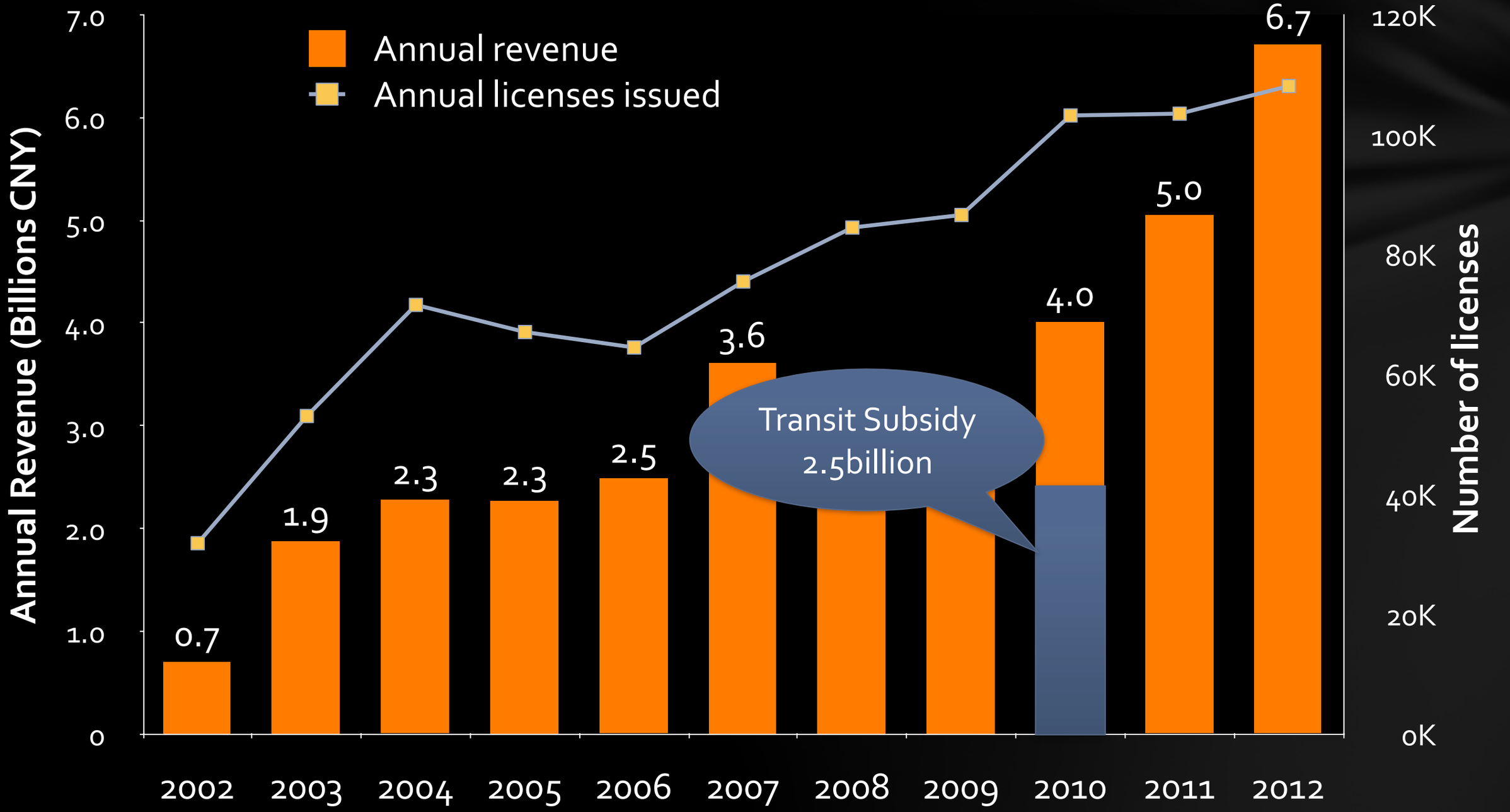
Shanghai's License Auction Policy

Bidding to Drive: License Auction in Shanghai

Photograph of auction removed due to copyright restrictions.


License plate issued
Average successful bid price
Number of bidders
70,000
52,500
35,000
17,500
0
Price (1,000 CNY)
Number (1,000s)
2002.1
2002.5
2002.9
2003.1
2003.5
2003.9
2004.1
2004.5
2004.9
2005.1
2005.5
2005.9
2006.1
2006.5
2006.9
2007.1
2007.5
2007.9
2008.1
2008.5
2008.9
2009.1
2009.5
2009.9
2010.1
2010.5
2010.9
2011.1
2011.5
2011.9
2012.1
2012.5
2012.9

4-6 Billion CNY Annual Revenue



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!

Chen, T. and J. Zhao (2013) Bidding to Drive: Car License Auction Policy in Shanghai and Its Public Acceptance, Transport Policy, 2013

Core policy drivers

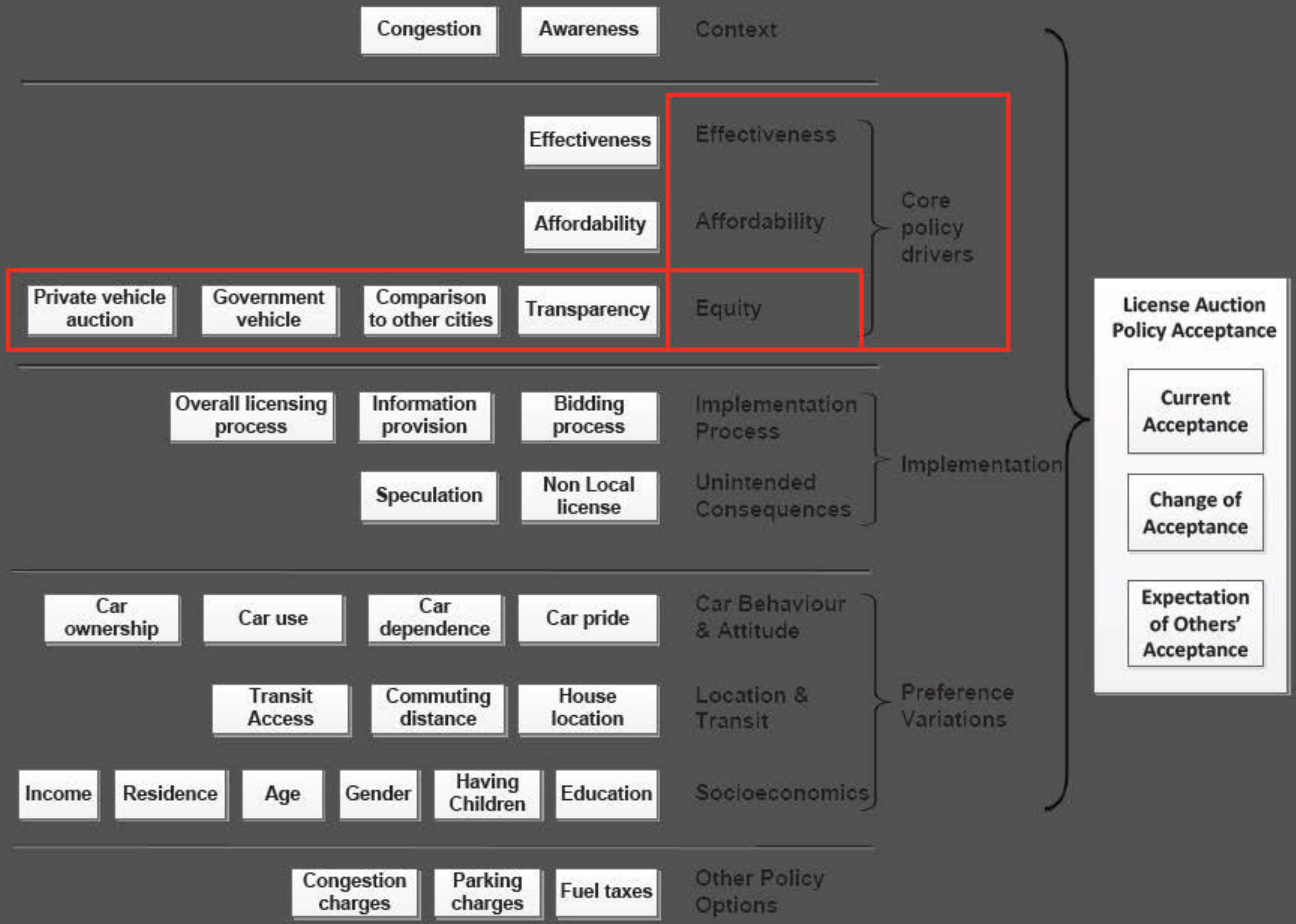
Effectiveness (perceived)

Affordability

Equity

Public Acceptance

Framework of Public Acceptance



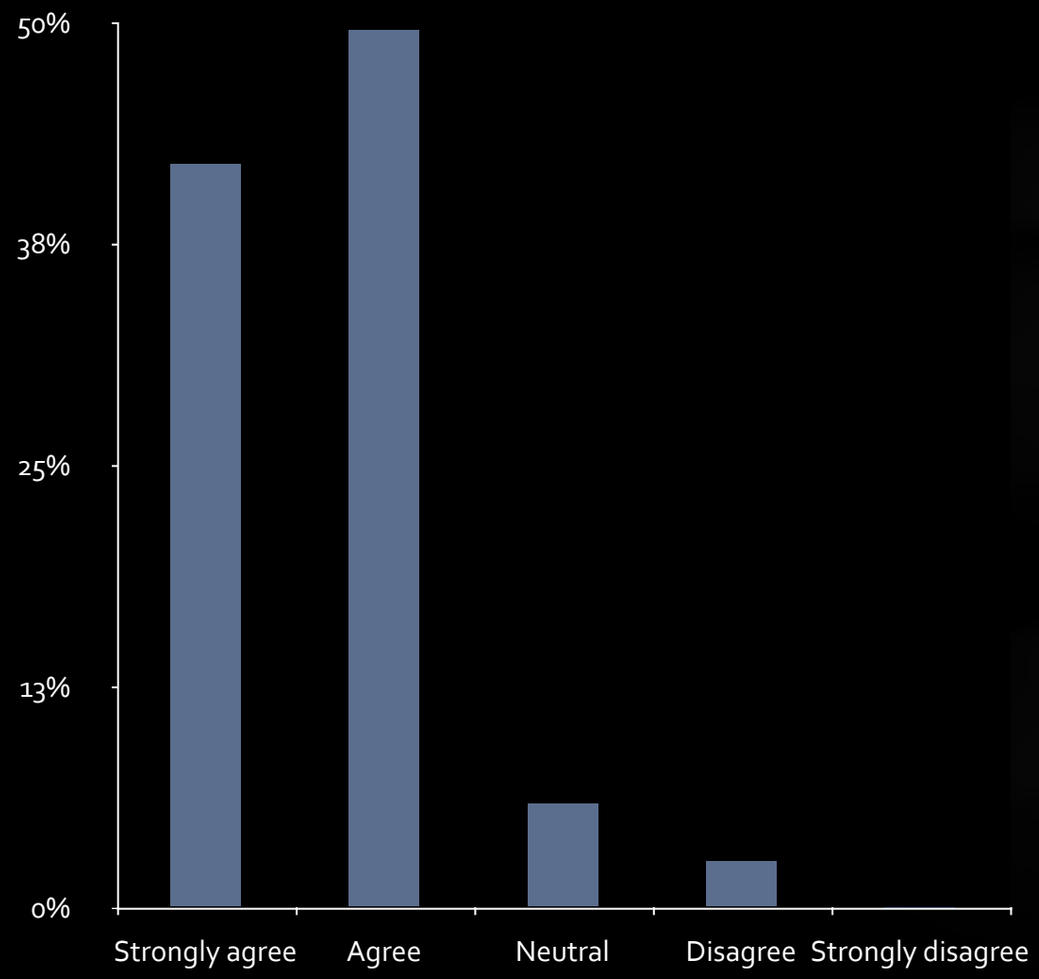
Primary Data Collection in Shanghai

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

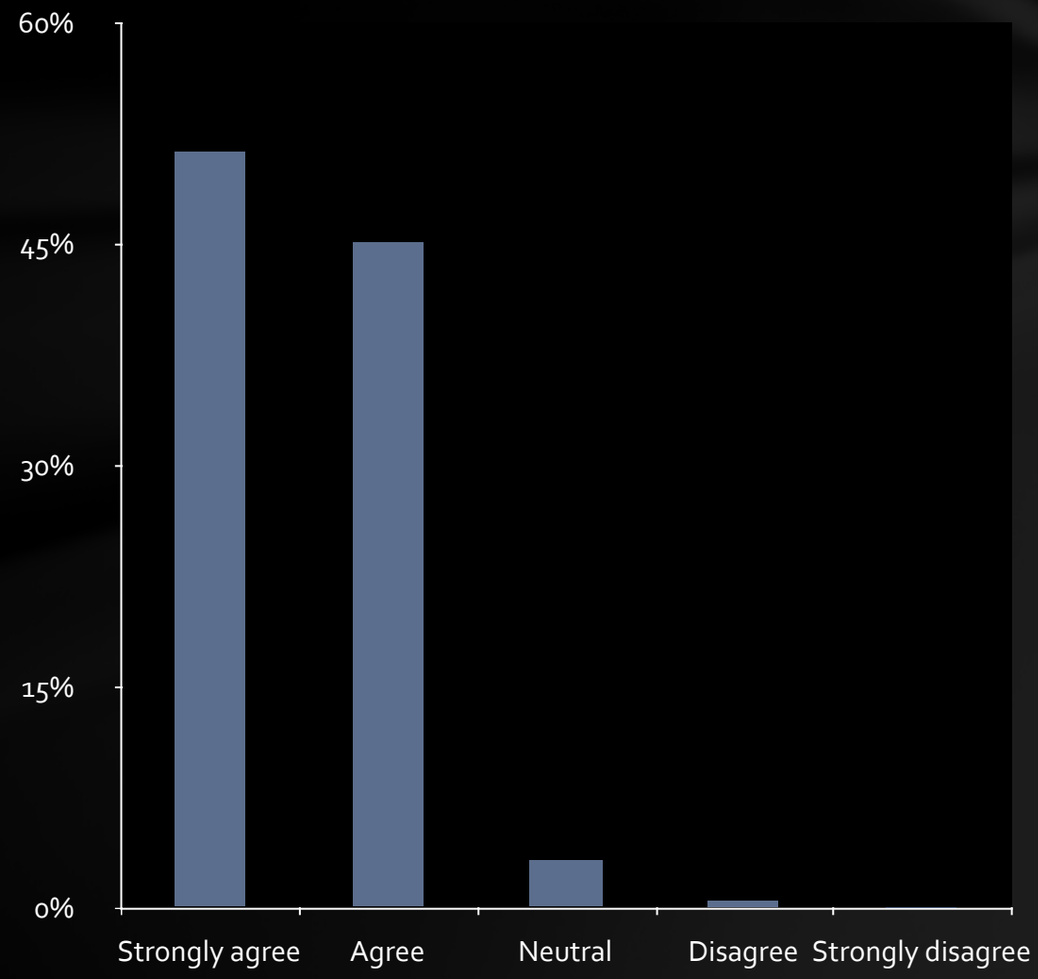
- 2012 survey
  - Professional survey company
- Data weighting
  - 6th Census in 2010: Local and migrants
  - Age, Gender, Income, Education, Location, Hukou
- Final dataset
  - 1389 valid responses
  - Representative along the above 6 dimensions

Policy Intervention Necessity

High congestion level



Government intervention necessary



Psychometric Measurement of Public **Acceptance**

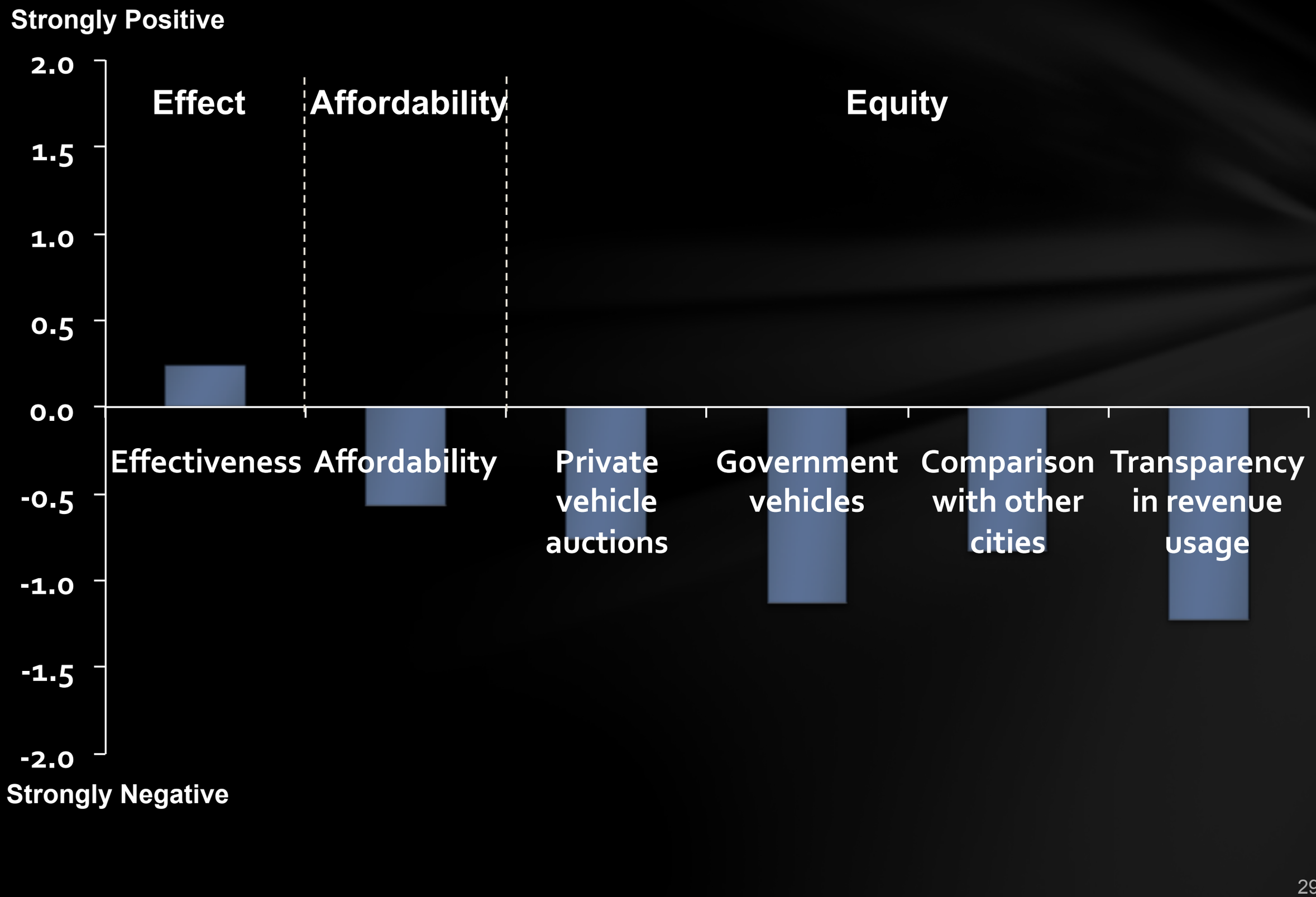
Indicators measuring policy acceptance (Likert-scale questions)	
X9	I support the quota auction policy in Shanghai.
X10	I hope the auction policy can continue to be implemented in Shanghai.
X11	Shanghai government should not use the quota auction policy to mitigate congestion.
X12	I cannot accept the quota auction policy since there are a lot of problems existing in the policy.
X13	If voting, I won't want the quota auction policy to continue implemented.

Reliability of measurement (Cronbach’s alpha = 0.75)

Overall Acceptance

Fully unacceptable ⟷ Fully acceptable

Core policy drivers



Preference Variation

Dependent Variables

- Acceptance
- Effectiveness
- Affordability
- Equity

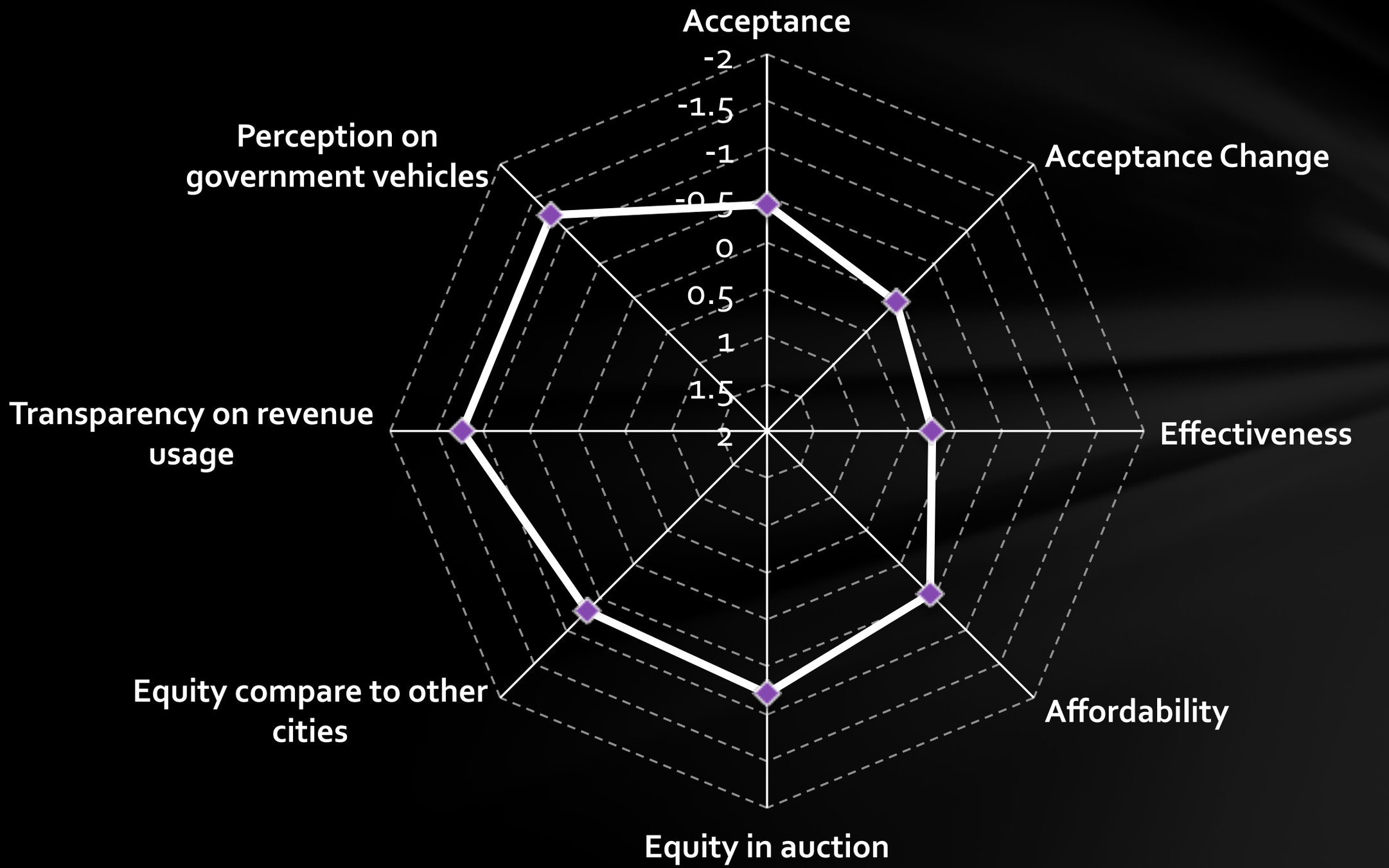
Independent Variables

- 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

Zhao, J. and T. Chen (2013) Car Owners as Supporting Constituency for Car Deterring Policies: Preference Variations in Shanghai's Car Licensing Policy

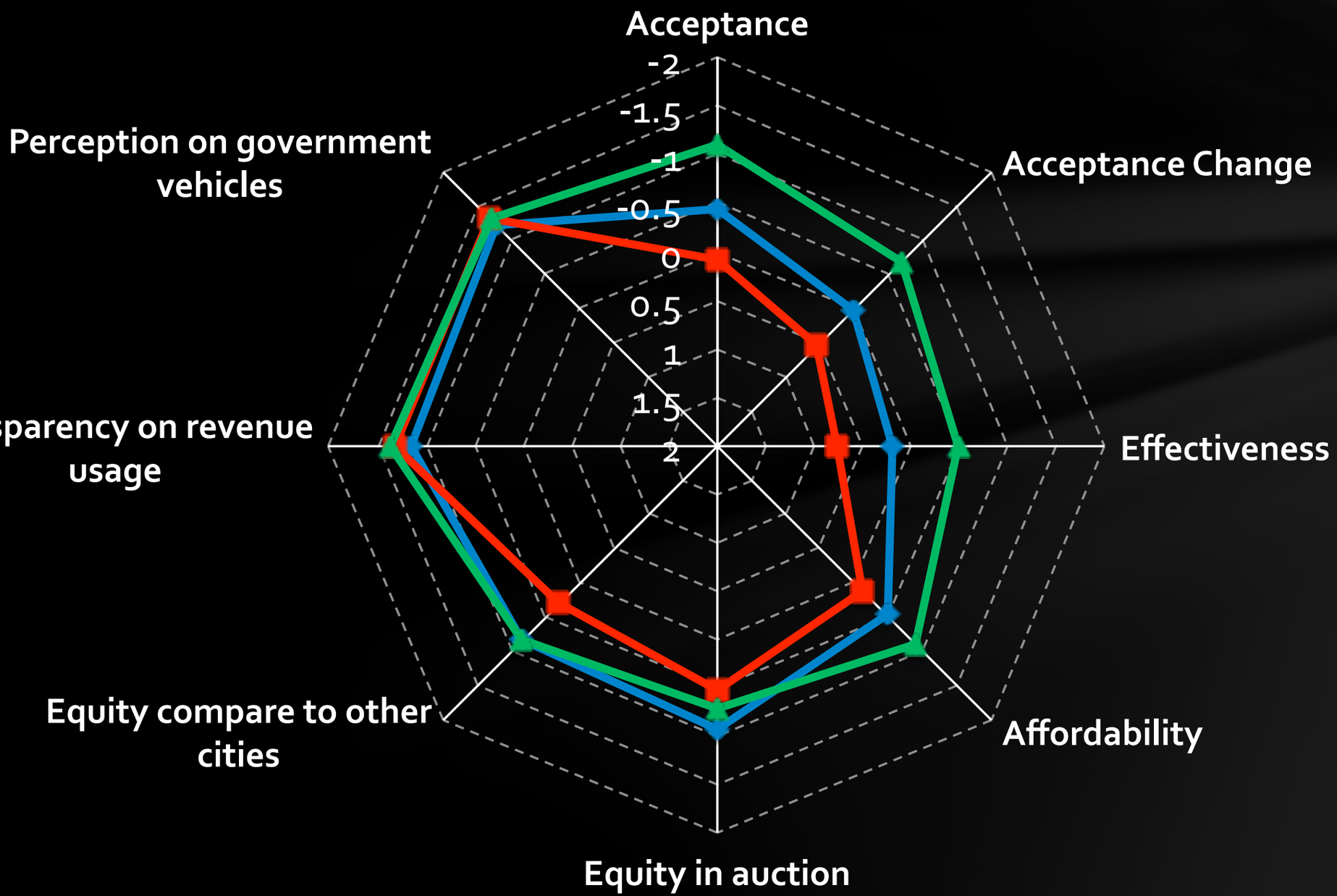
Overall Attitude



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

Photograph of license plate lottery removed due to copyright restrictions.

- 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

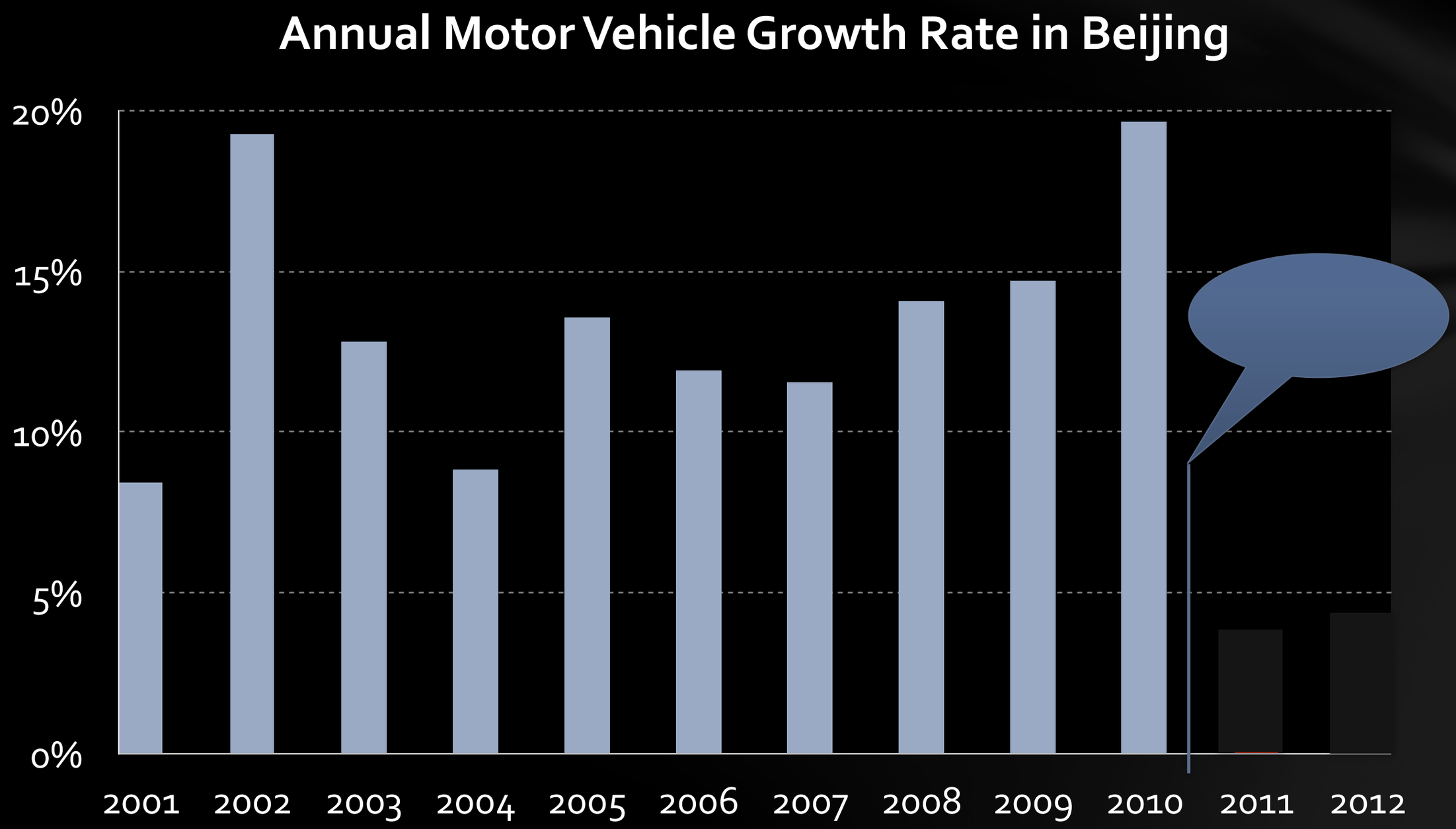
Beijing’s Lottery Policy

- Effectiveness
- Efficiency
- Equity

Motor Vehicles in Beijing

Graph removed due to copyright restrictions.

Beijing's Lottery: Effectiveness



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

CAR OWNERS

3.1.3
Revenue Transfer

Resource redistribution

3.1.4
Space

Inner vs. Outer City

NON-CAR OWNERS

Future car owners

LOCAL

MIGRANT

3.2.1
Local vs. Migrant

Different social class

PRIVATE

3.2.2
Government Vehicles

PUBLIC

LOOPHOLES

3.3.1 Corruption

3.3.2 Information Asymmertry

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

License plate issued
Average successful bid price
Number of bidders

70,000
52,500
35,000
17,500
0

Price (1,000 CNY)

Number (1,000s)

2002.1
2002.5
2002.9
2003.1
2003.5
2003.9
2004.1
2004.5
2004.9
2005.1
2005.5
2005.9
2006.1
2006.5
2006.9
2007.1
2007.5
2007.9
2008.1
2008.5
2008.9
2009.1
2009.5
2009.9
2010.1
2010.5
2010.9
2011.1
2011.5
2011.9
2012.1
2012.5
2012.9

Multivariate Autoregressive and Moving Average Model (ARMA)

- Vector
  - # Bidder
  - Bidding Price
  - # Quota

$$\boldsymbol{y}_t = \begin{pmatrix} y_{1t} \\ y_{2t} \\ y_{3t} \end{pmatrix} = \begin{pmatrix} quota_t \\ bidders_t \\ bid_t \end{pmatrix}$$

- Granger causality
- Multivariate ARMA

$$\boldsymbol{y}_t = \mathbf{B}\,\boldsymbol{x}_t + \sum_{i=1}^{p} \boldsymbol{\Phi}_i\,\boldsymbol{y}_{t-i} + \sum_{j=1}^{q} \boldsymbol{\Theta}_j\,\boldsymbol{\varepsilon}_{t-j} + \boldsymbol{\varepsilon}_t$$

3x1 · 3xM · 3x3 for each *p* · 3x1 · 3x3 for each *q* · 3x1 · 3x1

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.

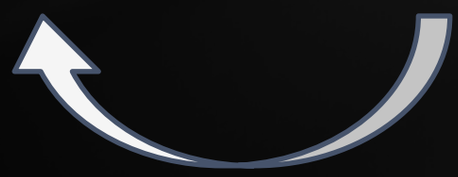
Mechanism of Quota Decision Making

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?

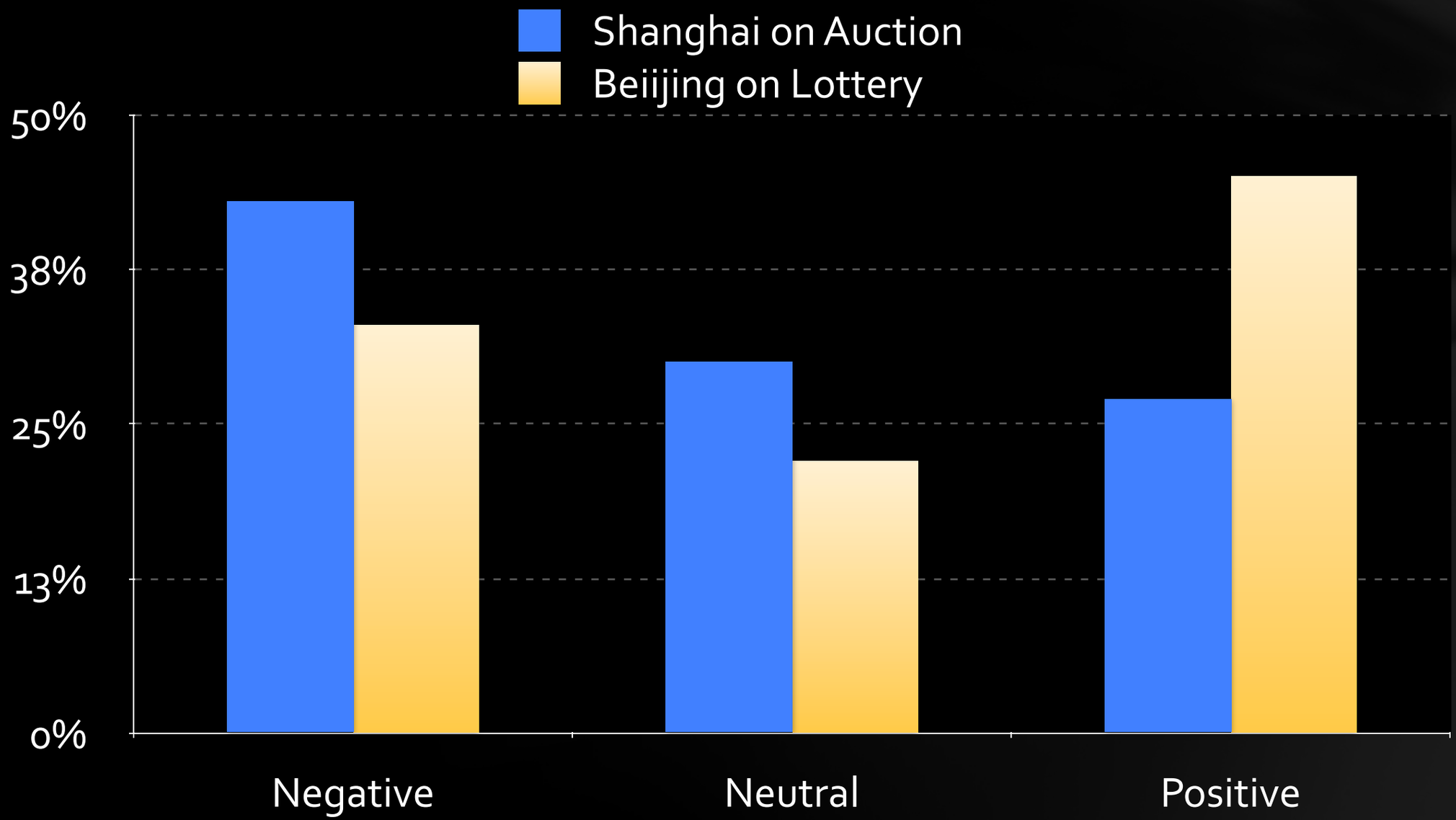
Evaluation of Shanghai and Beijing's Policies

	Shanghai' Auction	Beijing' Lottery
Effectiveness	The same	The same
Efficiency	High	Very low
Equity	Mixed	Superficial

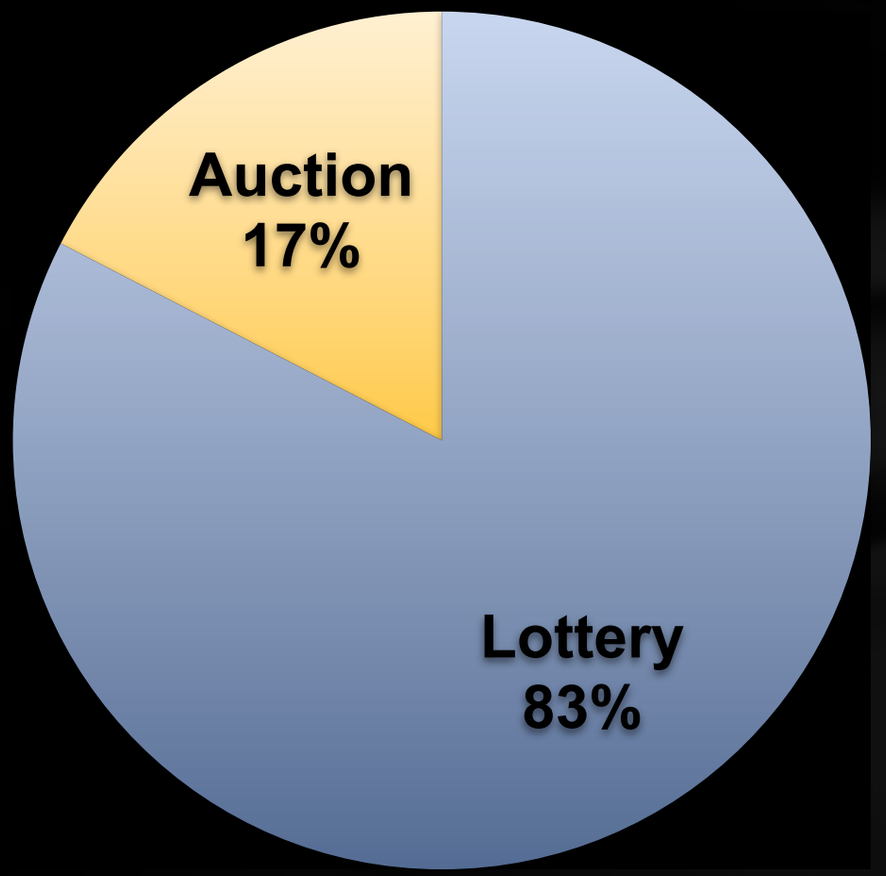
Citizen’s preference

- Beijing Transportation Research Center
- What would citizens choose?
  - Lottery or Auction

Public Acceptance (Shanghai vs. Beijing)



Auction or lottery?
Public preference in Beijing

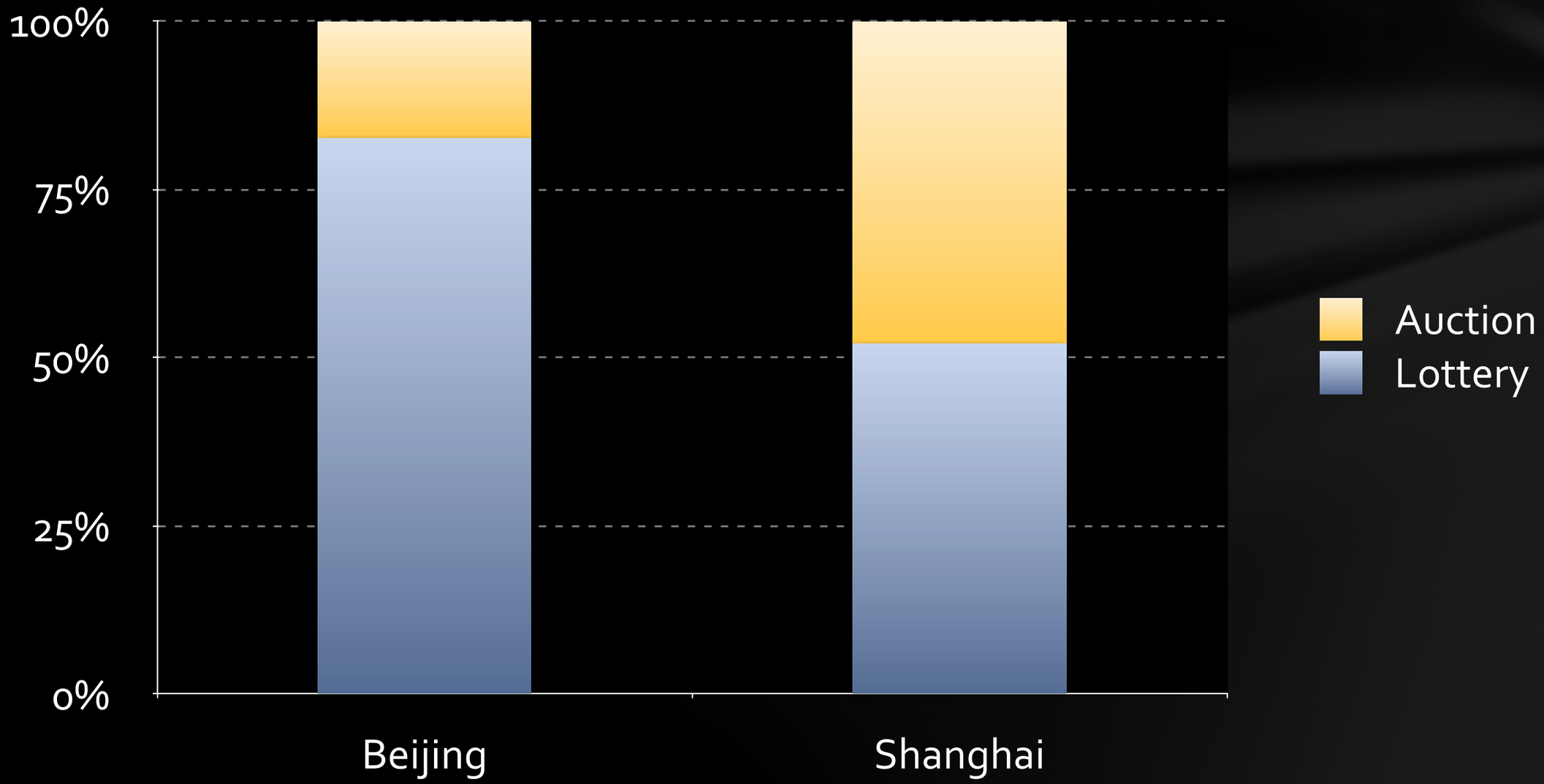


Salience in Policy Design

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



Purposeful Policy Leakage

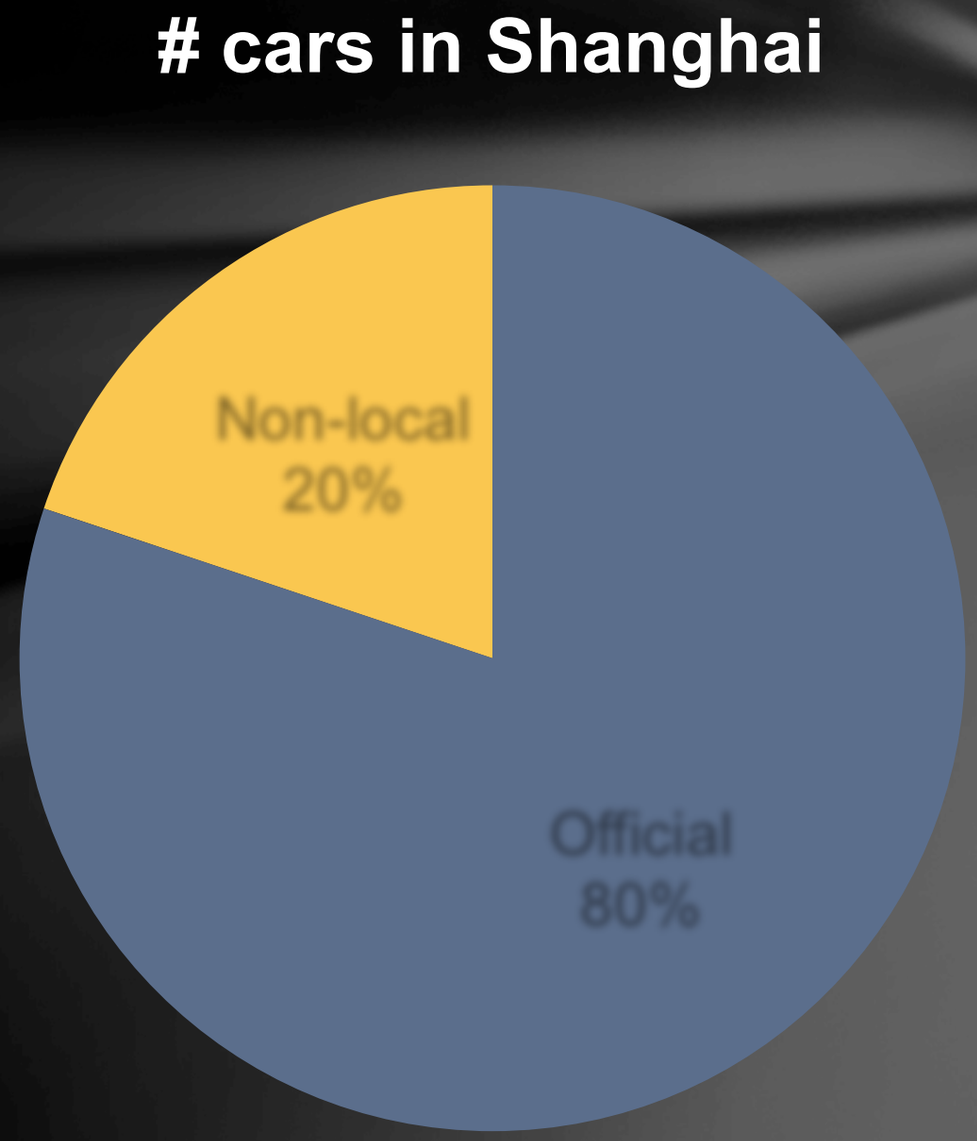
Legitimacy and Intentionality of Non-Local Vehicles

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

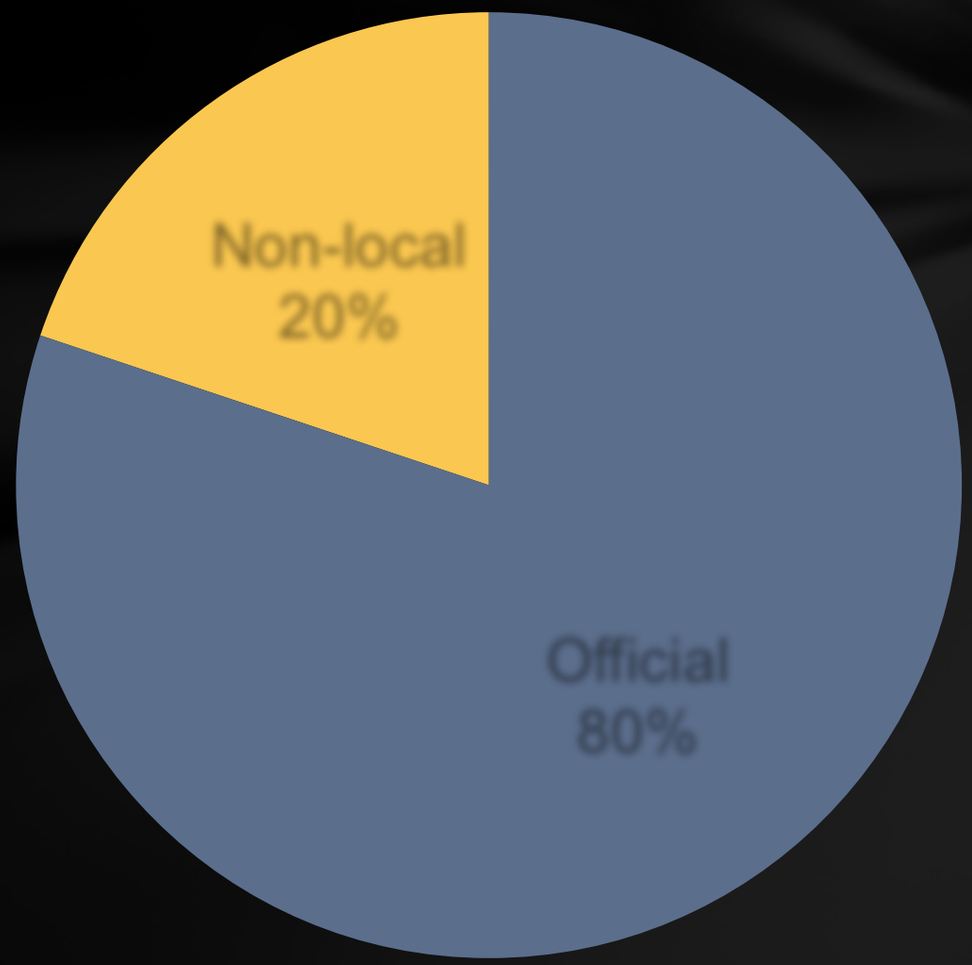
City State vs. City in a Region

- **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

 # cars in Shanghai



No dominant strategy!

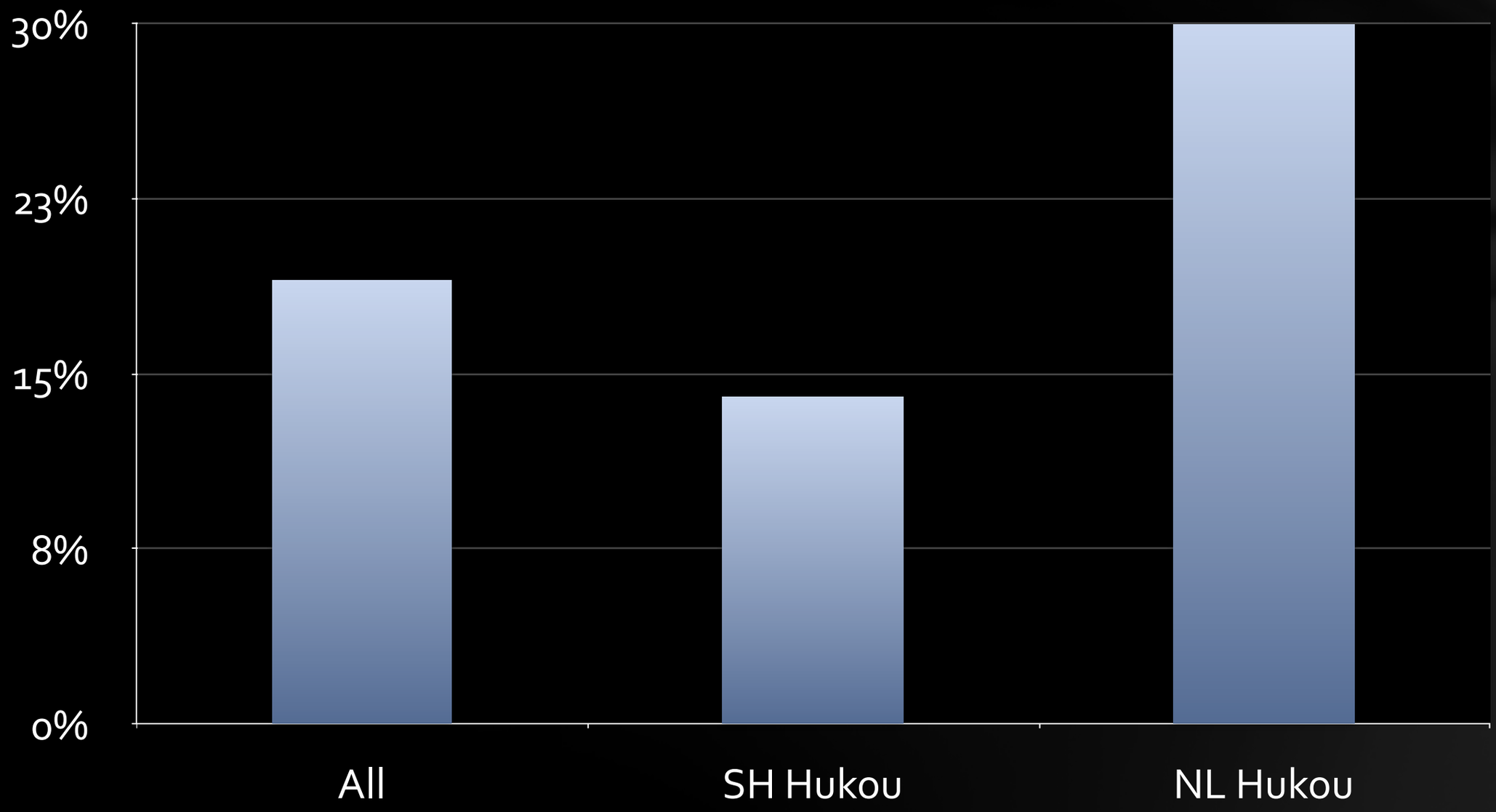
Primary Data Collection

- 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

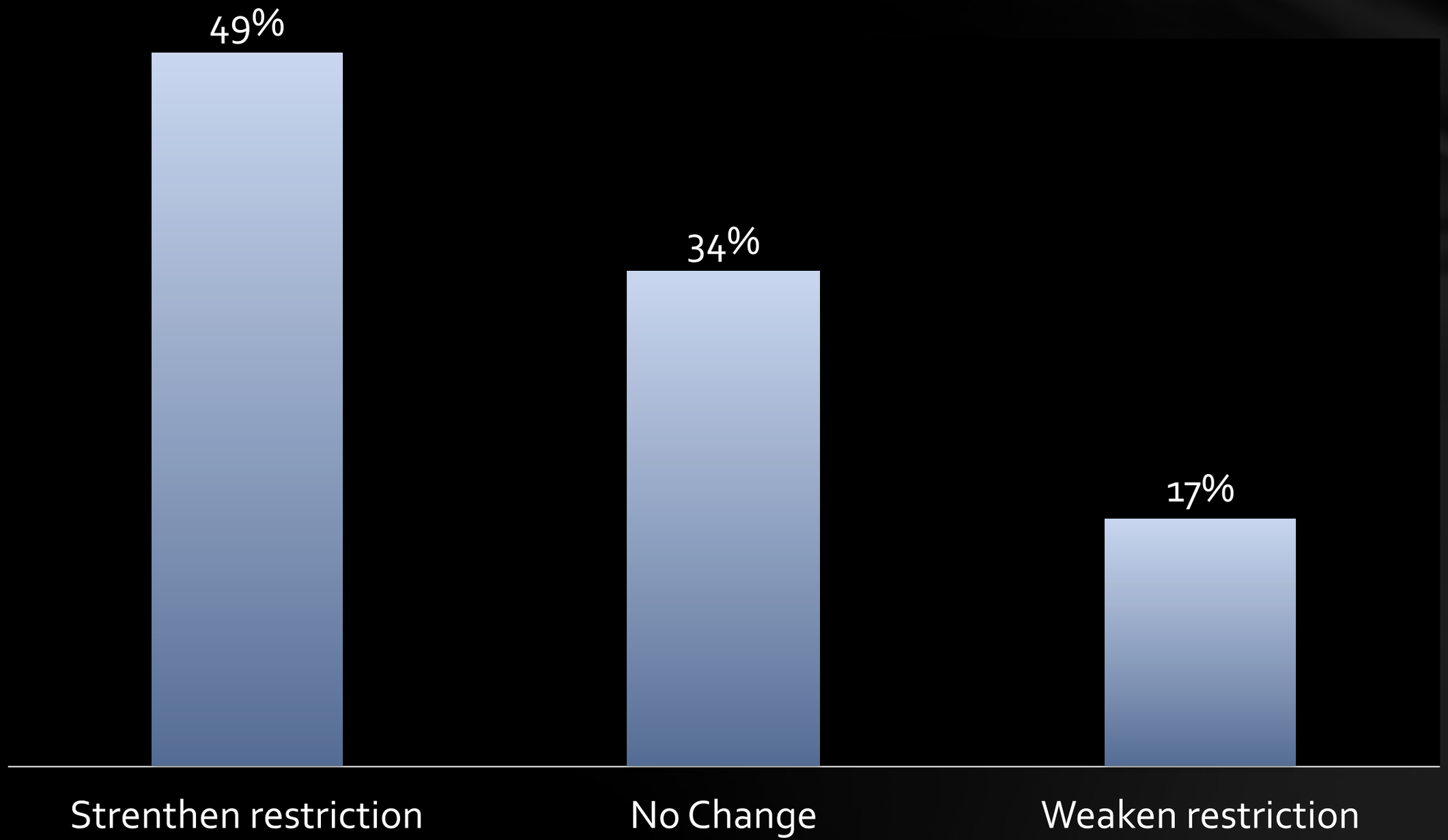
Public Responses

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

Behavior: % of NLV



Should Shanghai change the current NLV restriction?

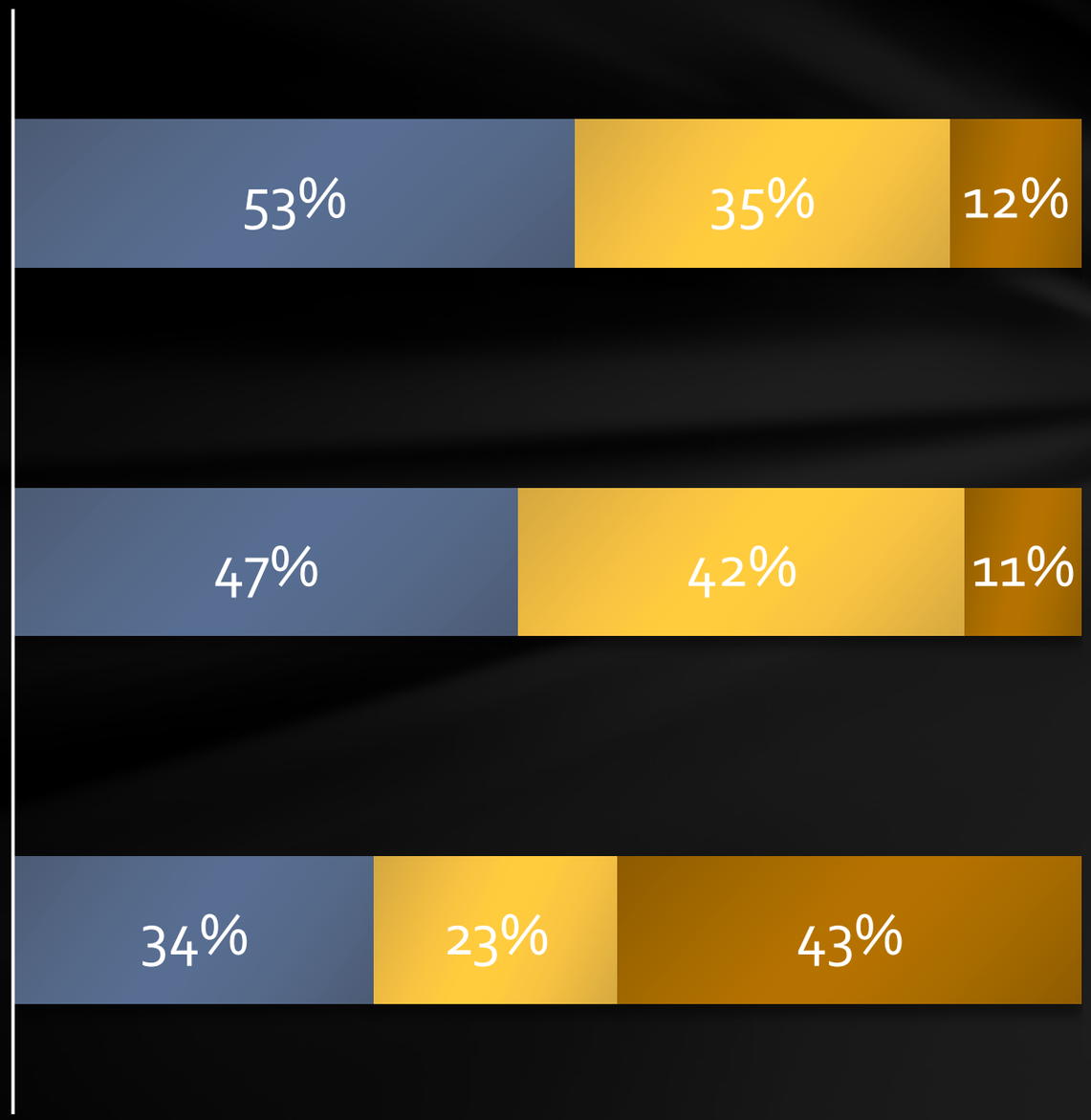


Trade off with Openness

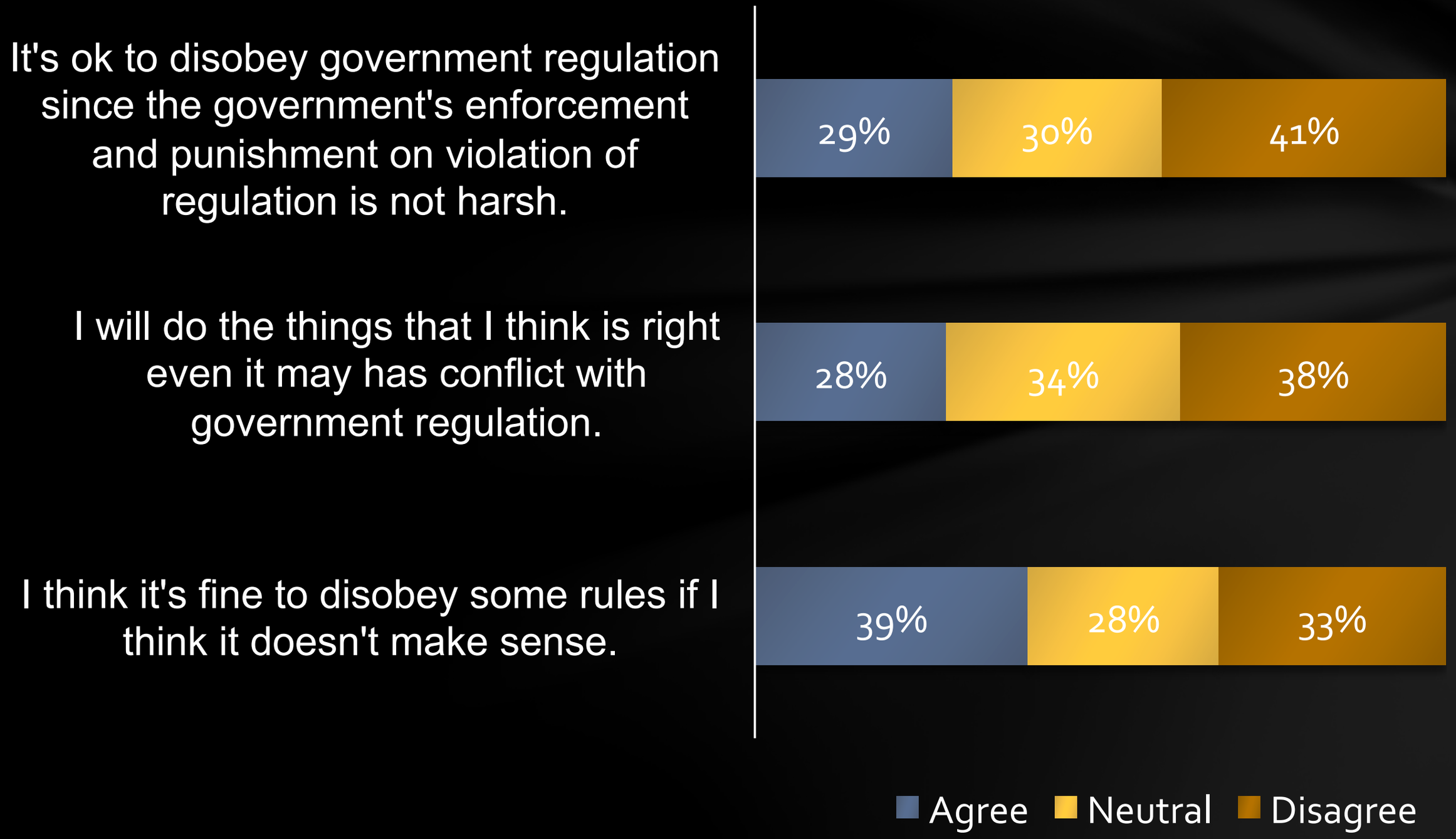
As a metropolitan, Shanghai should welcome vehicles from other cities to enter and drive freely in Shanghai.

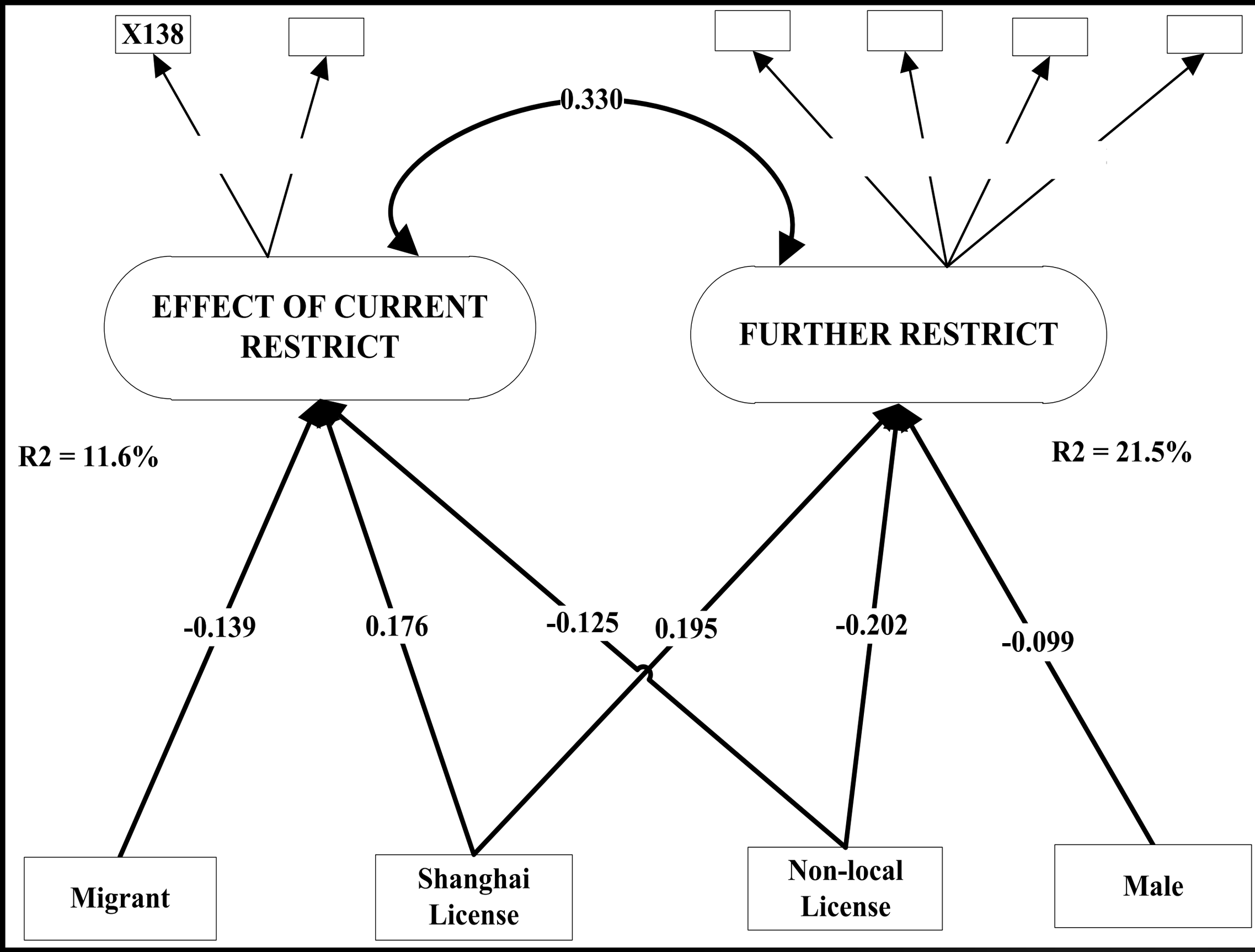
Shanghai should loosen the restriction on nonlocal vehicles since it has continuous tradings with other Chinese cities.

Shanghai government should totally ban non-local vehicles driving on Shanghai's road.

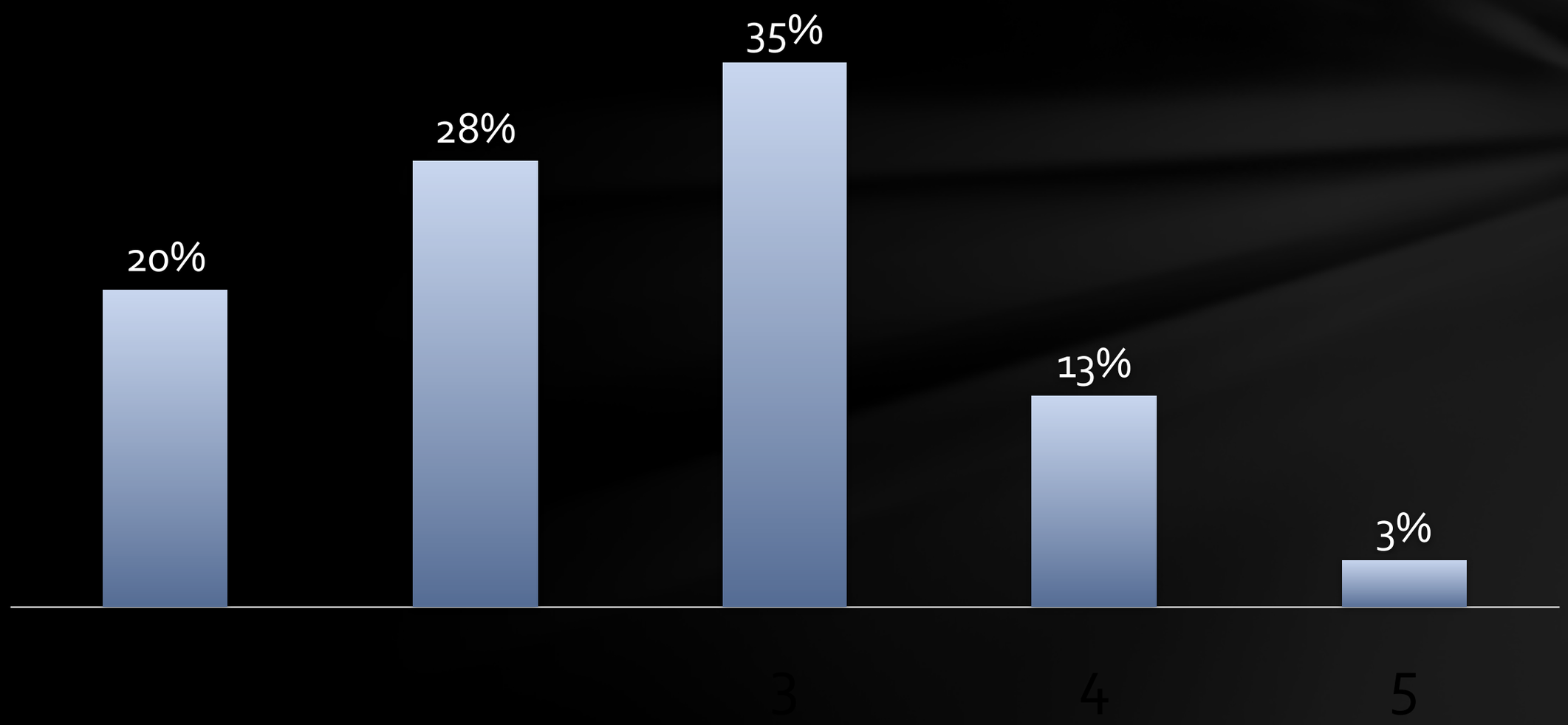


Respect of Government Regulation

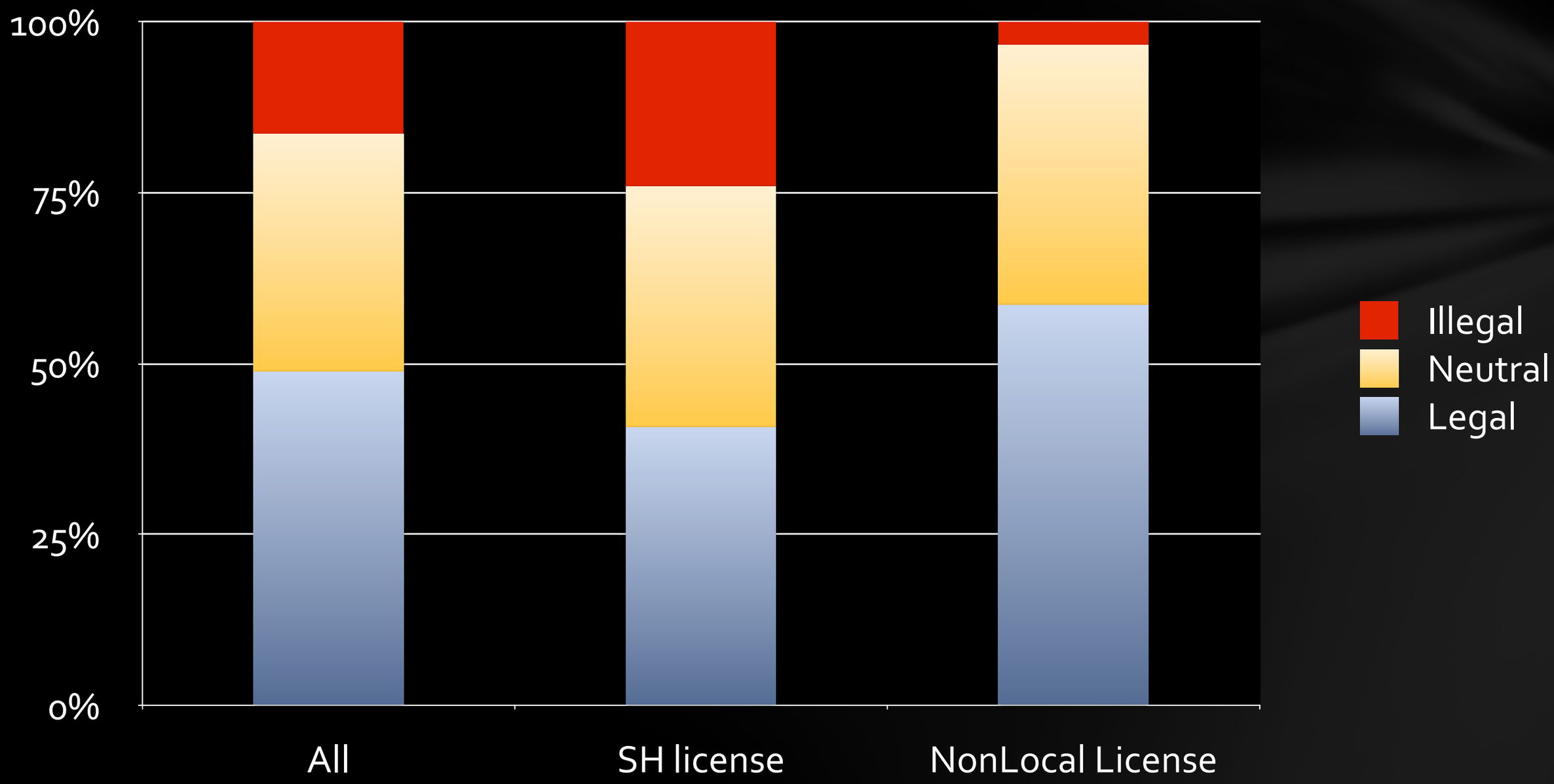



X138
0.330
EFFECT OF CURRENT RESTRICT
FURTHER RESTRICT
R2 = 11.6%
R2 = 21.5%
-0.139
0.176
-0.125
0.195
-0.202
-0.099
Migrant
Shanghai License
Non-local License
Male

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



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



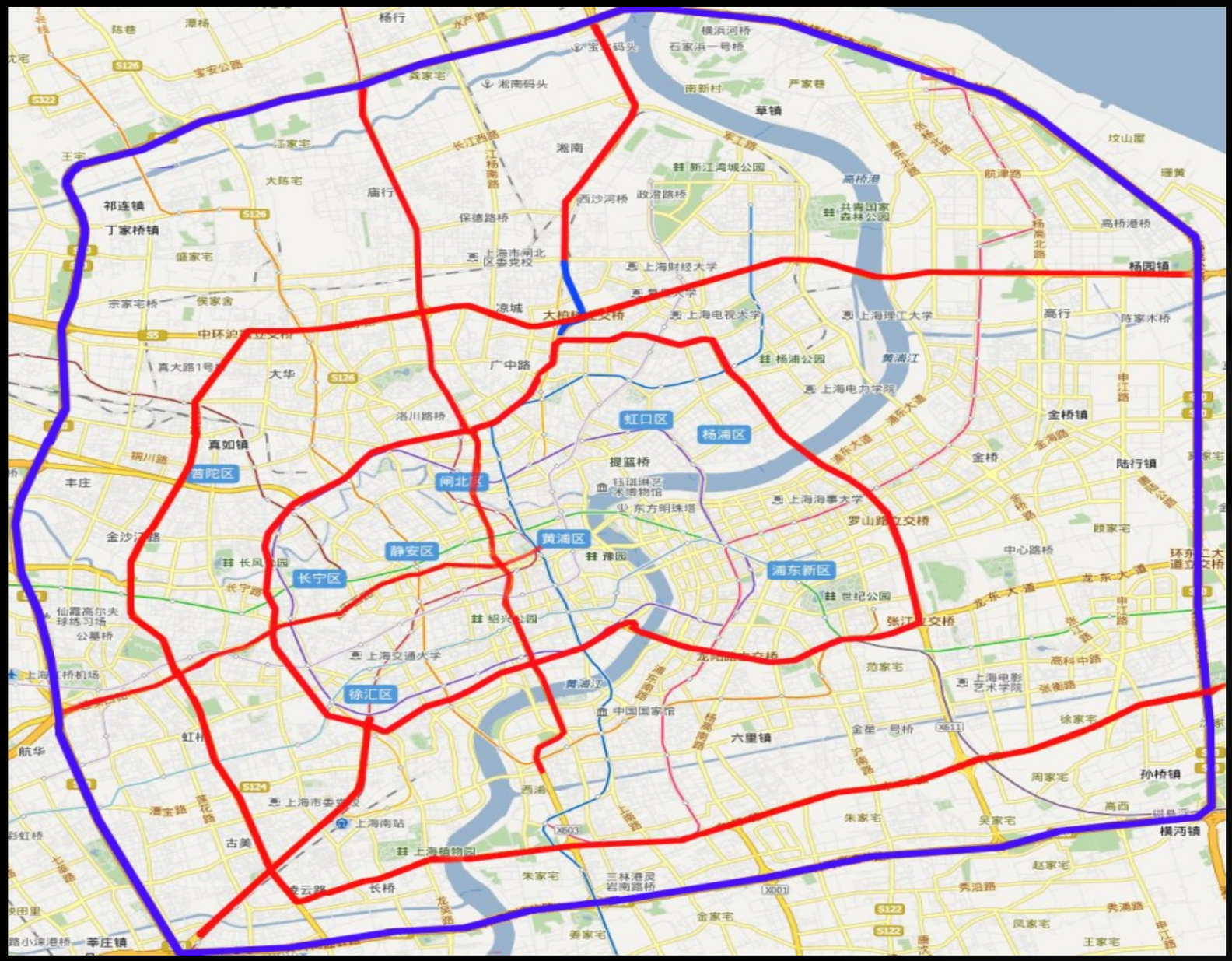
Non-local Vehicles

- 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

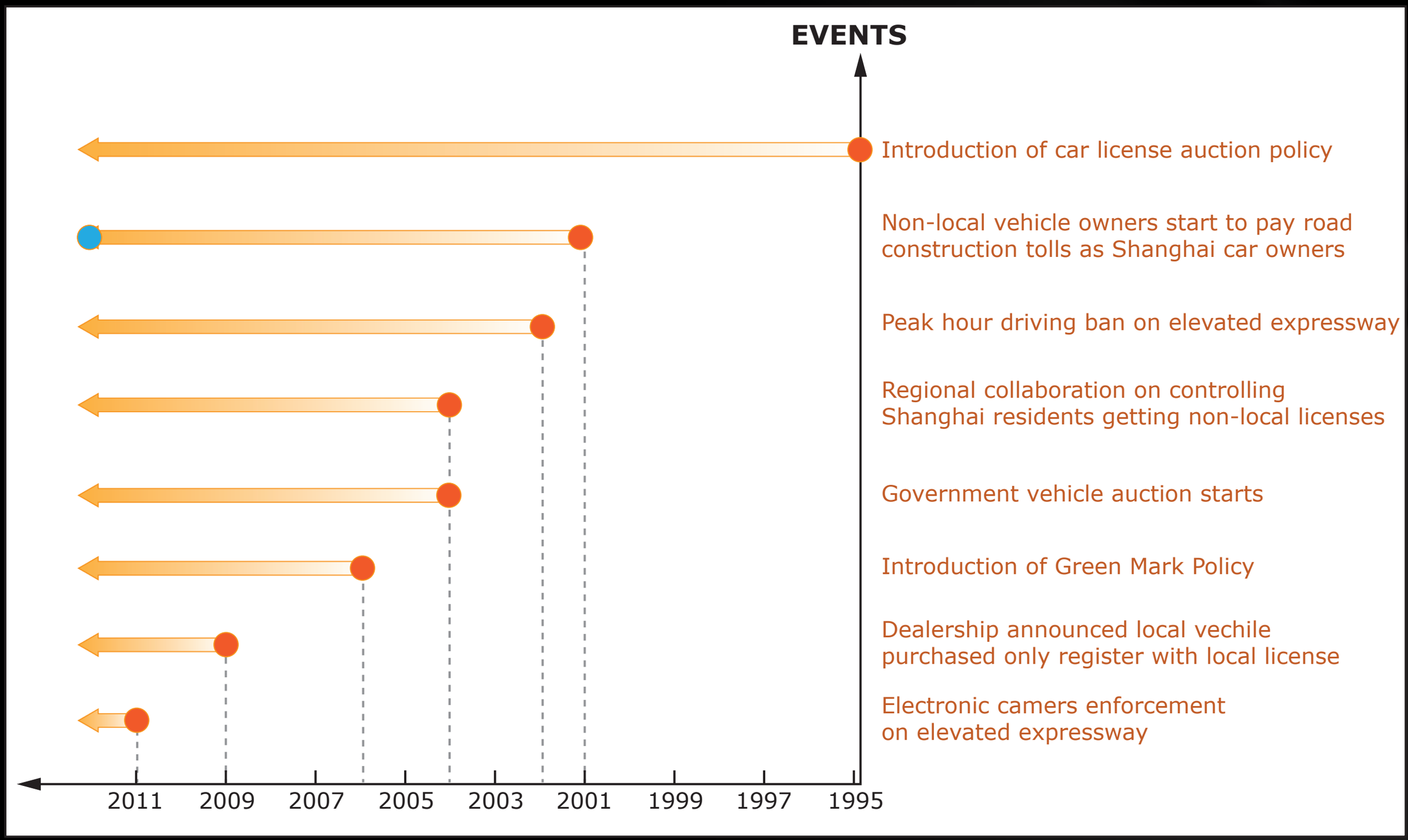


Image by MIT OpenCourseWare.

Shanghai Government

- Technical and Institutional Capacity
- Policy Intent

Legitimacy and Intentionality

	Government	Public
Legitimacy	• Mixed signals • Choice to restrict but not completely ban confers implicit legality	• NLL seen as reasonable reaction to policy • But inconvenient and lower status
Intentionality	• Intentional in general • Unintentional on specifics	• Maintain current choice • Potentially more NLL

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

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

Matus, K., Nam, K.-M., Selin, N.E., Lamsal, L.N., Reilly, J.M., Paltsev, S. (2012) Health Damages from Air Pollution in China. Global Environmental Change 22(1)

11.S945 Urbanizing China: A Reflective Dialogue

Fall 2013