

Round table on

Social Impacts of Time and Space-Based Road Pricing
Auckland – 30/11 & 1/12/2017

Urban Toll: Rethinking Acceptability through Accessibility

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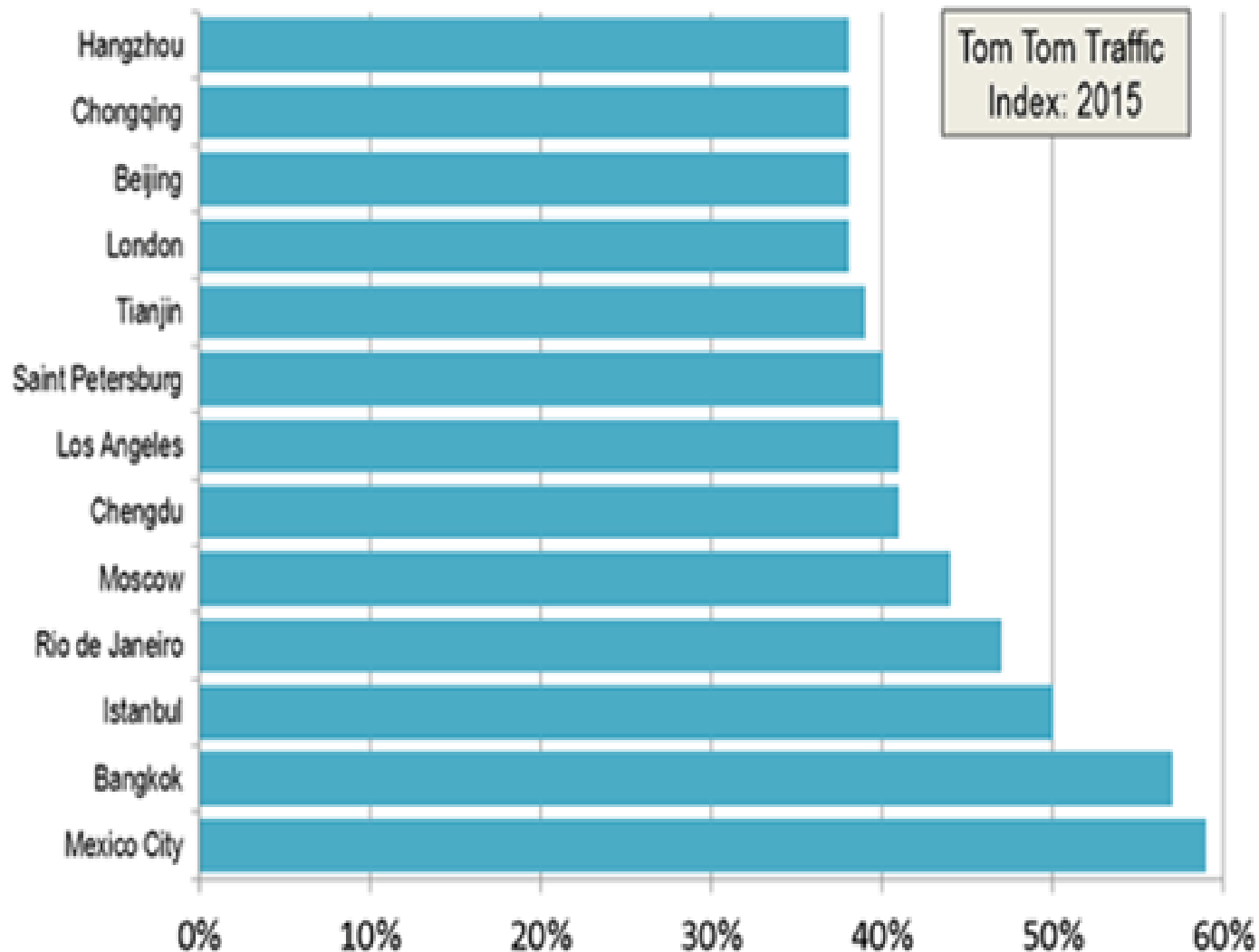


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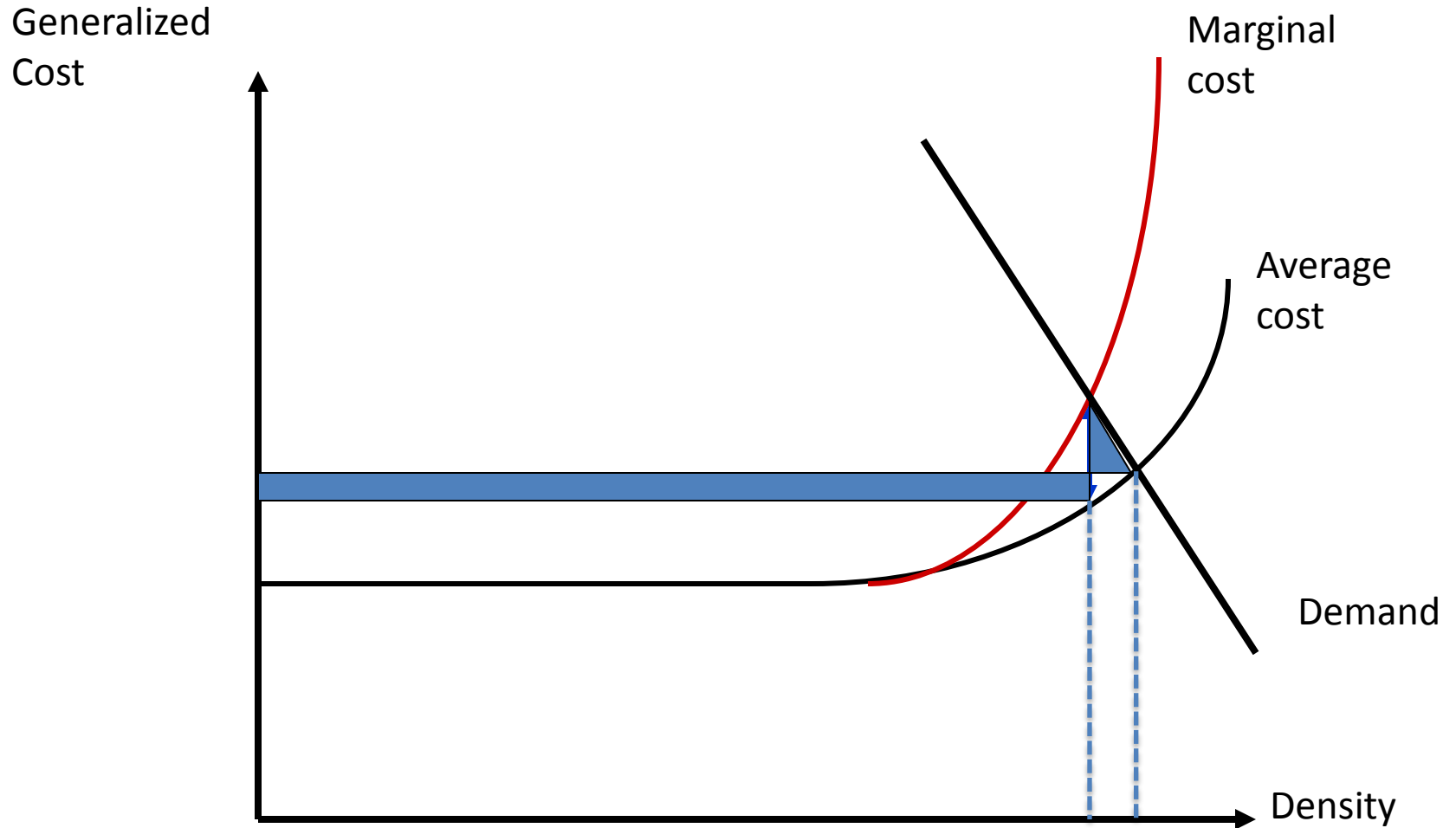


Additional travel time due to congestion (Cities of more than 5 million inhabitants)



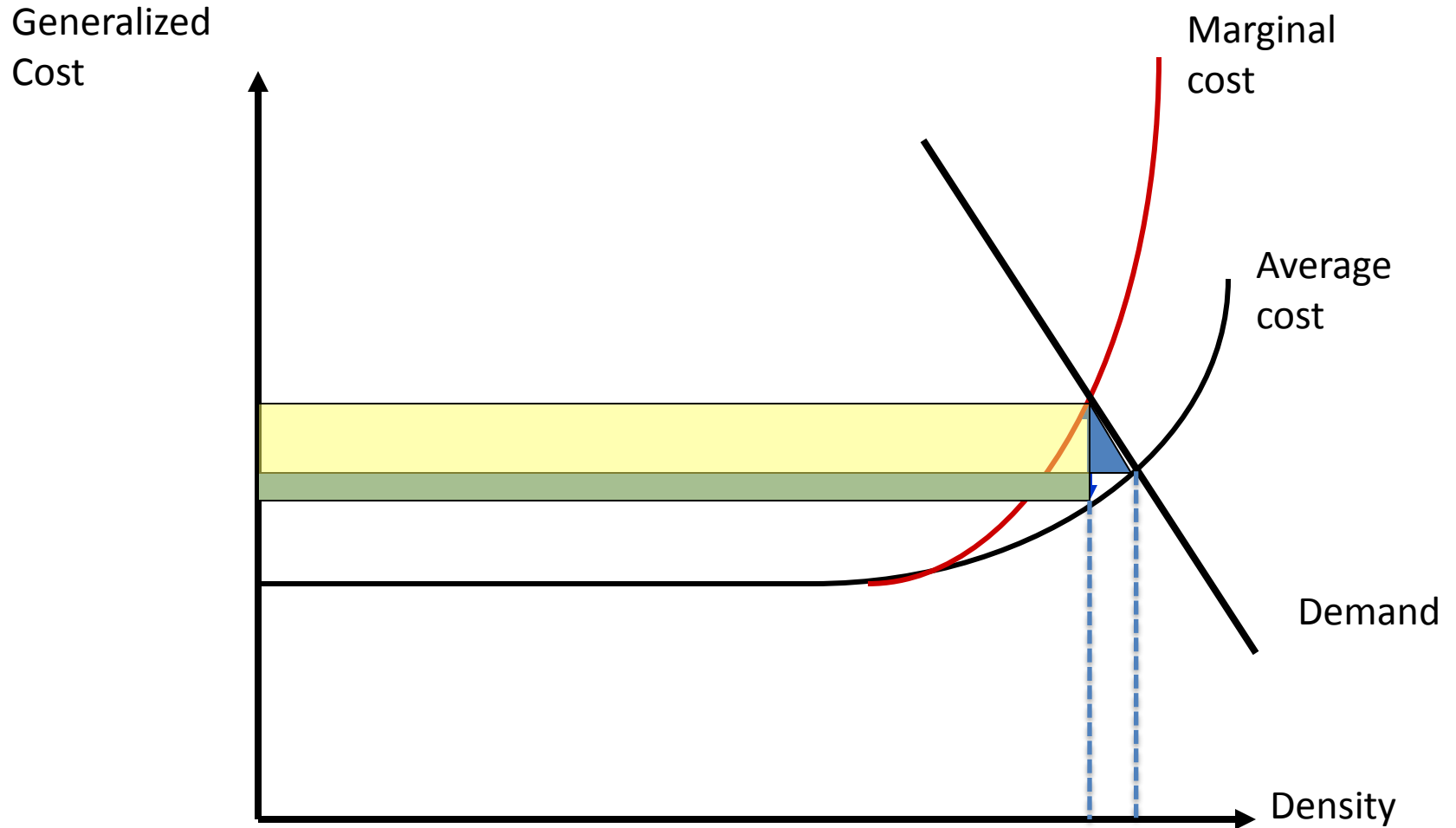


Economic efficiency and the evidence of congestion charging





Congestion charging: a distributive issue



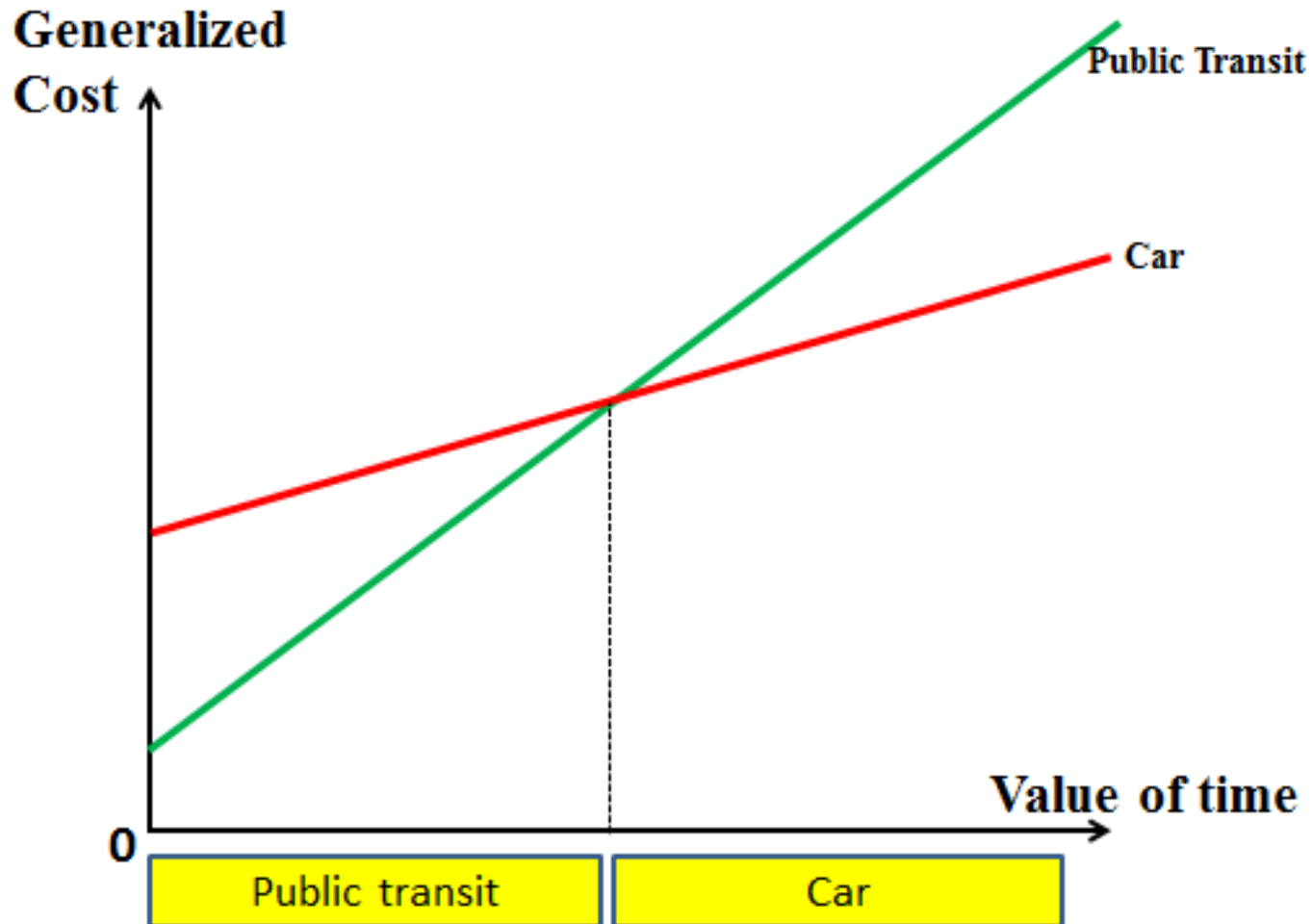


The acceptability issue

- Congestion charging = welfare improvement
- The main winner of the congestion charge is the beneficiary of the revenues of the toll
- Road users are paying more than their welfare gain under the assumption of a single value of time
- What if we adopt another hypothesis

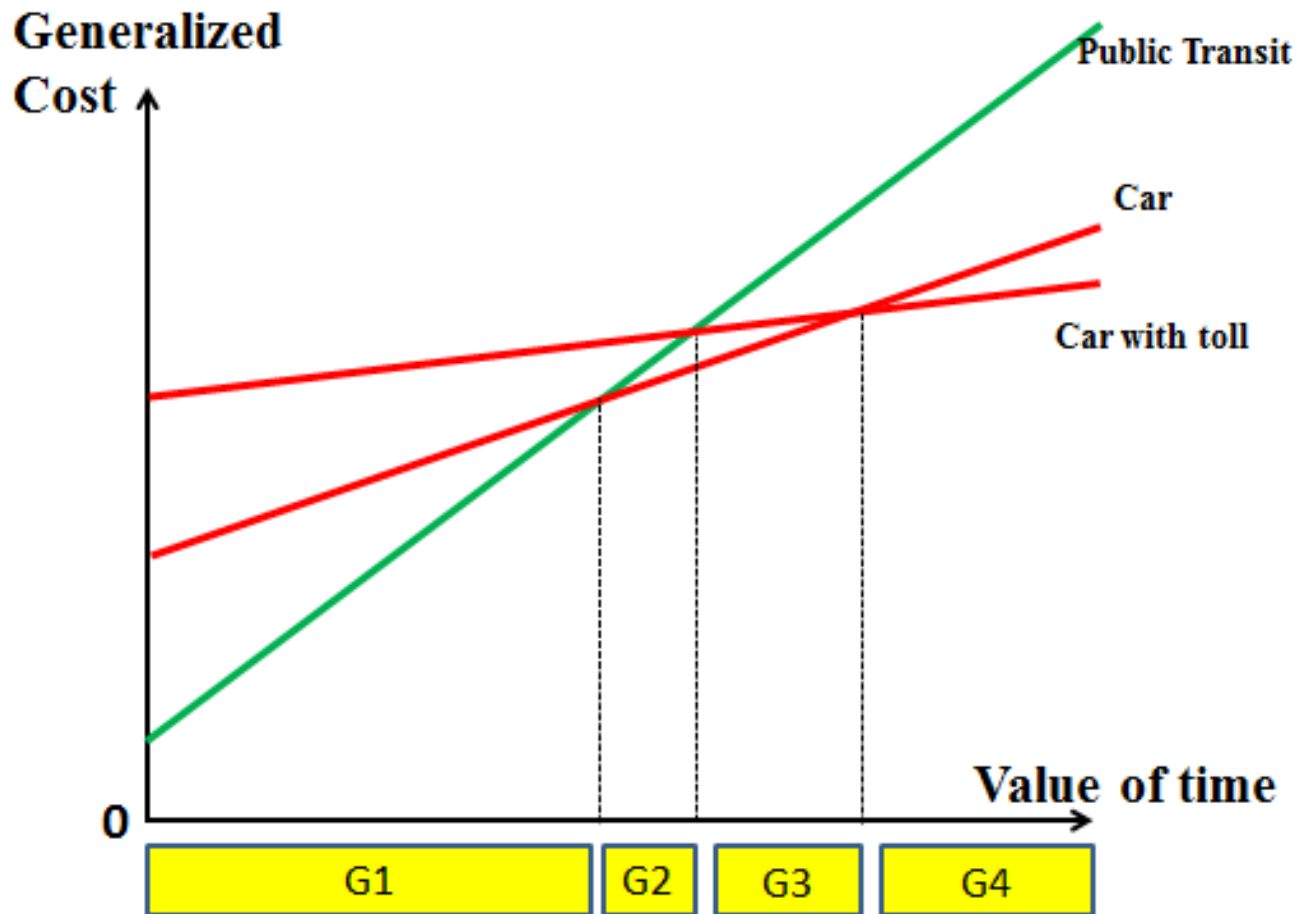


Value of time and modal split



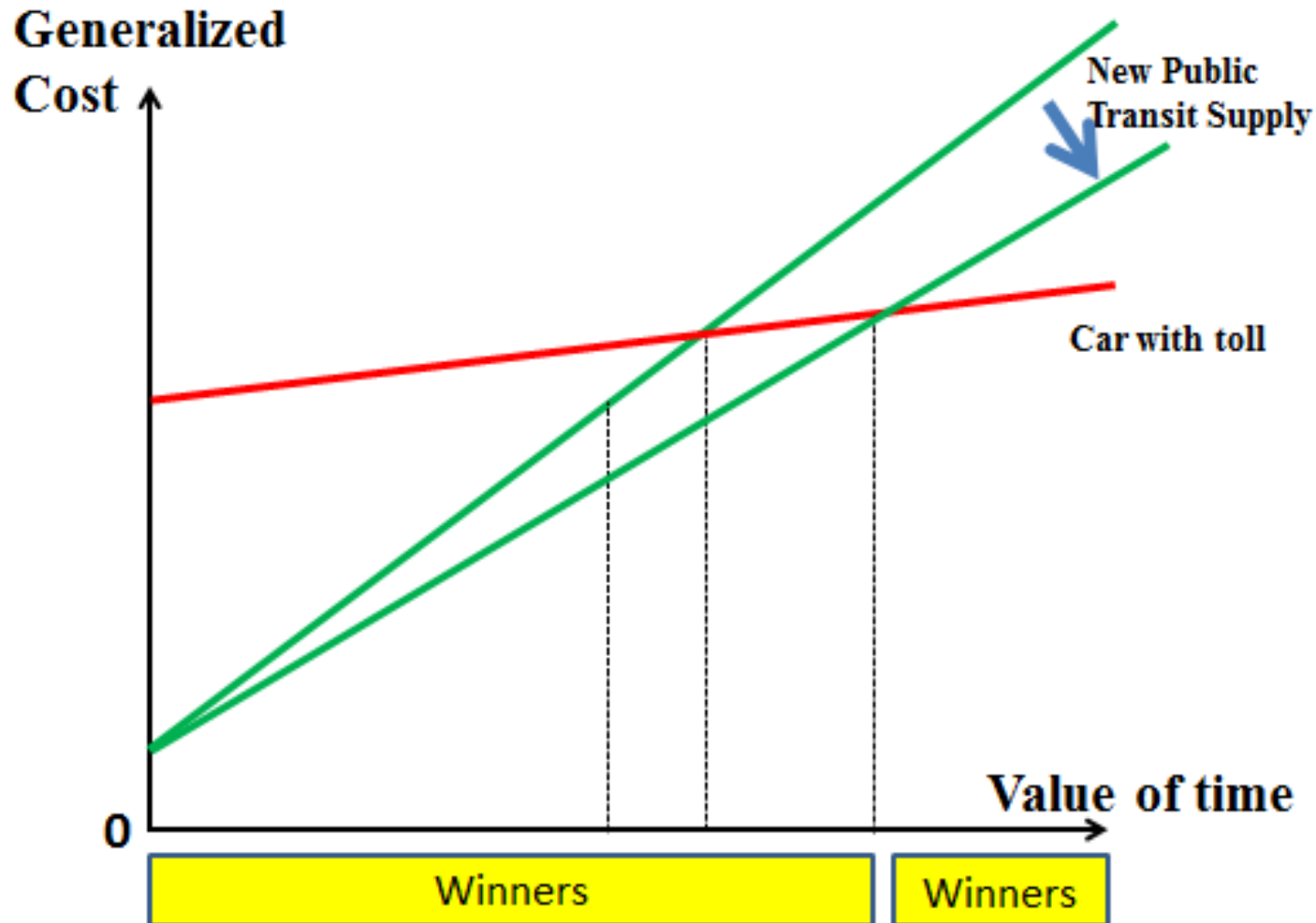


Winners and losers of congestion pricing





Public transit improvement: a win-win game?





From winners and losers to public transit

- Value of time and the sensitivity to congestion charging
- More losers than winners
- Except if there is a huge improvement of public transit
- Why do we need to introduce other modes of transport?

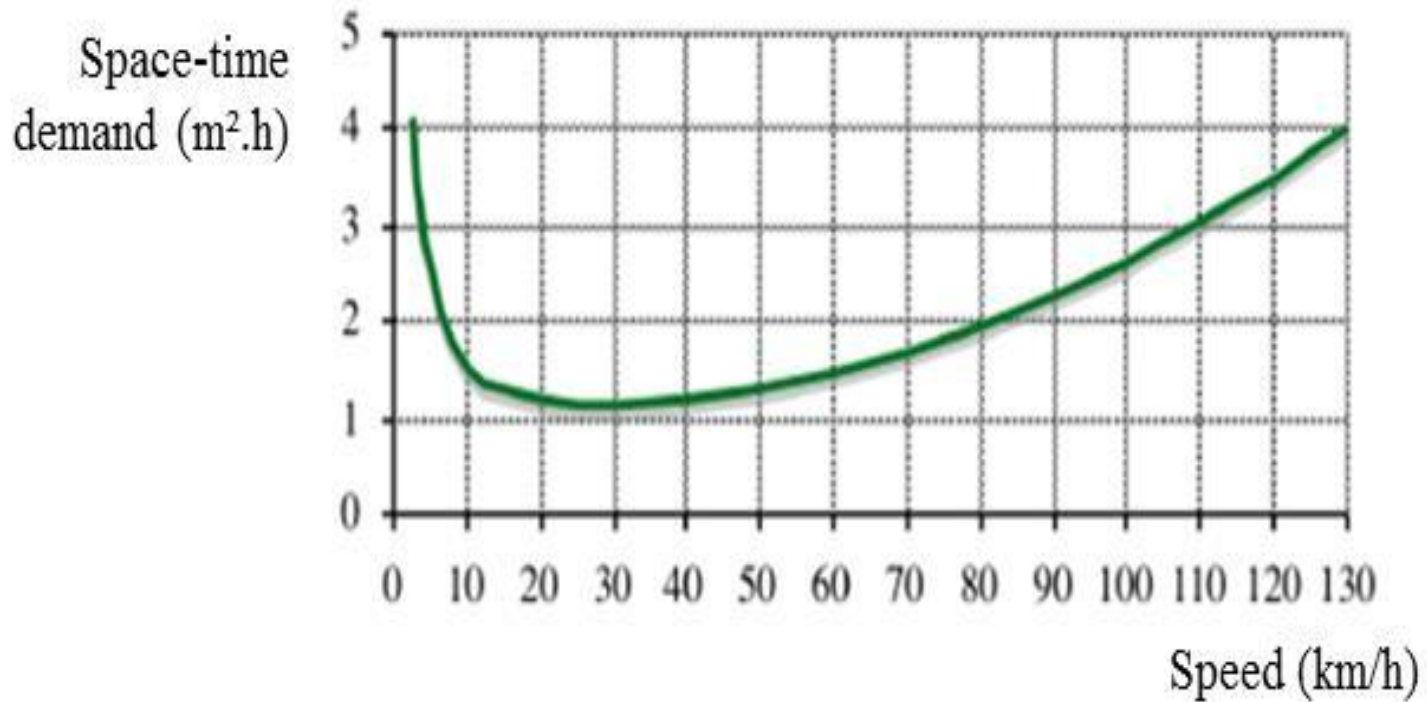


Compared space-time consumption

	$m^2 \cdot h / \text{veh km}$	Occupation rate	$m^2 \cdot h / \text{traveler km}$	Difference / pedestrian
Pedestrian	0,3	1	0,3	1
Cyclist	0,6	1	0,6	2
Two-wheeled motor vehicles	1,7	1,05	1,6	5
Cars	1,8	1,3	1,4	5
Bus (12 m)	7	17	0,3	1,4
in peak hour	7	50	0,15	0,5
Articulated bus (18 m)	10	23	0,3	1,4
in peak hour	10	70	0,15	0,5



Speed and Space-time consumption of a car (Héran 2008)





The speed-flow curve





Congestion charging and the scarcity of urban space

- A new approach of congestion charging
- For individual, time is the rarest resource
- For the community, space is the rarest resource
- Two key spatial issues
 - the space consumption of different mode of transports
 - How to address the spatial impacts of congestion charging



Contents

- 1) Road pricing: the acceptability issue
- 2) Accessibility and the tension between acceptability and economic efficiency
 - A spatial approach of the acceptability issue
 - Accessibility to identify winners and losers
 - The compensation issue



Accessibility: A concept to address “the tension between acceptability and economic efficiency”

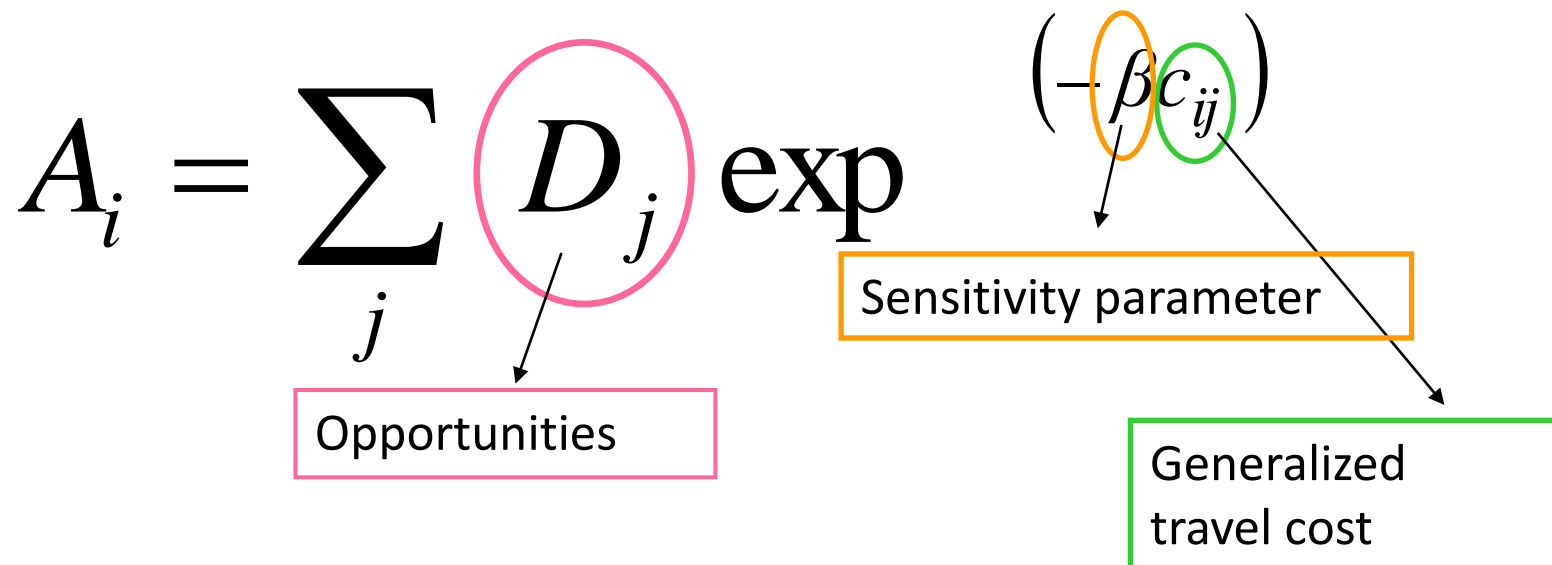
- Paradox between search for maximum economic efficiency and the acceptability transport policies
Westin et al. (2016)

⇒ how to reconcile efficiency and equity dimensions by introducing a spatial dimension?

⇒ to what extent and under what conditions a **spatial accessibility** based approach help resolve the acceptability issue?

The gravity-based access measure

Following Hansen (1959):

$$A_i = \sum_j D_j \exp(-\beta c_{ij})$$


Opportunities

Sensitivity parameter

Generalized travel cost

- Transport/ land use interaction
- Accessibility to jobs

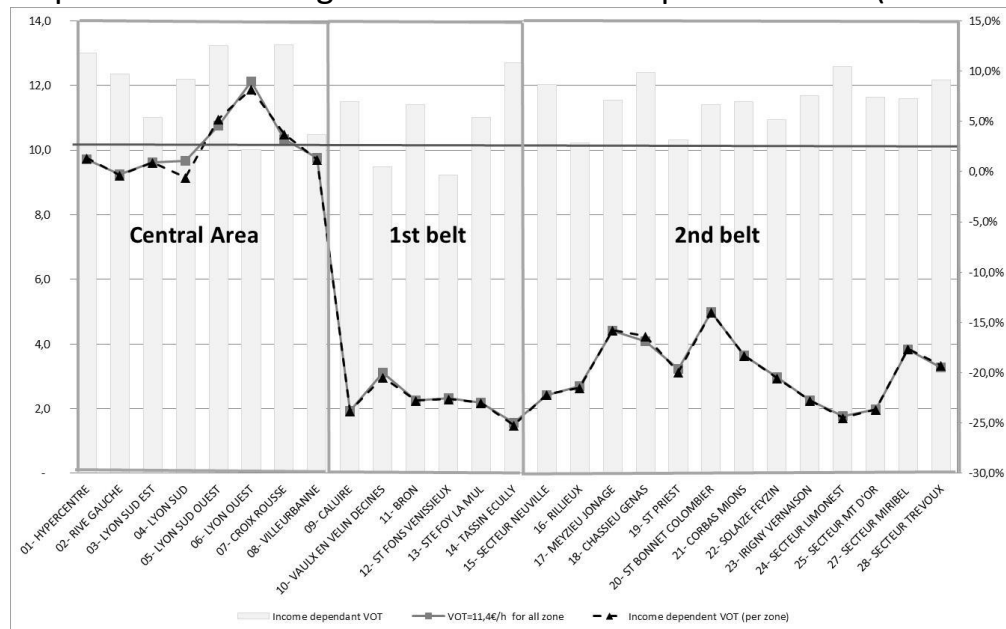
Accessibility: A concept to integrate individual and local disparities

- Travel cost sensitivity and income level

Impact of value of time on accessibility

→ Efficiency issues according VoT hypotheses

Accessibility variation per zone following a EUR 5 urban toll implementation (Souche et al., 2016)





- Travel cost sensitivity and socio-economic factors
- Impact of socio-economic factors on travel cost sensitivity

Figure 10: Travel time sensitivity

Purposes*	β (full day)	β (morning peak hour)
HBW	0,21	0,18
HBO	0,35	0,37
NHBO	0,34	0,43
NHBH	0,25	0,46
NHBW	0,26	0,09

Time sensitivity for different trip purposes (Bonnafous et al, 2010)

* Home-based work (HBW), Home based other (HBO), Non-home based other (NHBO), Non-home based home (NHBH) and Non-home based work (NHBW).

Gender	β (all trip purposes)	β (HBW trips)
Women	0,244	0,13
Men	0,297	0,18

Time sensitivity according to genders

Labour categories	β (all trip purposes)	β (HBW trips)
Farmers	0,35	0,26
Skilled workman	0,3	0,22
Workers	0,3	0,19
Employees	0,34	0,23
Mid-management position	0,3	0,19
Managers	0,29	0,16

Time sensitivity for different labour categories

— Source: Bonnafous *et al.*, 2009

Figure 11: Accessibility to jobs (homogeneous cost sensitivity)

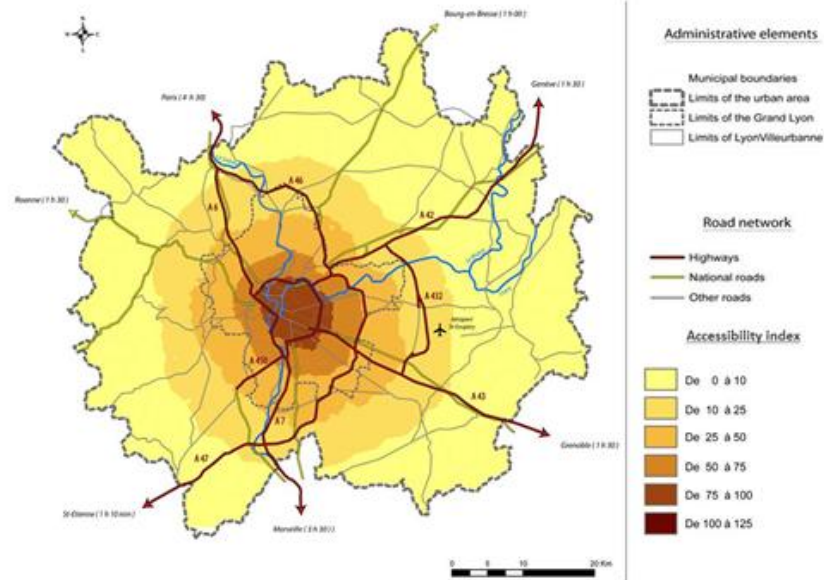
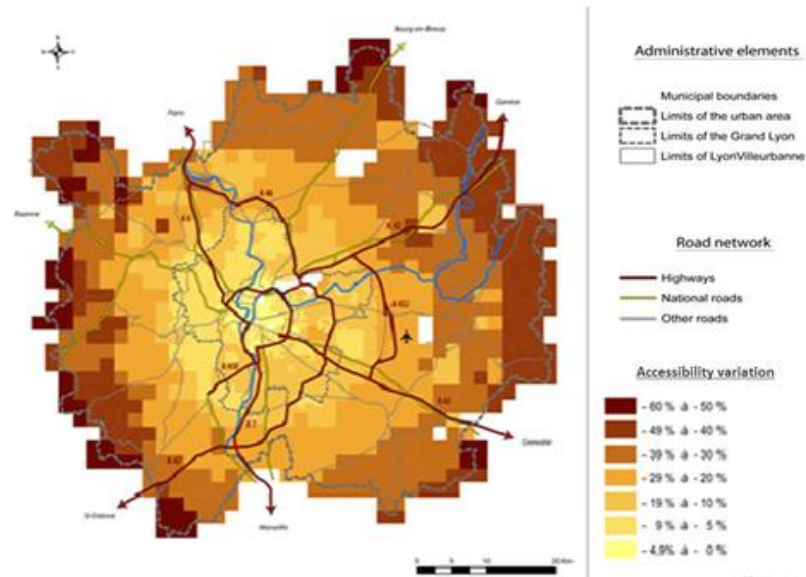


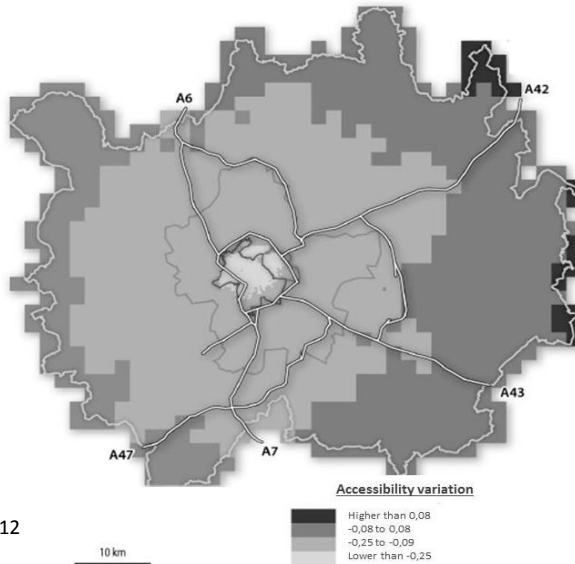
Figure 12: Accessibility variation when taking in account heterogeneous cost sensitivity



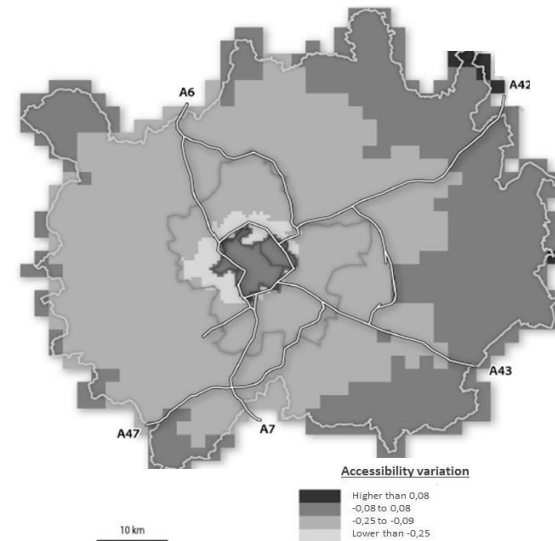


The example of two urban toll schemes in Lyon

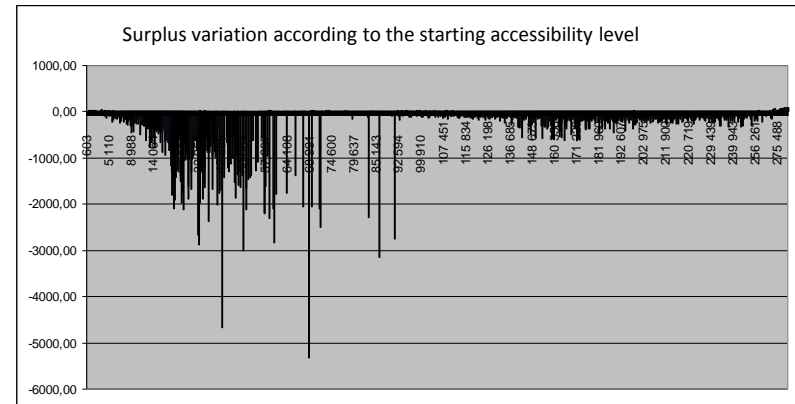
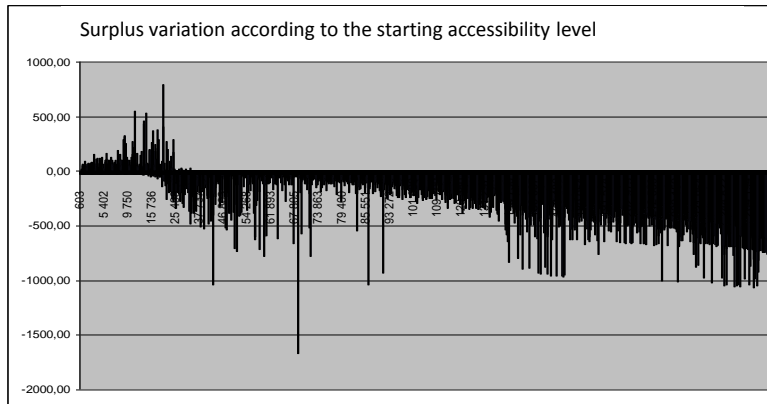
Job-access variation for car drivers (EUR 3 zone toll)



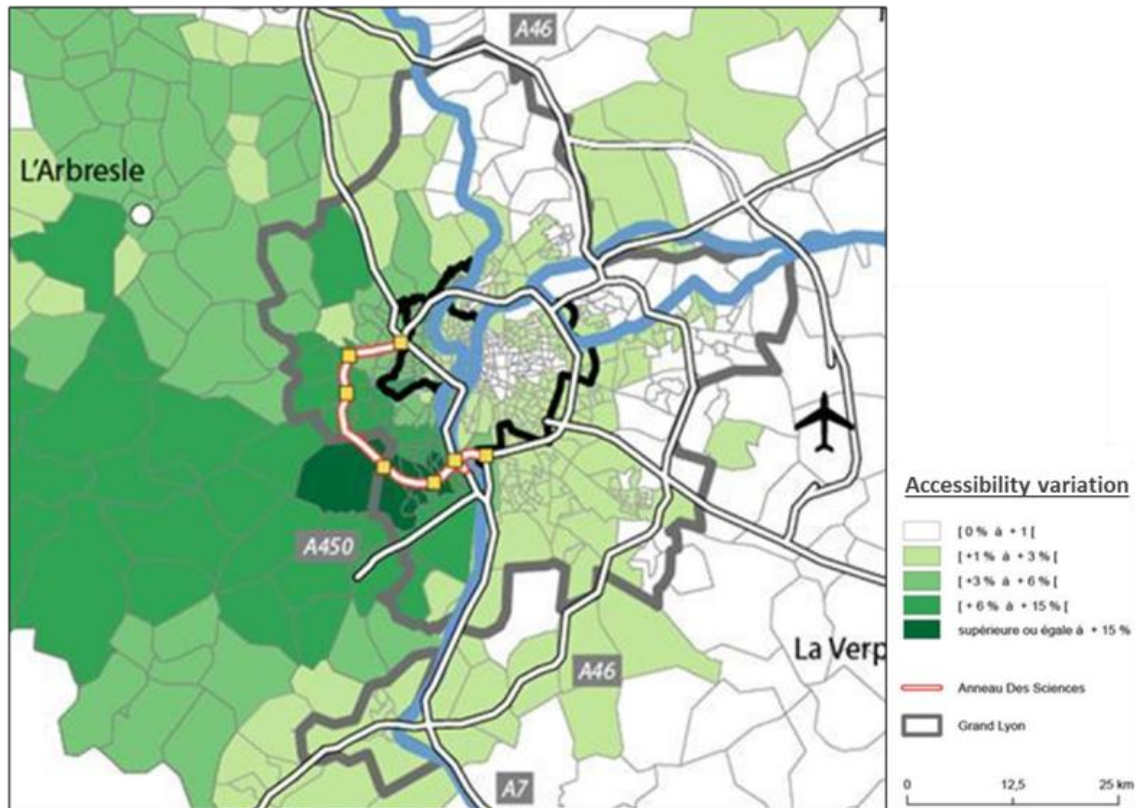
Job-access variation for car drivers (EUR 3 cordon toll)



Source : Crozet *et al.*, 2012



How to interpret accessibility in terms of acceptability: the example of the « Anneau des Sciences » bypass implementation



Source : Crozet *et al.*, 2012



Accessibility to answer the compensation issue

What type of compensation scheme can be implemented to compensate major losers and make road charging more acceptable?

- Time compensation: the example of a EUR 5 cordon toll in Lyon
 - 5% car traffic decrease in the city center due to a lower incoming traffic
 - For a worker located in the city center: time gain of 30 seconds to join inner city jobs (average time trip = 8 minutes)

≠ for people living in suburban areas



- Cost compensation: encouraging people to share their vehicle
-> high-occupancy vehicle lane
 - Increase of accessibility
 - However travel time gains depends on the level of traffic on reserved lines and are likely to decline with the success of carpooling
- Space consumption issues





Conclusion

- Congestion charging for time gains of to take care of the scarcity of space?
- Congestion charging and accessibility
 - A way to address the issue of acceptability for people living in the outskirts
 - A way to imagine different compensation process and the development of shared mobility