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# IMPACT OF INFORMATION AND COMMUNICATIONS TECHNOLOGY ON TRAVEL BEHAVIOR

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UP460 URBAN TRANSPORTATION AND LAND USE POLICY





## OVERVIEW

- Question I:
  - How will ICT influence people's activity-travel?
- Question II:
  - How will ICT influence travel choices?

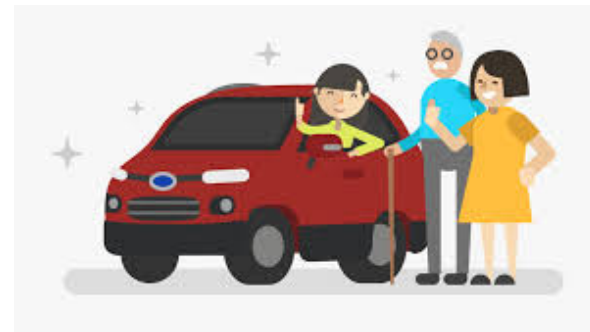


## ICT AND ACCESSIBILITY

- Short-term: Activity-travel and travel mode choices
- Mid-term: Mobility choices regarding employment, residential location, housing type, car ownership and mode of travel to work
- Long-term: Lifestyle choices such as labor market participation or orientation towards leisure activities
- Based on ideas proposed by Visser and Lanzendorf, 2003

Visser, E.-J., & Lanzendorf, M. (2004). Mobility and Accessibility Effects of B2c E-Commerce: A Literature Review. *Tijdschrift Voor Economische En Sociale Geografie (Journal of Economic & Social Geography)*, 95(2), 189–205. <https://doi.org/10.1111/j.0040-747X.2004.00300.x>

## SHORT-TERM: HOW DOES ICT CHANGE ACTIVITY-TRAVEL?

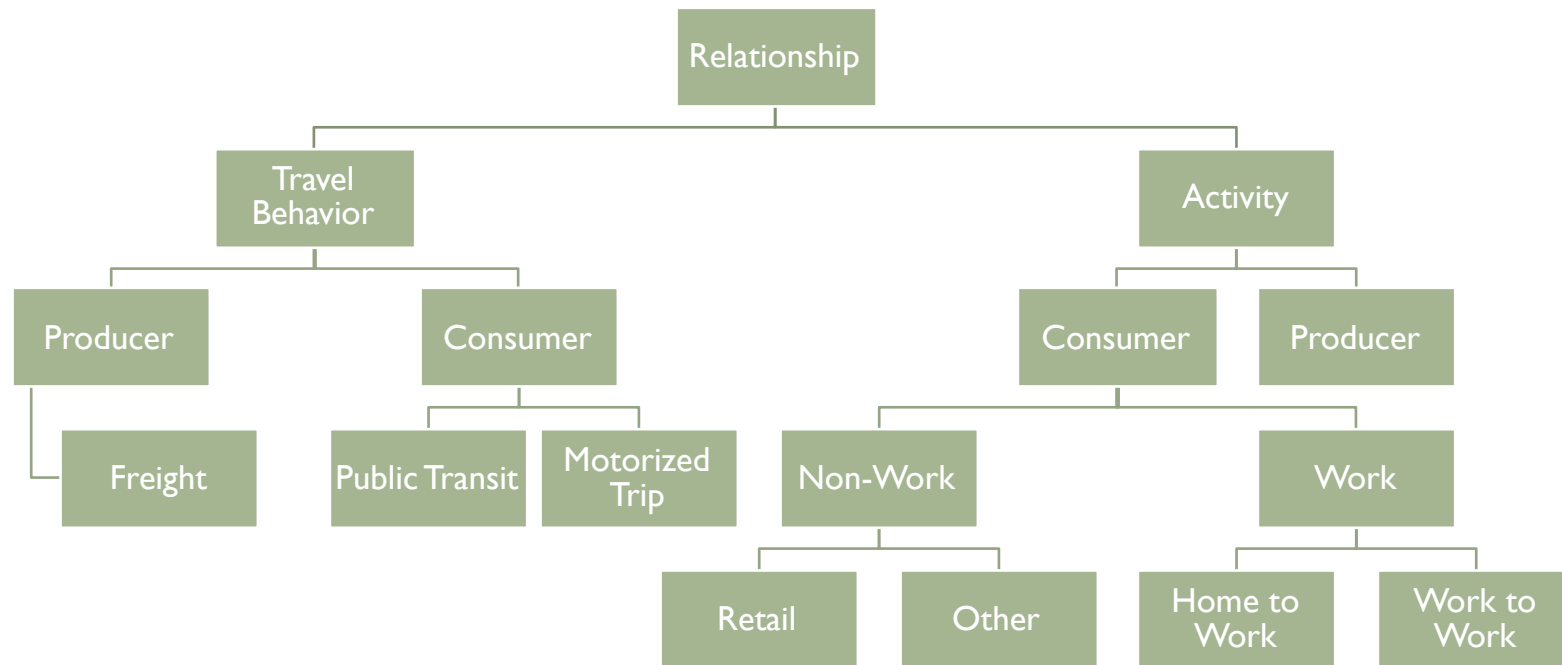


## SIX TYPES OF EFFECTS (LAVIERI ET.AL , 2018)

- Substitution
- Complementarity
- Modification
- Neutrality
- Activity fragmentation
- Multitasking
- Increase travel
- Decrease travel
- Uncertain

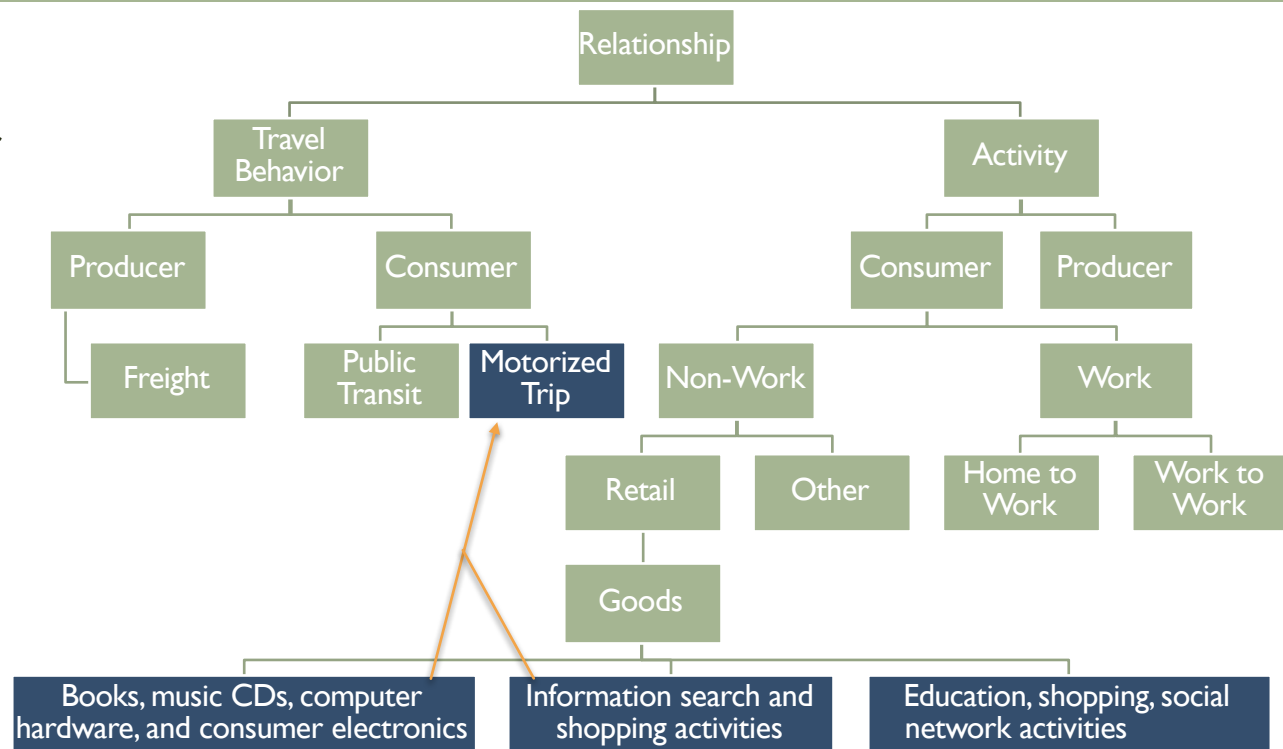
Lavieri, P. S., Dai, Q., & Bhat, C. R. (2018). Using virtual accessibility and physical accessibility as joint predictors of activity-travel behavior. *Transportation Research Part A: Policy & Practice*, 118, 527–544. <https://doi.org/10.1016/j.tra.2018.08.042>

# RELATIONSHIP MODEL



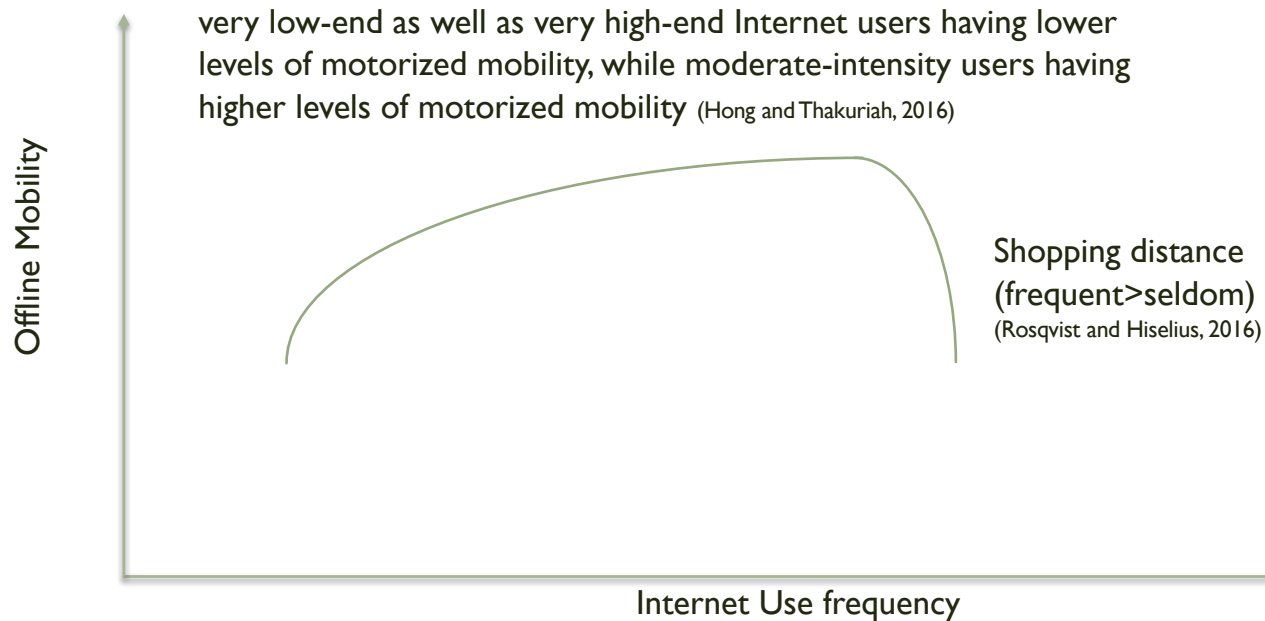
## SHOPPING: CONSUMER

- Substitution
- No conclusions made for decrease in physical mobility



## SHOPPING: CONSUMER

(CONCEPTUALLY...)



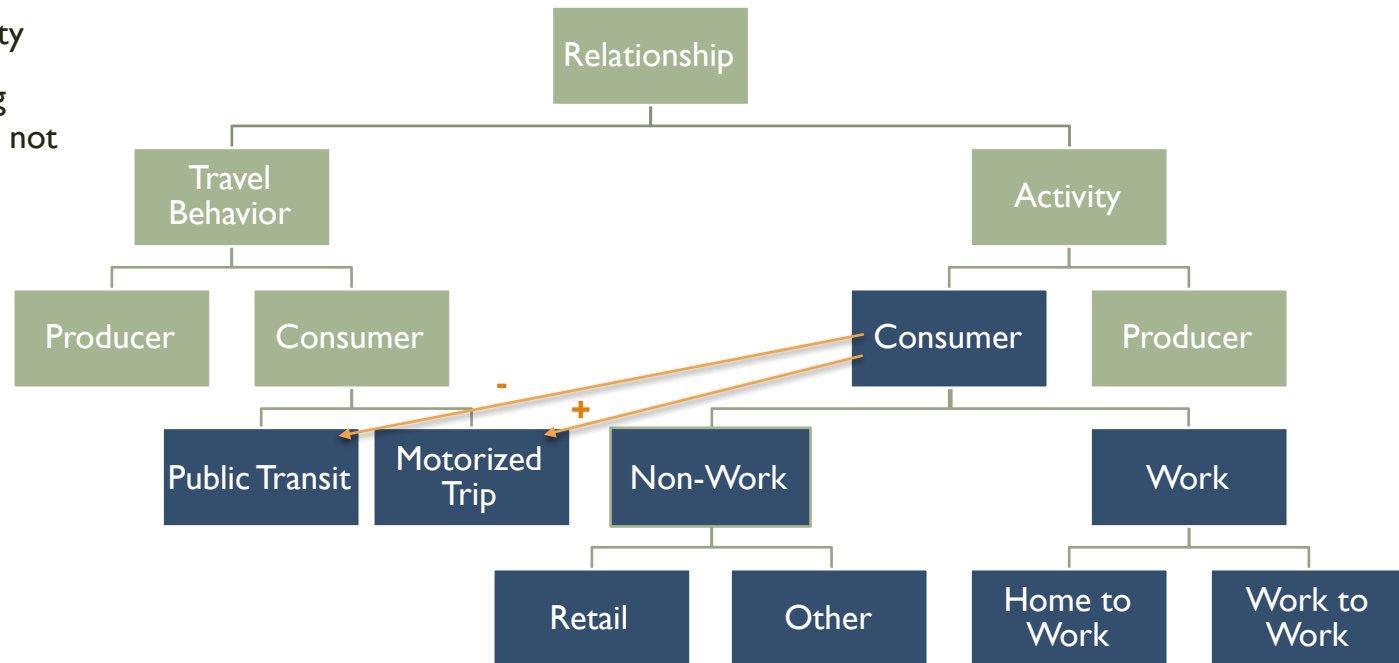
Hong, J., & Thakuria, P. (Vonu). (2016). Relationship between motorized travel and time spent online for nonwork purposes: An examination of location impact. *International Journal of Sustainable Transportation*, 10(7), 617–626. <https://doi.org/10.1080/15568318.2015.1079752>

Smidfelt Rosqvist, L., & Winslott Hiselius, L. (2016). Online shopping habits and the potential for reductions in carbon dioxide emissions from passenger transport. *Journal of Cleaner Production*, 131, 163–169. <https://doi.org/10.1016/j.jclepro.2016.05.054>

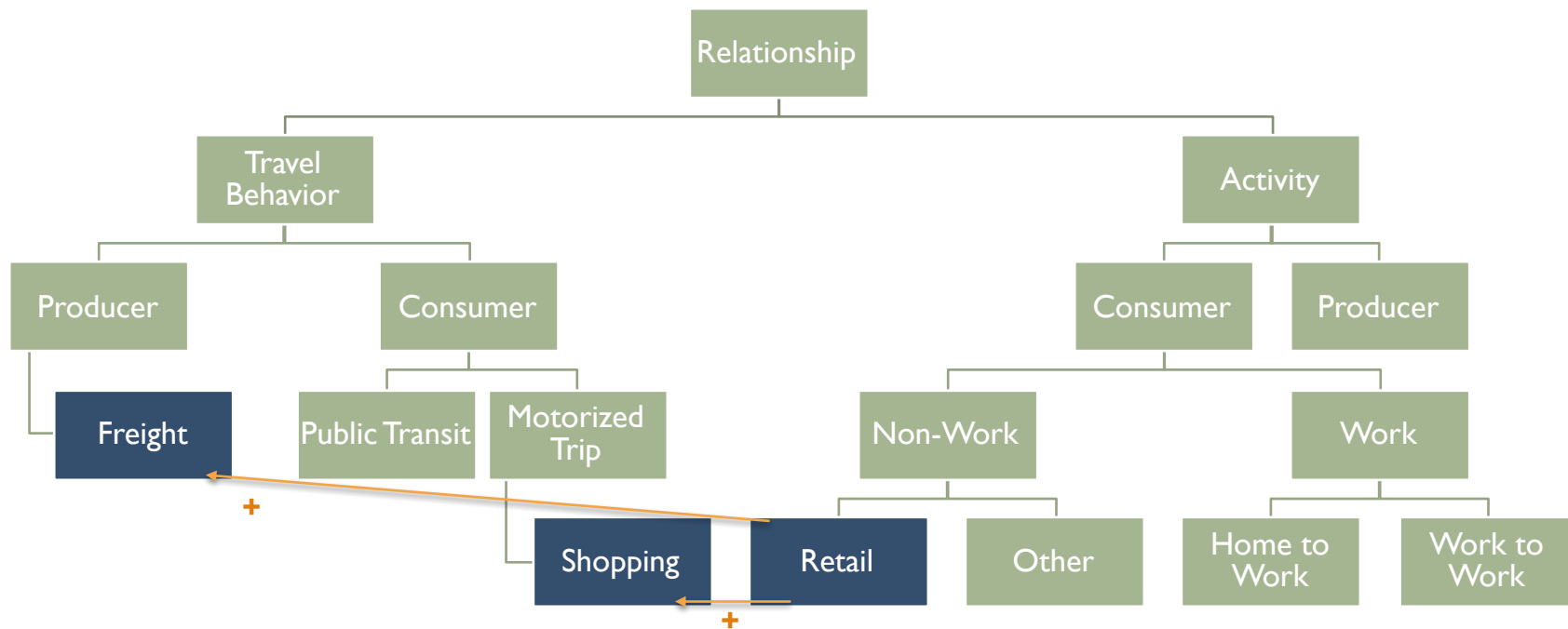


## SHOPPING: CONSUMER

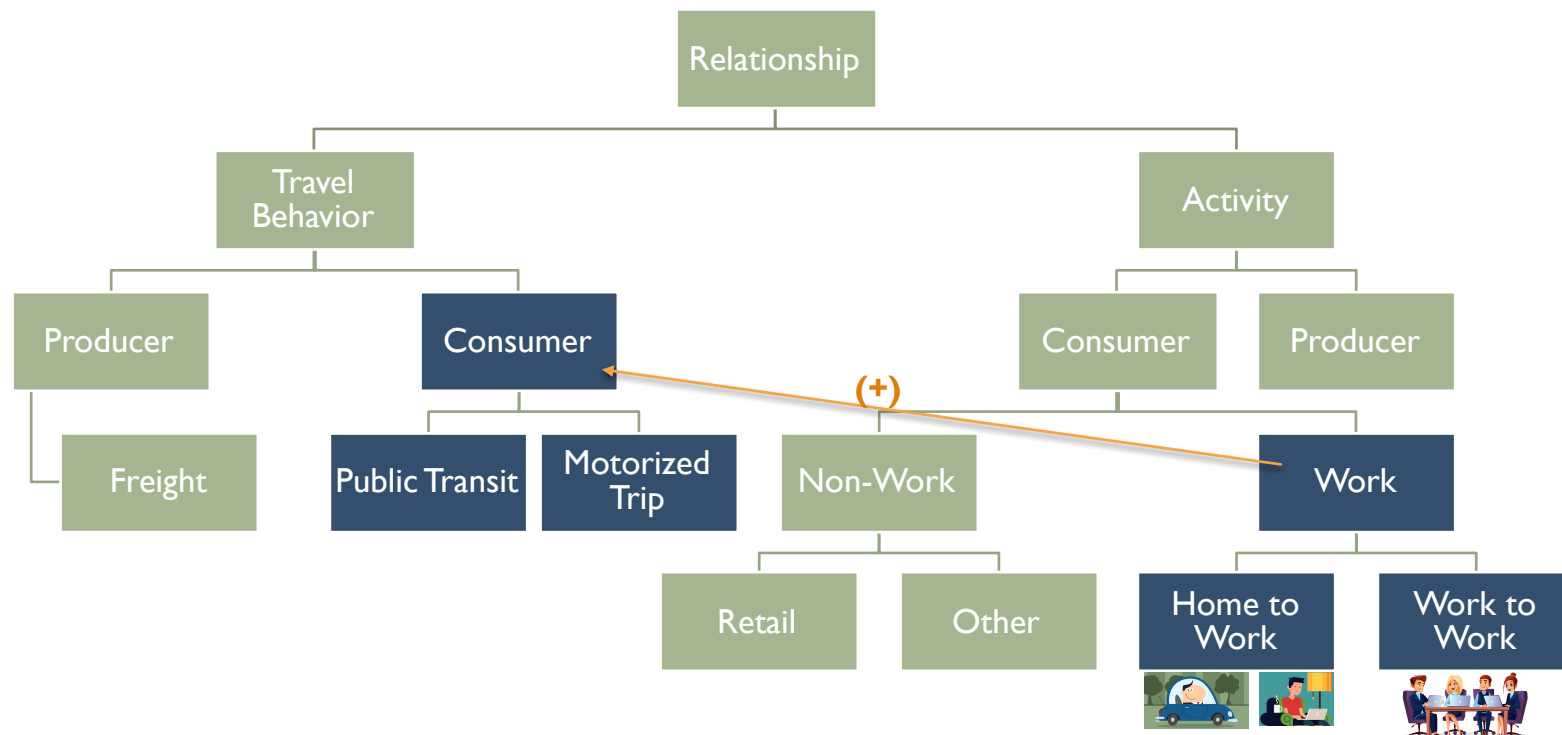
- Complementarity
- Online shopping activities should not decrease offline shopping trips
- For urban areas
- Moderate users



## SHOPPING: ADDING FREIGHT

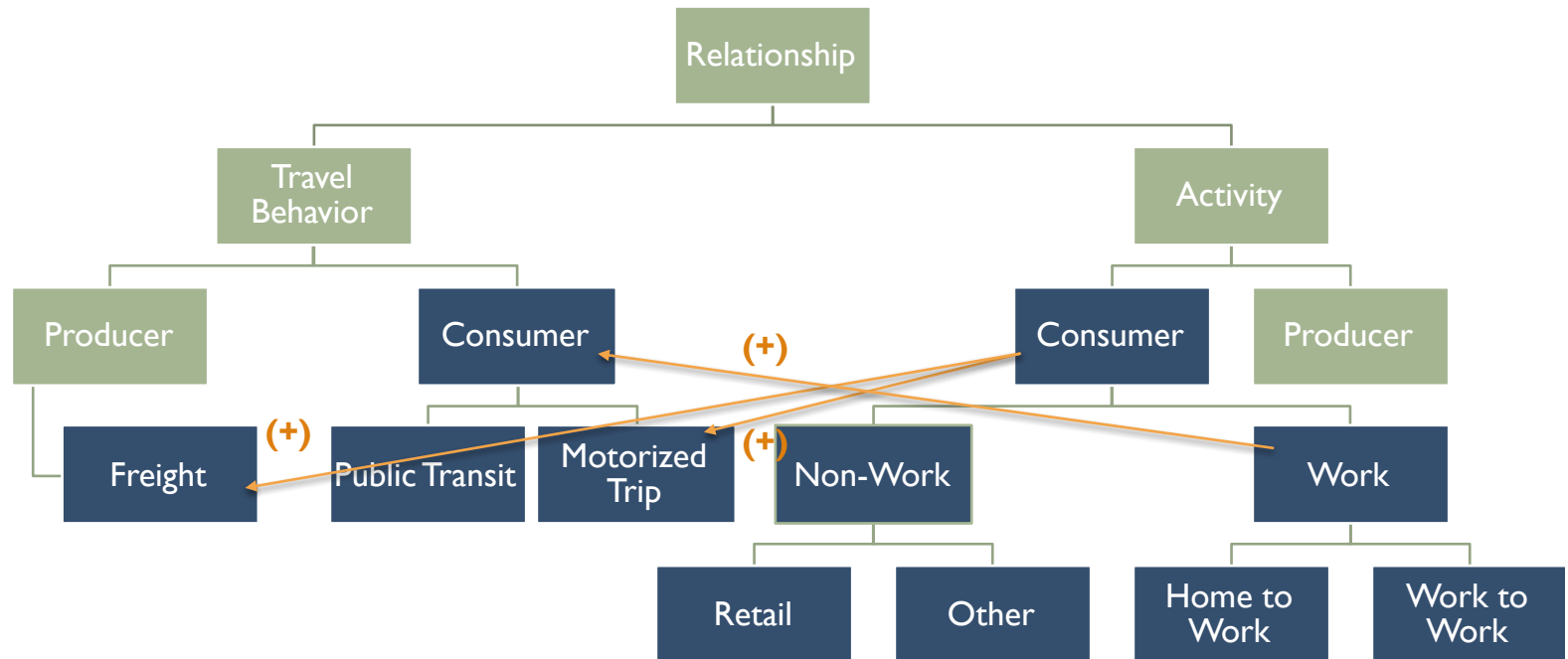


# WORK



## SHORT-TERM: HOW DOES ICT AFFECT OFFLINE TRIPS?

■ Uncertain

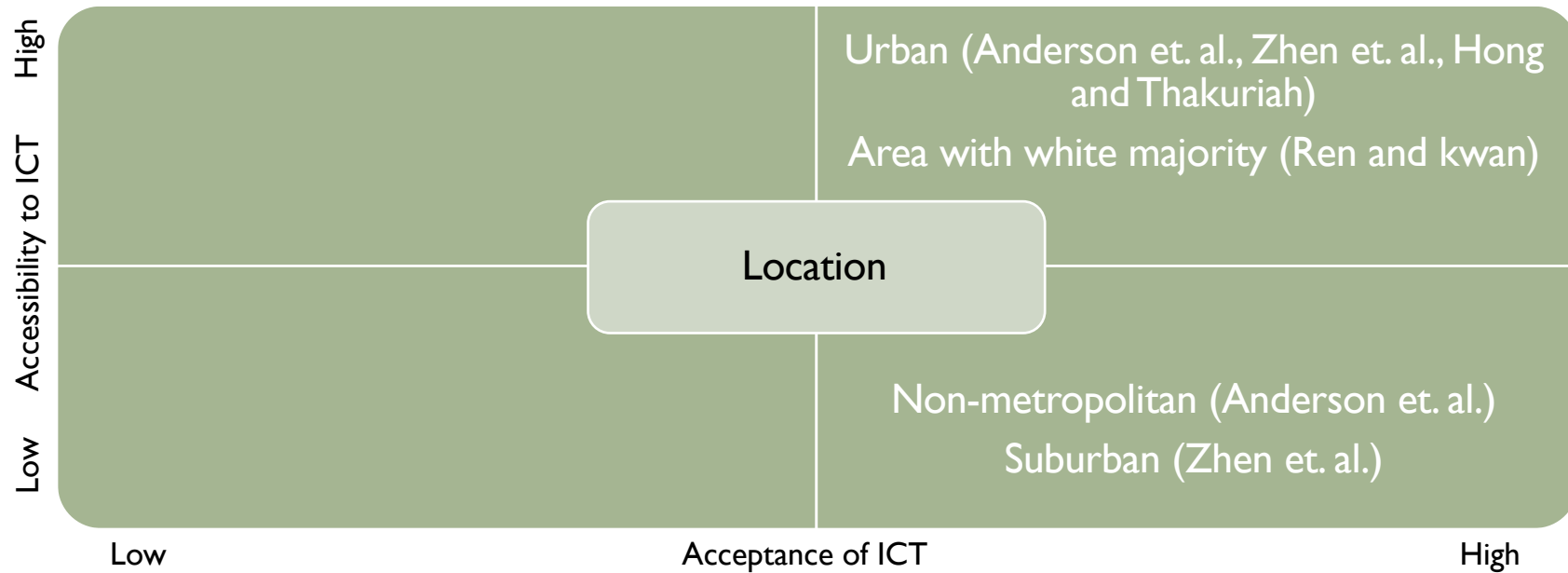




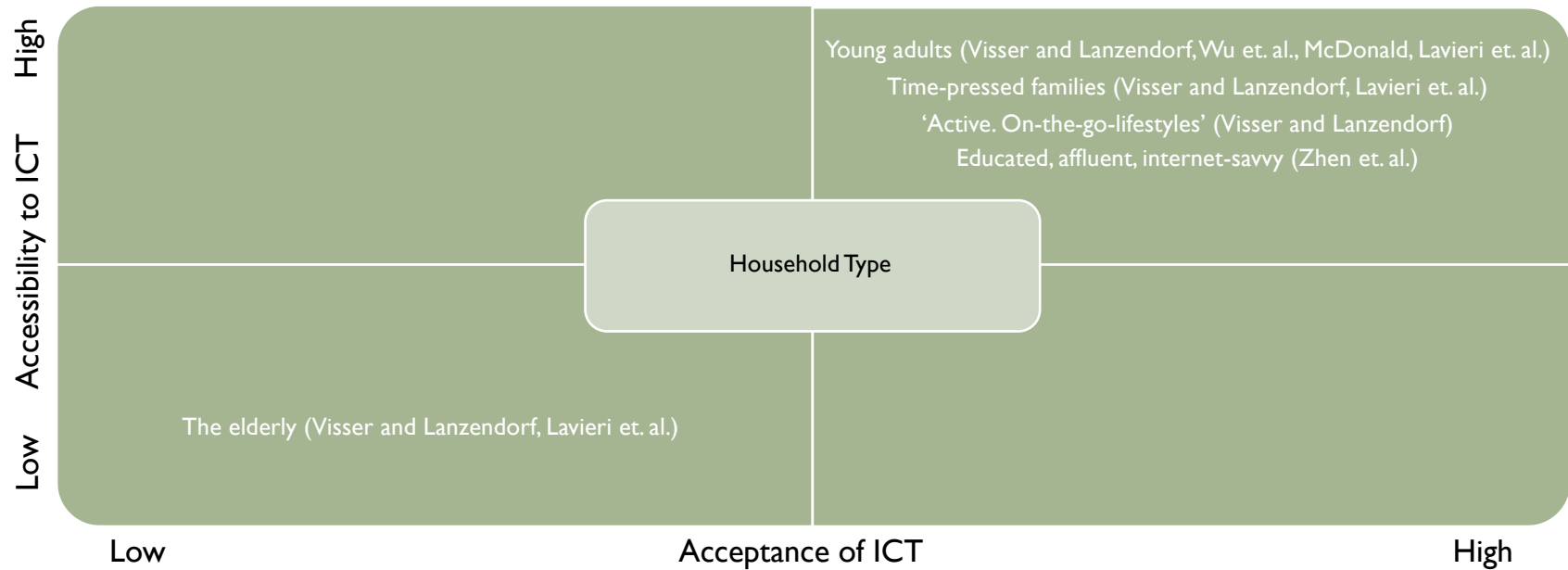
## DISCUSSION

- What leads to the uncertainty?

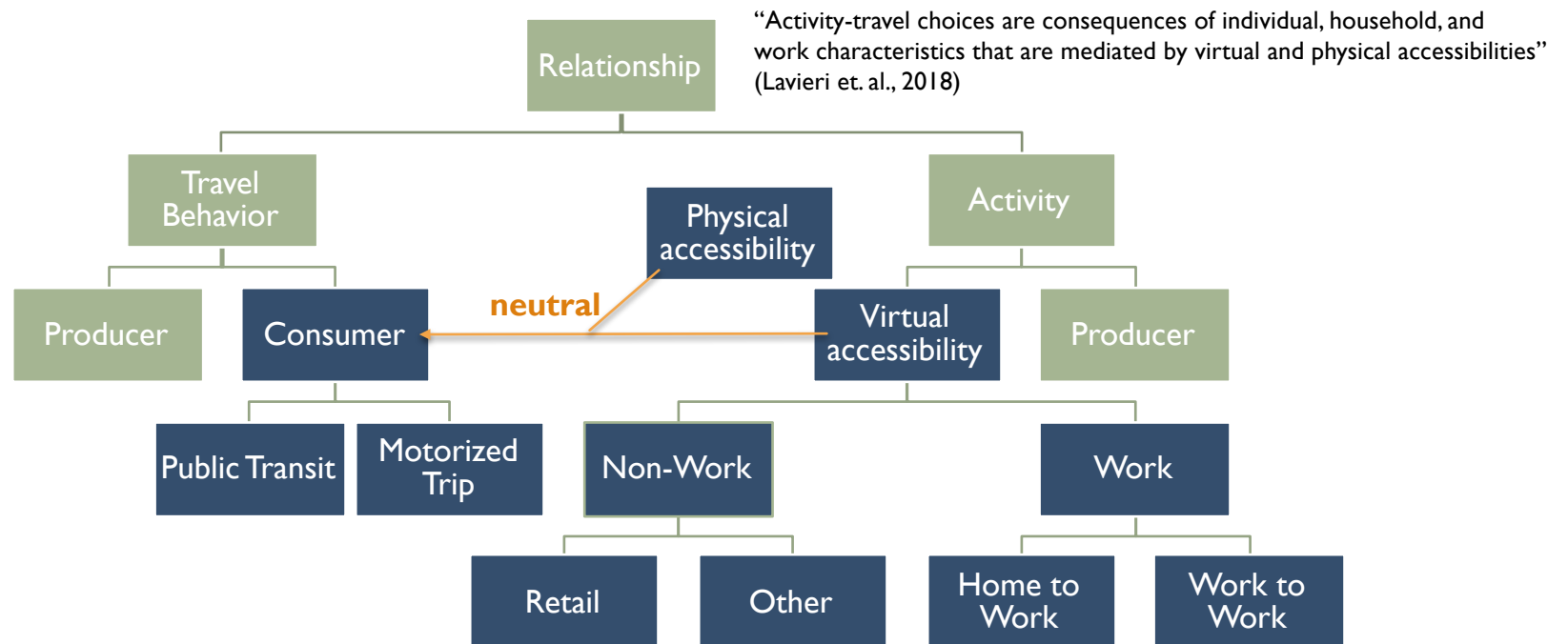
## ADOPTION OF ONLINE ACTIVITIES BY SOCIOECONOMIC FACTORS



## ADOPTION OF ONLINE ACTIVITIES BY SOCIOECONOMIC FACTORS



## PHYSICAL AND VIRTUAL ACCESSIBILITY SHOULD BE SEEN AS A PACKAGE



Lavieri, P. S., Dai, Q., & Bhat, C. R. (2018). Using virtual accessibility and physical accessibility as joint predictors of activity-travel behavior. *Transportation Research Part A: Policy & Practice*, 118, 527–544. <https://doi.org/10.1016/j.tra.2018.08.042>



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Physical Accessibility Latent Stochastic Construct (PALSC)

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Socio-demographic variables

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*House type (base: detached or semi-detached)*

Townhome

Apartment/flat

*Household tenure status (base: owner/buying or other)*

Renter

*Residential location (base: non-metropolitan area)*

Metropolitan area

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Physical accessibility measures (PAMs)

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*Travel time to the nearest hospital (hours)*

*Travel time to the nearest shopping center (hours)*

*Travel time to the nearest rail station (hours)*

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Virtual Accessibility Latent Stochastic Construct (VALSC)

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Socio-demographic variables

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*Age (base: 17 to 49 years old)*

50 or more years old

*Education (base: less than degree-level)*

Degree-level or above

*Household income (base: less than £50,000)*

£50,000 and over

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Virtual accessibility measures (VAMs)

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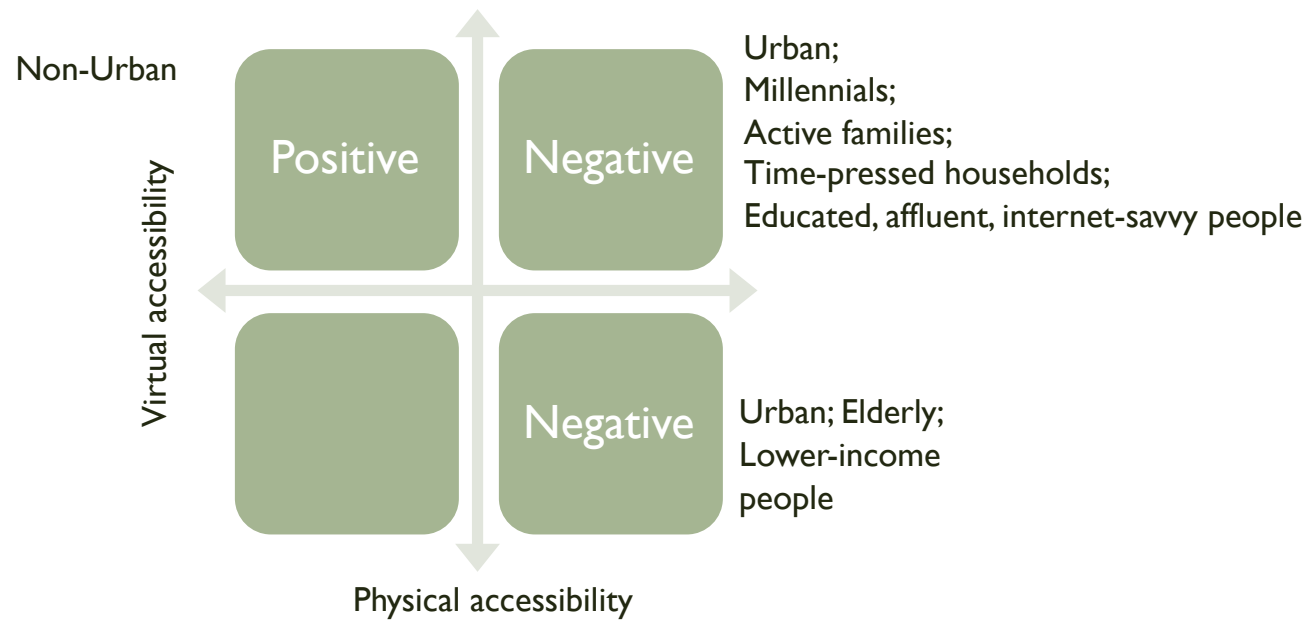
*Occupation type (base: routine, manual, intermediate occupations)*

Managerial and professional jobs

*Internet availability (base: has Internet connection at home)*

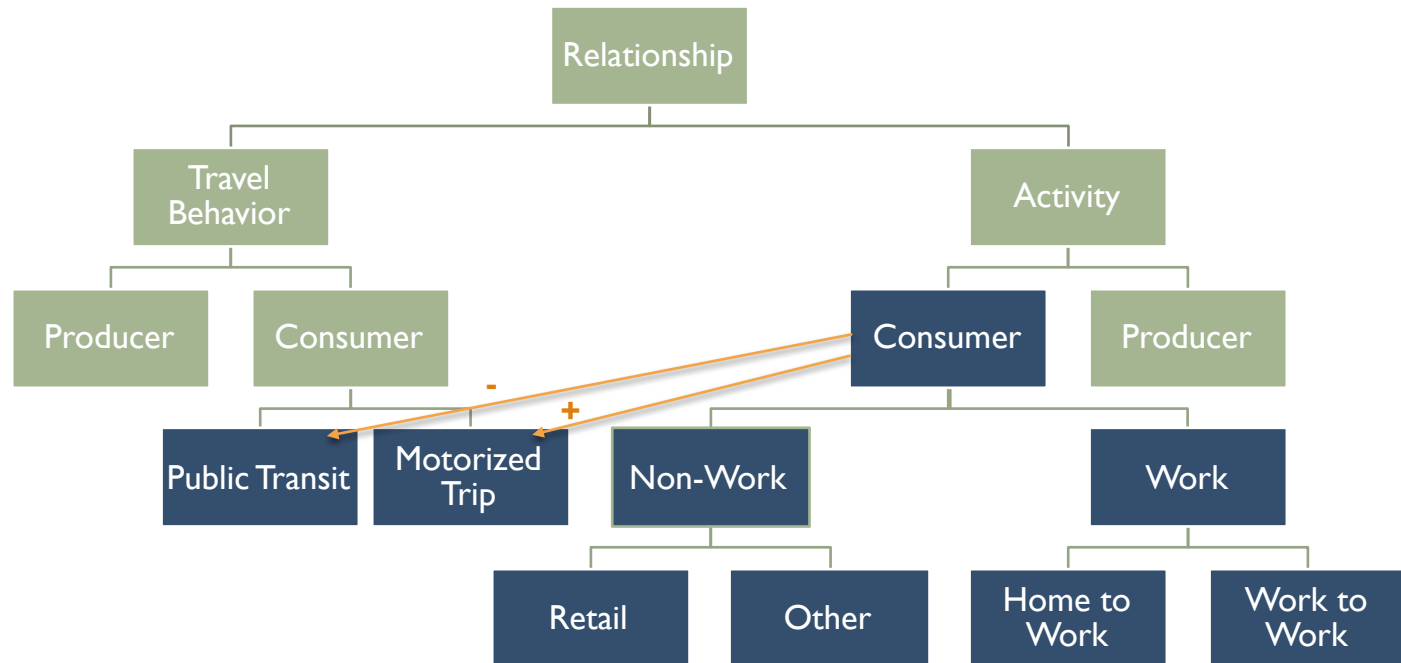
Does not have Internet connection at home

## JOINT ACCESSIBILITY AND MOTORIZED TRAVEL DISTANCE

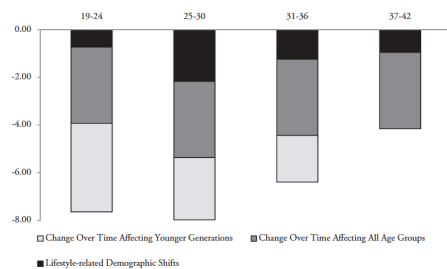


## HOW DOES ICT CHANGE TRAVEL MODE CHOICES?

- Increases motorized trip and decreases public transit trips

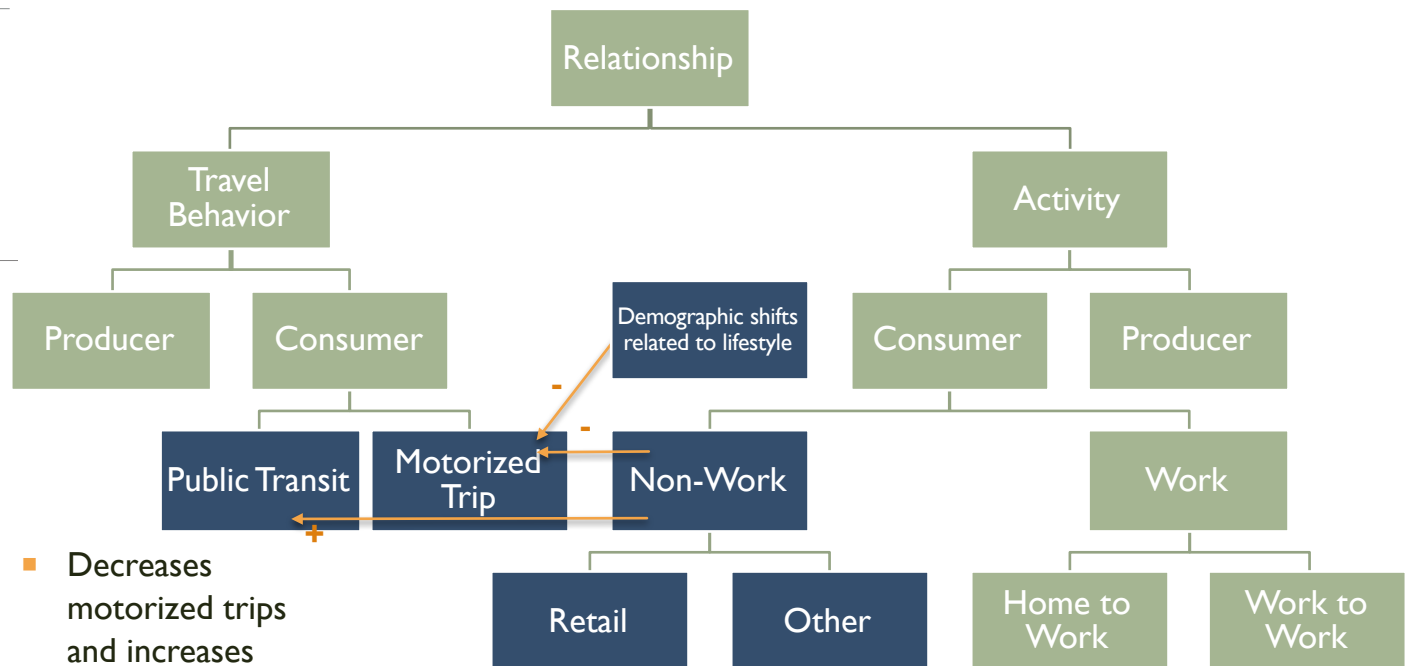



# MILLENNIALS



Change in daily automobile mileage from 1995 to 2009 by age group and source of change.

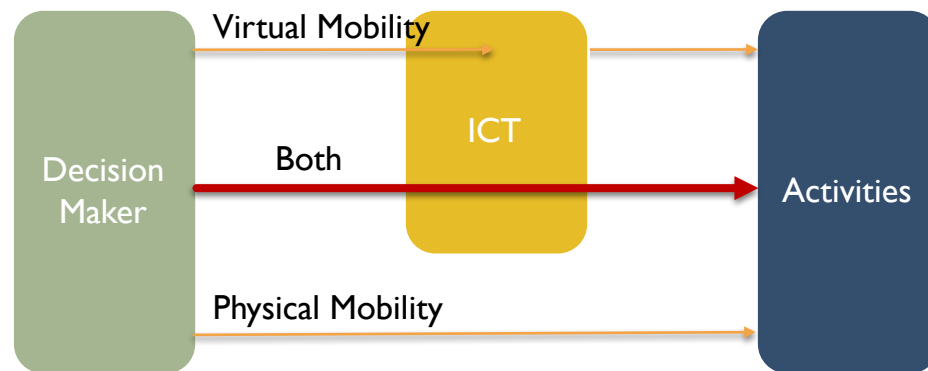
Age, years	1995	2001	2009	Change (09:95)	t	p value
Driver						
19-24	0.88	0.87	0.87	-0.01	-0.72	0.470
25-30	0.93	0.93	0.88	-0.05	-4.96	<0.001
31-36	0.95	0.95	0.93	-0.01	-2.02	0.043
37-42	0.95	0.96	0.95	0.00	-0.15	0.882
Number of daily auto trips						
19-24	4.0	3.7	3.2	-0.9	-9.20	<0.001
25-30	4.2	3.8	3.2	-1.0	-10.86	<0.001
31-36	4.4	4.0	3.6	-0.8	-10.49	<0.001
37-42	4.5	4.4	3.8	-0.7	-8.44	<0.001
Daily auto miles traveled						
19-24	37.1	35.4	29.9	-7.3	-5.24	<0.001
25-30	39.6	36.8	31.8	-7.7	-4.70	<0.001
31-36	39.2	39.6	33.1	-6.2	-5.12	<0.001
37-42	38.5	40.6	35.6	-2.9	-2.80	0.005



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- Calculations indicate that the predicted increase in online shopping behavior together with the predicted increase of the Swedish population in 2030 would give a 22% decrease in CO2 emissions related to shopping trips compared to 2012. (Rosqvist and Hiselius, 2016)

Smidfelt Rosqvist, L., & Winslott Hiselius, L. (2016). Online shopping habits and the potential for reductions in carbon dioxide emissions from passenger transport. *Journal of Cleaner Production*, 131, 163–169. <https://doi.org/10.1016/j.jclepro.2016.05.054>

## TRAVEL DECISION MODEL

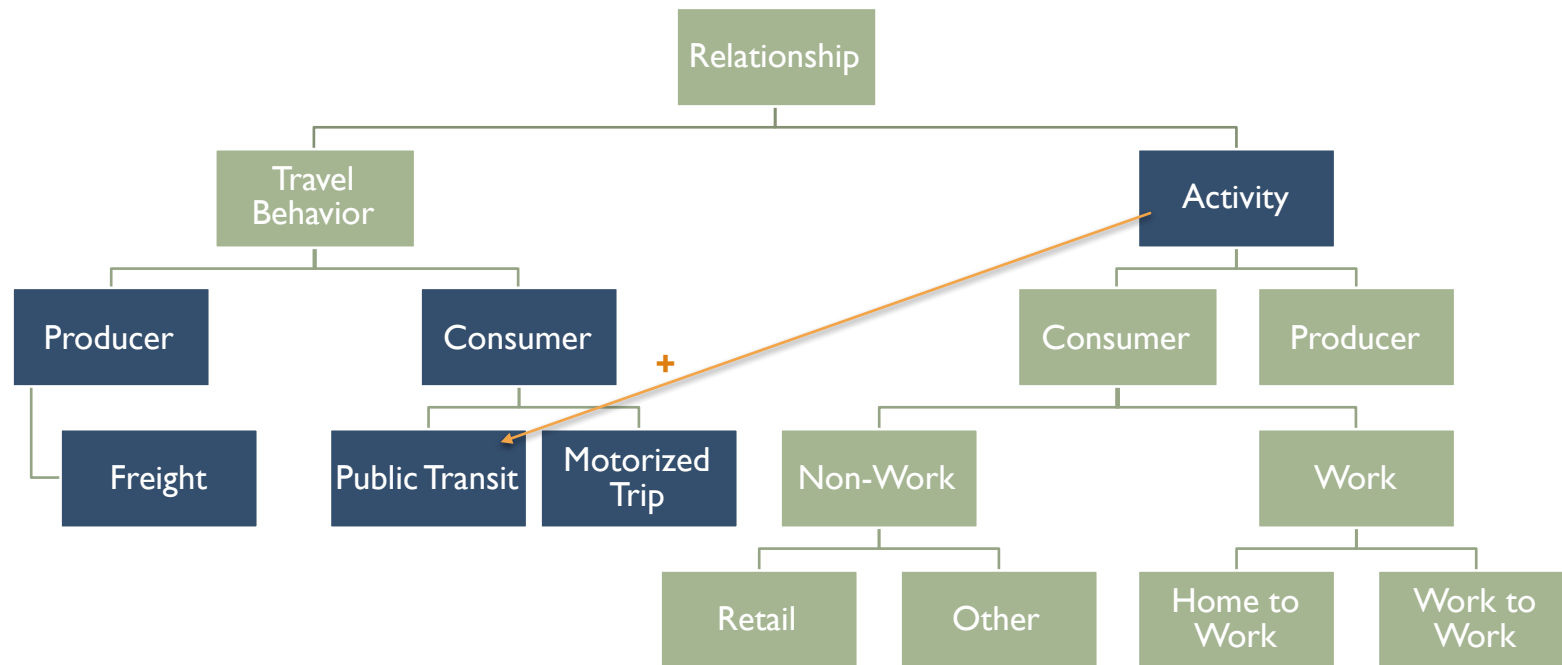


## IMPACT OF ICT ON TRAVEL MODE CHOICES

- Revised from study of Mokhtarian and Tal, 2013

	Destination	Mode	Route
Inspiration	Promotes new travel	Could promote public transit	Makes routes as destinations
Evaluation	Discourages new travel	Offers sustainable travel with planning and car-pooling tools	Decreases mobility time, frequency, and distance with GPS tools

Mokhtarian, P. & Tal, G. (2013). Impacts of ict on travel behavior: a tapestry of relationships. In J. Rodrigue T. Notteboom & J. Shaw The SAGE handbook of transport studies (pp. 241-260). London: SAGE Publications, Ltd doi: 10.4135/9781446247655.n14







## DISCUSSION

- 1.Examples for ICT and travel choices
- 2.What kinds of research can study the impact of ICT on travel mode choices?

## MID-TERM

### HOW WILL TRAVEL MODE CHANGE?

- Automobile Vehicle Ownership
- 1. Online platform for new and used car purchase
- 2. ICT-based features for automobile vehicle
- 3. ICT enables use of car-sharing, bike-sharing, providing alternatives for driving
  - To what extent driving will be substituted by these alternatives is controversial



## LONG-TERM

### HOW WILL ICT INFLUENCE SPATIAL DISTRIBUTION LOGISTICS

- Privacy
  - People may or may not find ways to avoid using ICT
- Equity through virtual accessibility
  - Virtual accessibility could also be a plausible solution for people with low physical accessibility
- Sustainability
  - Planners could take advantage of ICT to promote sustainable travel modes
- Lifestyle
  - Individuals may reconsider where to live depending on their preference for ICT



## IMPLICATION FORECAST TRAVEL DEMAND

- To consider how different trajectories for the travel of millennials could influence infrastructure needs:
  - Improve travel demand models for working and business trips
  - Adopt a scenario planning approach for different areas
  - Conduct comprehensive research about ICT and travel choices



THANK YOU! QUESTIONS?