Valuing the impacts of road traffic on local communities

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19/05/2016

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Community severance a.k.a. barrier effect

How to monetize severance?

- Sweden, Denmark (old documents for transport appraisal)
  Formulas combining traffic variables (density, composition, speed), crossing need, and unit monetary values per age group

- Delay * Value of time

- Stated preference: estimate willingness to contribute to projects that reduce severance

Methods

1st order effects
delay, collision risk, inconvenience of crossing the road

Stated preference survey

2nd order effects of changes in travel behaviour

Don’t walk → physical health
Don’t go → social exclusion
Go but use car → external effects

1. Estimate changes in number of trips (total, walk, car)
2. Combine with unit values from literature

Stated preference survey: design

Traffic density: **Low**

Central reservation with no guard railing

In this scenario, which of the two options would you choose?

Option A	Option B
Cross at this point Saving 80p off your one-way ticket cost	Do not cross the road and pay the higher ticket cost

Option A Option B

or shopping bill

Stated preference survey: results

	coeff.	WTP (£)
constant	-1.78	
saving	0.86	
lanes=3	-1.40	1.6
no central reservation	-1.26	1.7
density=medium	-0.95	1.1
density=high	-2.11	2.5
speed=30mph	-0.43	0.6

Model: random-effects logit
Dependent variable: log odds of crossing the road
Omitted category: 2 lanes, c.r., low density, speed<30mph
n=200
all variables significant at the 1% level

Household survey

How do you usually travel to the following places?

	Walk	Cycle	Bus	Train, tram, tube	Car	Other	I don't go there
A local corner shop/newsagent	☐	☐	☐	☐	☐	☐	☐
A supermarket	☐	☐	☐	☐	☐	☐	☐
A park (or playing field)	☐	☐	☐	☐	☐	☐	☐
A community centre or leisure centre	☐	☐	☐	☐	☐	☐	☐
A GP or health centre	☐	☐	☐	☐	☐	☐	☐
A chemist or pharmacy	☐	☐	☐	☐	☐	☐	☐
A pub, restaurant or café	☐	☐	☐	☐	☐	☐	☐

Results

Model: multinominal logit

Dependent variables:
log odds of travelling by a certain means vs. not travelling

Omitted categories:
Destination: shop
Traffic level: Low

n=518
variables in bold significant at the 10% level or less

	Walk	Car	Other
supermarket	-0.48	**1.76**	1.04
park	**-3.27**	**-2.07**	**-1.82**
community centre	**-4.18**	**-2.77**	**-2.57**
health	**-1.65**	0.02	-0.08
pharmacy	**-1.26**	-0.17	-0.29
café	**-3.08**	**-1.52**	**-1.80**
within walking distance	**2.15**	0.28	-0.31
age>65	-0.05	0.02	**0.74**
lives alone	**-0.73**	**-0.30**	**-0.78**
social housing	0.20	**0.31**	**0.92**
1 car	**-0.27**	**2.22**	-0.29
2+ cars	**-0.60**	**2.70**	**-0.71**
full time work	-0.17	**-0.36**	-0.07
qualification: degree	0.16	**-0.42**	0.21
qualifications: none	**-0.69**	**-0.72**	-0.20
bad health	**-0.76**	-0.18	-0.04
mobility restriction	**-0.87**	0.16	**-0.36**
traffic: medium	**-0.66**	**-0.57**	**-0.94**
traffic: high	**-0.68**	-0.30	**-0.59**
constant	**3.84**	0.43	**1.72**

Impact of traffic on travel behaviour

Difference between probabilities of each choice
(comparing high traffic levels vs. low traffic levels)

Destination	Walk	Car	Other	Don't Go
shop	-2.2%	1.4%	0.1%	0.6%
supermarket	-5.2%	4.8%	-0.2%	0.7%
park	-8.7%	1.5%	-1.1%	8.2%
community centre	-10.8%	0.6%	-1.7%	11.9%
health	-5.5%	3.5%	-0.2%	2.2%
pharmacy	-4.6%	2.8%	0.0%	1.8%
café	-7.0%	8.4%	-2.3%	0.8%

2nd order severance impacts

Health

External costs

Social exclusion

Monetize second-order impacts

Health

Health benefits of walking per km

Ex: *NZTA (2005)*

£0.19

External costs

External costs of car travel per km per year

Ex: CE Delft et al (2011)

£ 0.0647

Social exclusion

Trade-off value between number of trips and income for a given risk of social exclusion

Ex: Stanley et al. (2012)

£8.90

Main conclusions

People attach a monetary value to avoid crossing a busy road.

That value is a measure of the disutility caused by traffic on pedestrians

The presence of traffic decreases the probability of walking to local destinations and increases the probability of using car or not going to those destinations at all

The resulting changes in the number of walking, car, and total trips can be combined with unit monetary values of their impact on health, external effects, and social exclusion