

Niek Mouter: PVE: a new method to assess the societal value of smart public transport solutions?

# PVE designed as viable alternative for CBA

1. Cost-Benefit Analysis dominant method for evaluation public policies;
2. Societal value of a government policy derived from number of euros that individuals are willing to pay from their **private income** for the impacts;
3. Longstanding criticism 'private willingness to pay' approach:
  - Philosophy (Kelman, Sagoff, Ackerman and Heinzerling);
  - Economics (Solow, Sunstein; Sen);
  - Psychology/behavioral economics (Thaler, Kahneman).

## Consumer-citizen duality:

*"Individuals' private WTP may not reflect how they want public policies to change."*

# What explains the consumer-citizen duality?



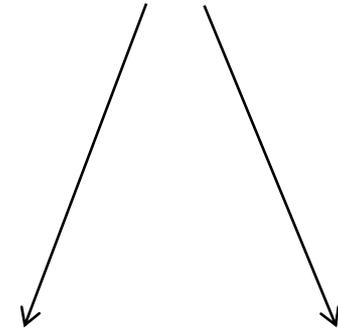
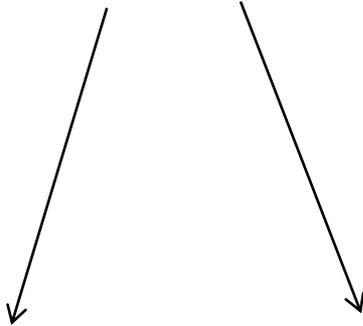
*“Moral considerations more salient in a public context than in a private context”*

Ackerman, Heinzerling, Sagoff



*“Dollars in different mental accounts can have different purposes. Private and public euros might have different purposes.”*

Thaler and Kahneman



FOR A FASTER & MORE EFFECTIVE RAPID TRANSIT SYSTEM

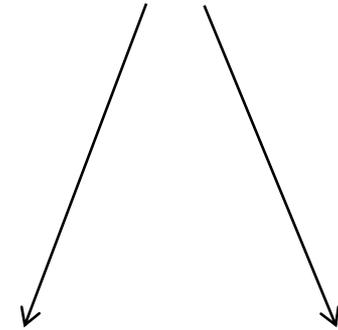
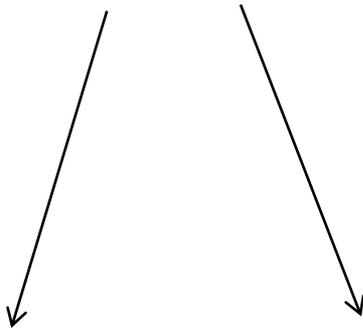
Travel  
Time  
Savings



FOR A FASTER & MORE EFFECTIVE RAPID TRANSIT SYSTEM

Travel  
Time  
Savings





# Experiment 1: private choice willingness to pay

Replication previous Dutch VOSL study (de Blaeij, Verhoef, Rouwendal, Rietveld)

- We ask you to choose one of the two routes:
- Both 2x2-lane motorways
- 80,000 trips per day (29 million trips per year)

	<b>Route A</b>	<b>Route B</b>
<b>Travel time</b>	40 minutes	30 minutes
<b>Number of traffic deaths on the road</b>	5 per year	3 per year
<b>Toll costs</b>	3.50 euro	6.50 euro

MNL:

- Value of Time: 7.41 euro per hour;
- Value of Statistical life 9.7 million euro per statistical life;
- Mean marginal rate of substitution time vs death: 2.71 minutes travel time savings = reduction of 1 traffic casualty

## Experiment 2: private choice (no costs)

### DIFFERENT GROUP OF RESPONDENTS

- We ask you to choose one of the two routes:
- Both 2x2-lane motorways
- 80,000 trips per day (29 million trips per year)

	<b>Route A</b>	<b>Route B</b>
<b>Travel time</b>	40 minutes	30 minutes
<b>Number of traffic deaths on the road</b>	3 per year	5 per year

MNL:

- Mean marginal rate of substitution time vs death: 2.53 minutes travel time savings = reduction of 1 traffic casualty

## Experiment 3: willingness to allocate public budget

- The government decided to build a new road.
- The government still needs to decide about the route of the new road.
- Government asks you whether you would recommend Route A or B
- Both 2x2-lane motorways
- 80,000 trips per day (29 million trips per year)
- The government is interested in general preferences of Dutch citizens. Hence, it is not made clear whether or not you would experience any effects (positive and negative) from either of the two routes.

	Route A	Route B
Travel time	40 minutes	30 minutes
Number of traffic deaths on the road	3 per year	5 per year

- Mean marginal rate of substitution time vs death: 16.3 minutes travel time savings = reduction of 1 traffic casualty

# Comparison consumer vs citizen experiment

Context	Experiment 1			Experiment 2			Experiment 3		
	Classical Consumer route choice			Consumer route choice (no costs)			Citizen route choice		
Model	MNL			MNL			MNL		
# Observations	1559			1247			1343		
Null LL :	-1080.6			-864.4			-930.9		
Final LL:	-701.3			-780.1			-426.3		
$\rho^2$ :	0.35			0.10			0.54		
<i>Estimates</i>	Est	SE	T	Est	SE	T	Est	SE	T
B_Death	-0.342	0.024	-14.30	-0.334	0.027	-12.39	-0.832	0.049	-19.25
B_TravelTime	-0.126	0.011	-11.26	-0.132	0.013	-9.81	-0.051	0.015	-3.72
B_TravelCosts	-1.020	0.048	-21.38						
Mean marginal RoS T/D	<b>2.71</b>	0.29	9.27	<b>2.53</b>	0.17	15.10	<b>16.31</b>	4.35	3.75

**Mean marginal RoS T/D practice. 45 seconds per death!**

# Let's provide a viable alternative!

## Participatory Value Evaluation:

- Government projects are evaluated through individuals' **willingness to allocate public budget** to (impacts of) public projects in a **realistic experiment**.

## Application (Transport Authority Amsterdam)

<http://pve.splicedgene.com/participatory-value-evaluation-transport-authority-amsterdam>

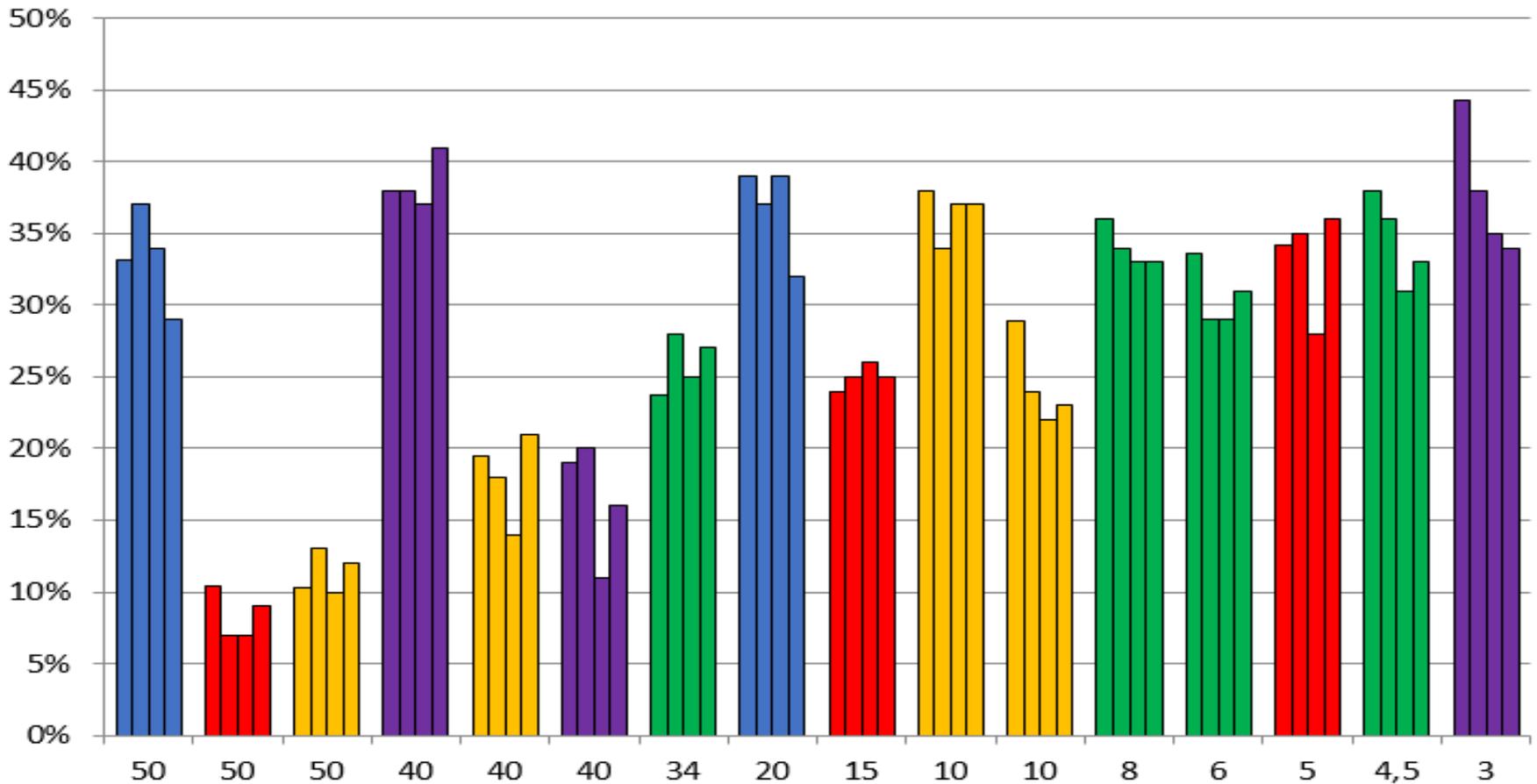
2,498 individuals (four waves) were asked to allocate 100 million

- 16 projects: car, public transport, cycling, safety;
- Total cost of 16 projects: 405 million.
- Provided information about traditional goals: costs of project, reduction traffic, deaths/severe injuries, travel time savings, impact on noise pollution.

# Market shares

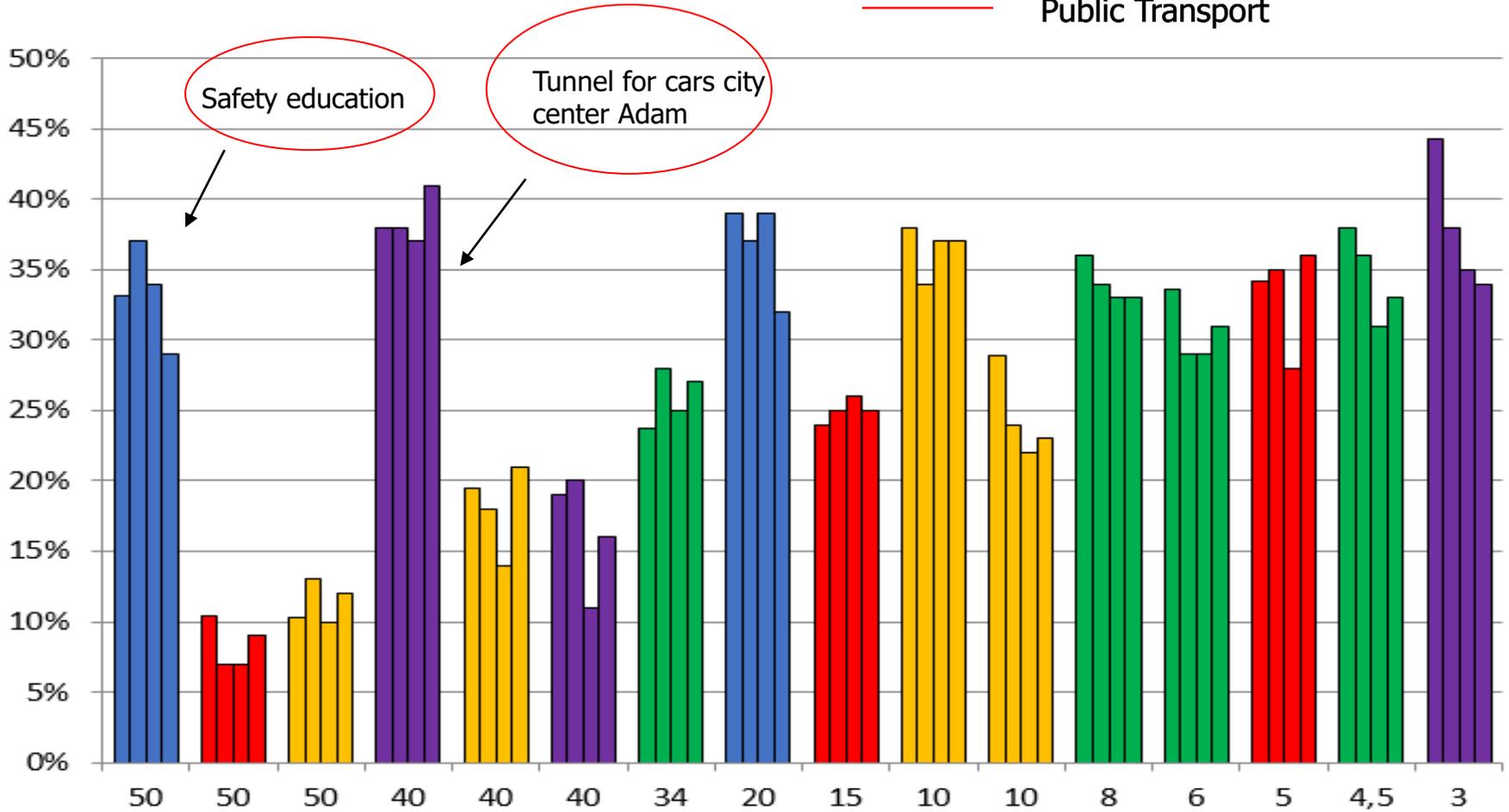
Total budget: 100 mln

- Safety
- Tunnels separate fast/slow modes
- Car
- Cycling
- Public Transport



# Market shares

- Safety
- Tunnels separate fast/slow modes
- Car
- Cycling
- Public Transport



# Policy evaluation



- Dekker, T., Koster, P.R., Mouter, N., (2019). The economics of Participatory Value Evaluation. Working paper Tinbergen Institute. 19-008/VIII
  - Estimation is based on MDCEV model (Bhat, 2018).
  - Directly estimate the social welfare effects of transport projects.
  - Individuals aimed to select the portfolio with the highest utility
  - Attractiveness of a project is defined by attributes and other properties.

**Estimation results****Estimate****T-value****Taste parameters**

B_Reduction of travel time (per 1,000,000 minutes)	0.4806	1.13
B_Additional traffic deaths	-1.5814	-2.76
B_Additonal traffic injuries	-0.1896	-2.31
B_Additional households affected by noise pollution (per 100)	-0.0619	-0.85
B_Additional trees cut (per 100)	-0.0882	-1.09

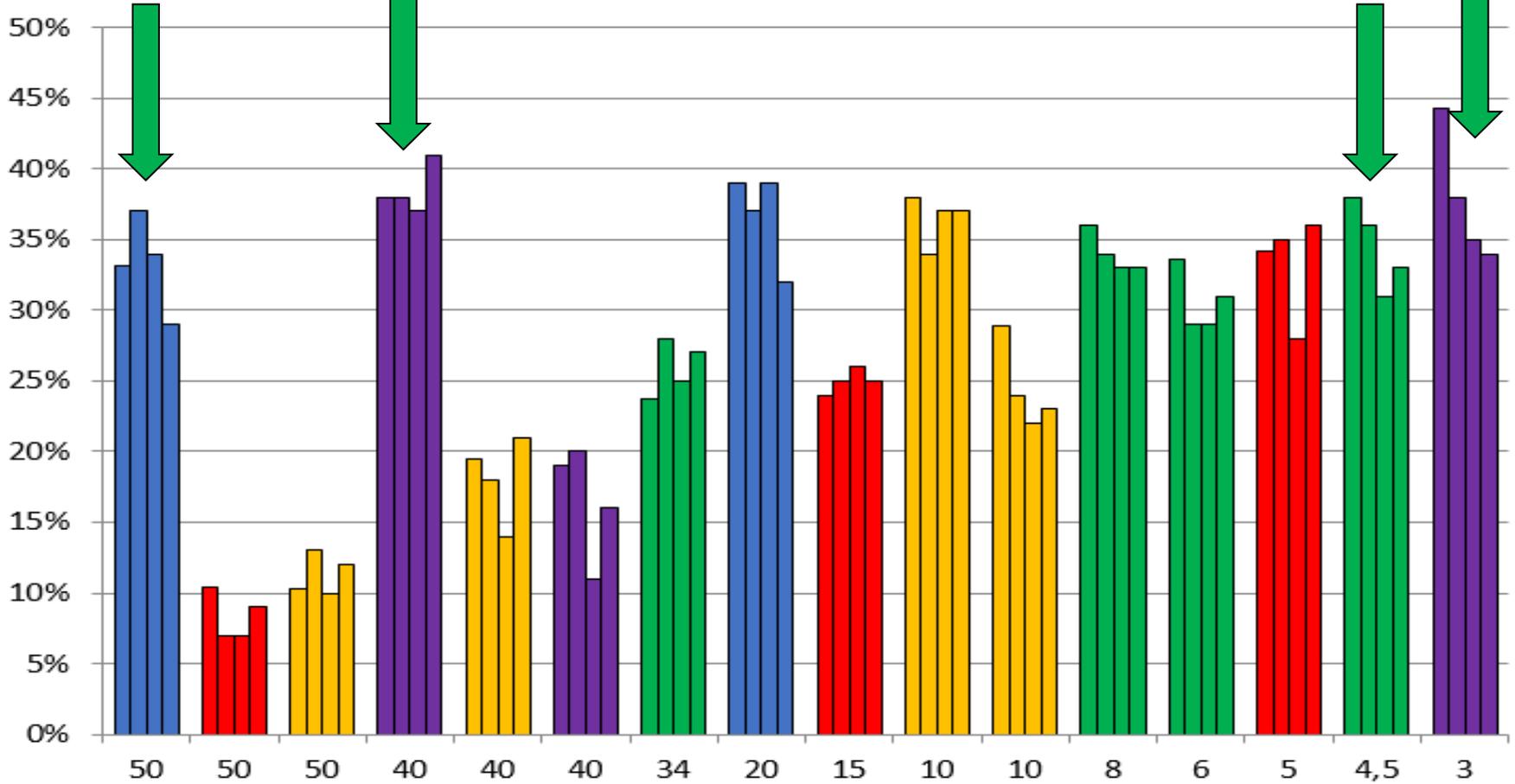
**Project specific parameters**

B_Faster connection bus and cartraffic Zaandam	6.5555	<b>65.28</b>
B_IJpendam pedestrian tunnel	4.5549	<b>101.35</b>
B_Fly-over A10 at the junction Amsterdam Noord	6.6974	<b>38.09</b>
B_Extending the MacGillavrylaan to the Middenweg	5.5604	<b>53.77</b>
B_Widening the Bovenkerkerweg to 2 lanes per direction	5.3741	<b>71.39</b>
B_New bus connection IJburg - Bijlmer Arena	6.3883	<b>139.15</b>
B_Acceleration of the bus connection Amsterdam CS - Zaandam	4.9451	<b>118.33</b>
B_Improvement tram connection Diemen – Linnaeusstraat	5.7723	<b>134.40</b>
B_Cycling highway Hoofddorp – Schiphol – Aalsmeer	5.3959	<b>128.12</b>
B_Cycling highway Amstelveenseweg	5.0542	<b>74.96</b>
B_New bridge for cyclists and pedestrians Purmerend (Hoornselaan)	4.8378	<b>110.12</b>
B_Guisweg bike tunnel	6.5271	<b>149.09</b>
B_New cycling bridge Zeeburg (35)	6.6641	<b>146.95</b>
B_Stadhouderskade car tunnel at the entrance of the Vondelpark	7.0658	<b>108.88</b>
B_Traffic education for children in the age group 4 -18	7.1350	<b>77.60</b>
B_Five police officers which sanction violation of traffic regulations	6.1875	<b>65.71</b>

# Policy evaluation

PVE method

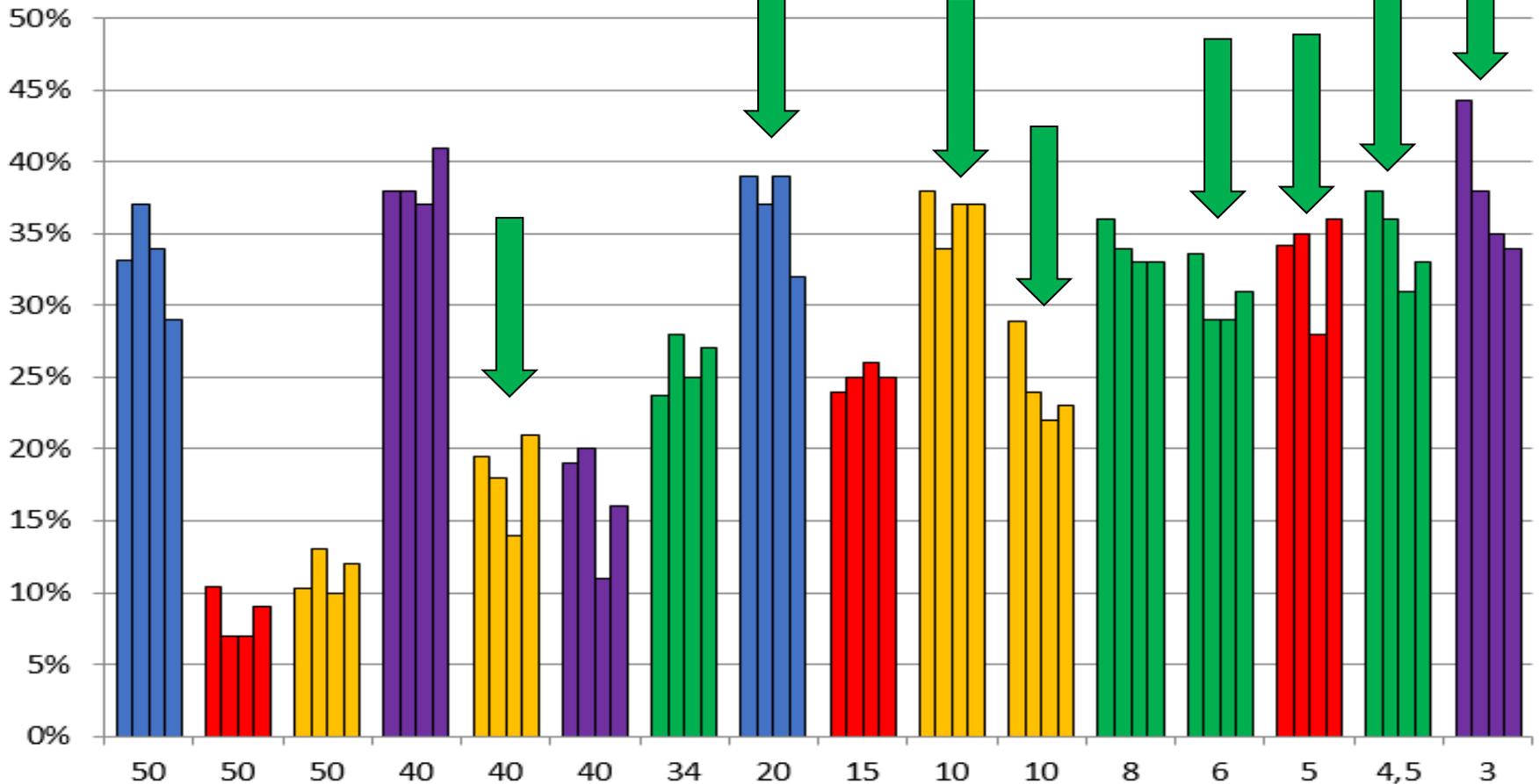
- Safety
- Tunnels separate fast/slow modes
- Car
- Cycling
- Public Transport



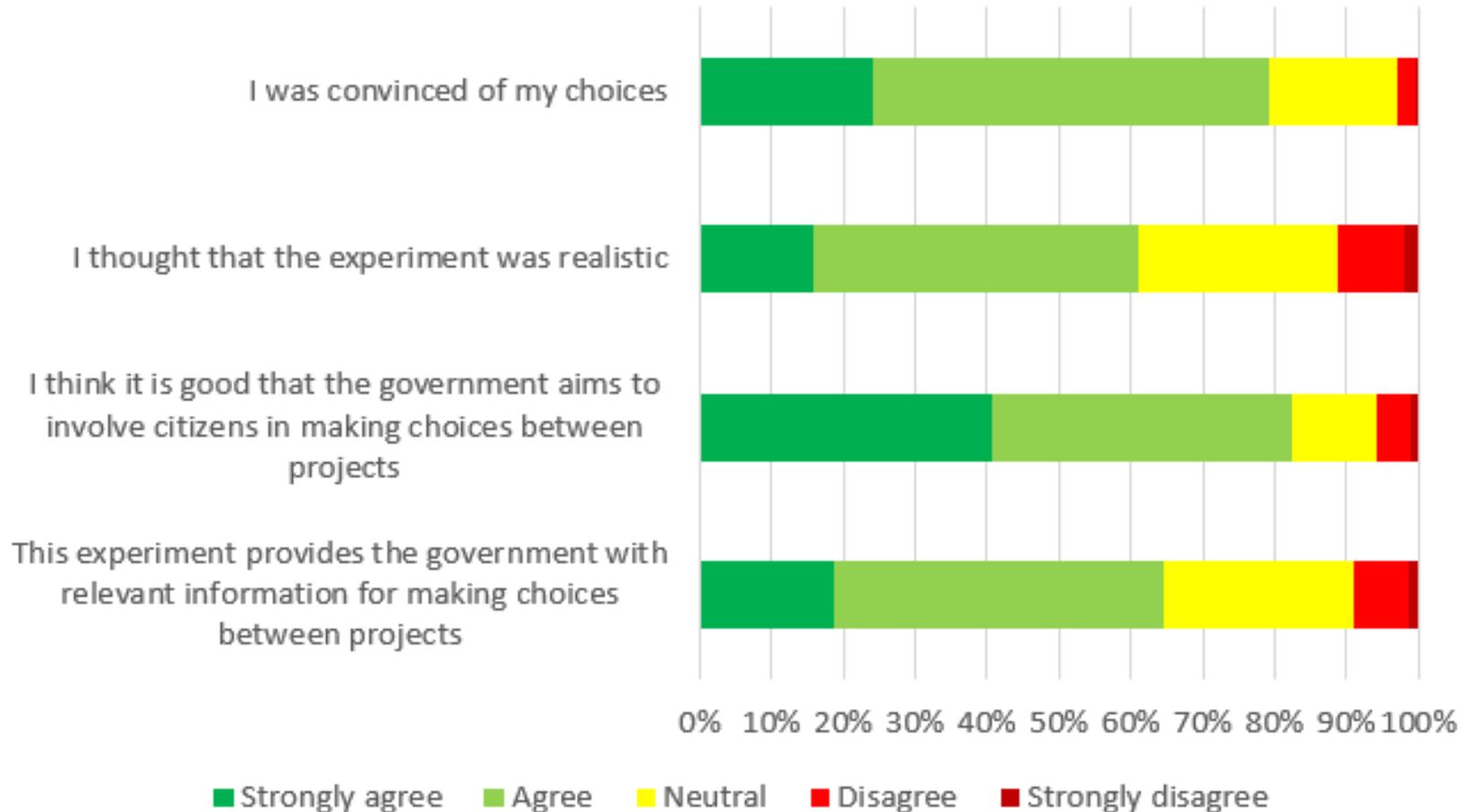
# Policy evaluation

## Classical Cost-Benefit Analysis

- Safety
- Tunnels separate fast/slow modes
- Car
- Cycling
- Public Transport



# Respondents' experiences



# The virtue of mass participation

Conventional participation approaches are designed for the happy few:

- People who have a lot to gain;
- People who have a lot of spare time;
- People who like to speak in public/discuss with other citizens.

**Overrepresentation** of *old highly educated white males*.







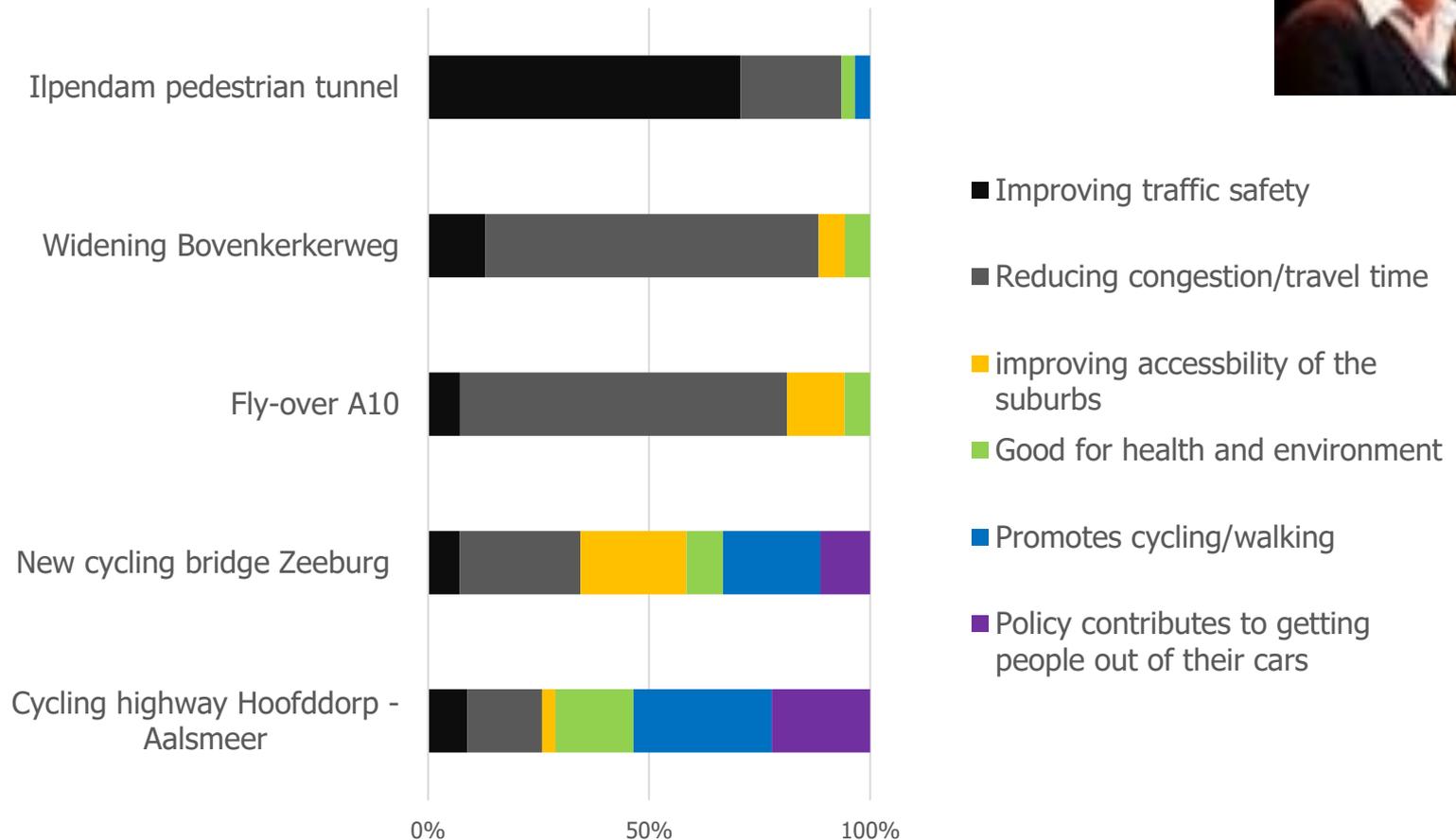


# PVE vs conventional approaches to participation

	<b>PVE</b>	<b>Conventional</b>
<b>Entry barriers</b>	<ul style="list-style-type: none"><li>• <b>Low</b></li><li>• Around 20 minutes</li><li>• Where and when you want</li></ul>	<ul style="list-style-type: none"><li>• <b>High</b></li><li>• You need to go to a public hearing or a 'community evening'.</li></ul>
<b>Number of citizens who participate</b>	<ul style="list-style-type: none"><li>• 1,000 – 10,000</li></ul>	<ul style="list-style-type: none"><li>• 100 max.</li></ul>
<b>Discuss with other citizens?</b>	<ul style="list-style-type: none"><li>• No</li></ul>	<ul style="list-style-type: none"><li>• Yes</li><li>• You need to speak in public</li><li>• You need to listen to (annoying) citizens.</li></ul>
<b>Investment of civil servants</b>	<ul style="list-style-type: none"><li>• Low investment of time/energy</li></ul>	<ul style="list-style-type: none"><li>• Participation fatigue</li></ul>

	Experiment 1	Experiment 2
<b>Gender</b>		
Male	55%	56%
Female	45%	44%
<b>Age</b>		
18-25	9%	8%
26-35	15%	14%
36-45	15%	15%
46-55	18%	23%
56+65	20%	18%
65+	24%	22%
<b>Education</b>		
Low education	49%	44%
High education	51%	56%
<b>Income</b>		
$I \leq I < 28\ 600$	20%	19%
$28\ 600 \leq I < 42\ 400$	23%	21%
$42\ 400 \leq I < 71\ 000$	34%	33%
$I \geq 71\ 000$	23%	28%

# Qualitative results (9,920 motivations)



# Inclusion broader goals: spatial equality

- *"As a resident of Amsterdam, I wanted to do something for the regions outside Amsterdam with the funds I had left over."*
- *"Spread the investments across the region and across the different modes."*

# Incorporating broader goals: normative arguments for promoting cycling

- *"Cycling is good for health and the environment. Those who bike deserve a comfortable route."*
- *"This bike tunnel would be an appropriate reward to cyclists."*

# Normative ideas future urban mobility system

## Amsterdam should be a 'cycling city':

- *"My choices are based on the idea that Amsterdam is a cycling city par excellence. This idea should be further developed and therefore we should encourage cycling by expanding cycling infrastructure."*

# Implications

When we believe that all considerations individuals value with regard to the composition of a transport investment program should be addressed in the evaluation of the program.....

# Implications

When we believe that all considerations individuals value with regard to the composition of a transport investment program should be addressed in the evaluation of the program.....then we have to design preference elicitation frameworks that allow individuals to express all considerations.

PVE allows individuals to express:

- Ethical considerations such as 'spatial equality';
- Citizens' normative ideas concerning future urban mobility system.
- Their belief that government funds should be spend on different purposes than their own money.

**Question:** to which extent do traditional valuation methods adopted in CBA allow individuals to express these considerations?

**Question:** to which extent do traditional valuation methods adopted in CBA allow individuals to express these considerations? And if not, is this a problem?

### **Questions related to smart PT:**

- What kind of transport investments are citizens willing to sacrifice to make way for investment schemes to adjust the transport system to the introduction of automated vehicles and Mobility as a Service?
- Establishing the value of PT for disabled people.
- Value of PT at the periphery.

# Thank your very much

- Mouter, N., Koster, P.R., Dekker, T. (2019). Participatory Value Evaluation: a novel method to evaluate future urban mobility investments. Working paper Tinbergen Institute. 09-046/VIII.
- Dekker, T., Koster, P.R., Mouter, N., (2019). The economics of Participatory Value Evaluation. Working paper Tinbergen Institute. 19-008/VIII
- Mouter, N., Koster, P.R., Dekker, T. (2019). An introduction to Participatory Value Evaluation. Working paper Tinbergen Institute. 19-024/V
- Mouter, N., van Cranenburgh, S., van Wee, G.P. 2017. Do individuals have different preferences as consumer and citizen? The trade-off between travel time and safety. Transportation Research Part A 106, pp. 333-349.
- Mouter, N., van Cranenburgh, S., van Wee, G.P. 2018. The consumer-citizen duality: Ten reasons why citizens prefer safety and drivers desire speed. Accident Analysis & Prevention 121, pp. 53 – 63.

## Do you want to make a PVE yourself?

Please send an email to [n.mouter@tudelft.nl](mailto:n.mouter@tudelft.nl) and I will send you log-in details.