

Transport Initiatives: Outcomes from the factor analysis and categorisation - Australia

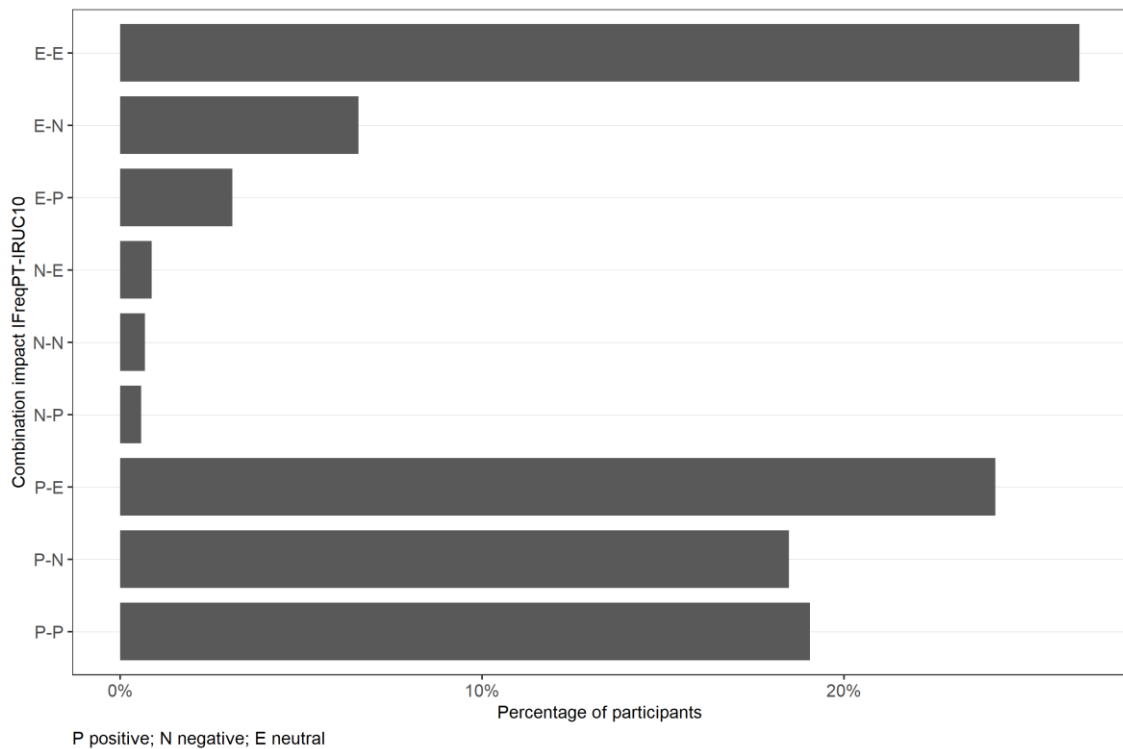
Version: November 4, 2025

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General description

- I am focusing on understanding the combined decision between positive impact (P), negative impact (N) and neutral (E) of the initiatives:
 - IFreqPT: Double public transport services frequency
 - IRUC10: Peak-period road user charge US\$0.10/mile
- I am only using Australian data for this analysis
- 28% of the sample said NA in one or both of the above, so I assumed that NA = neutral impact.



The next step was to estimate an MNL model for the combined impact decision of these initiatives, and also a separate MNL model for each of these. The explanatory variables used are the following:

- Socioeconomics: age, gender, household income, family composition, number of children, occupation, employment status, number of cars (by type), number of active modes, disability, car kms, proportion of hours WFH or remotely.
- Number of trips by mode and purpose

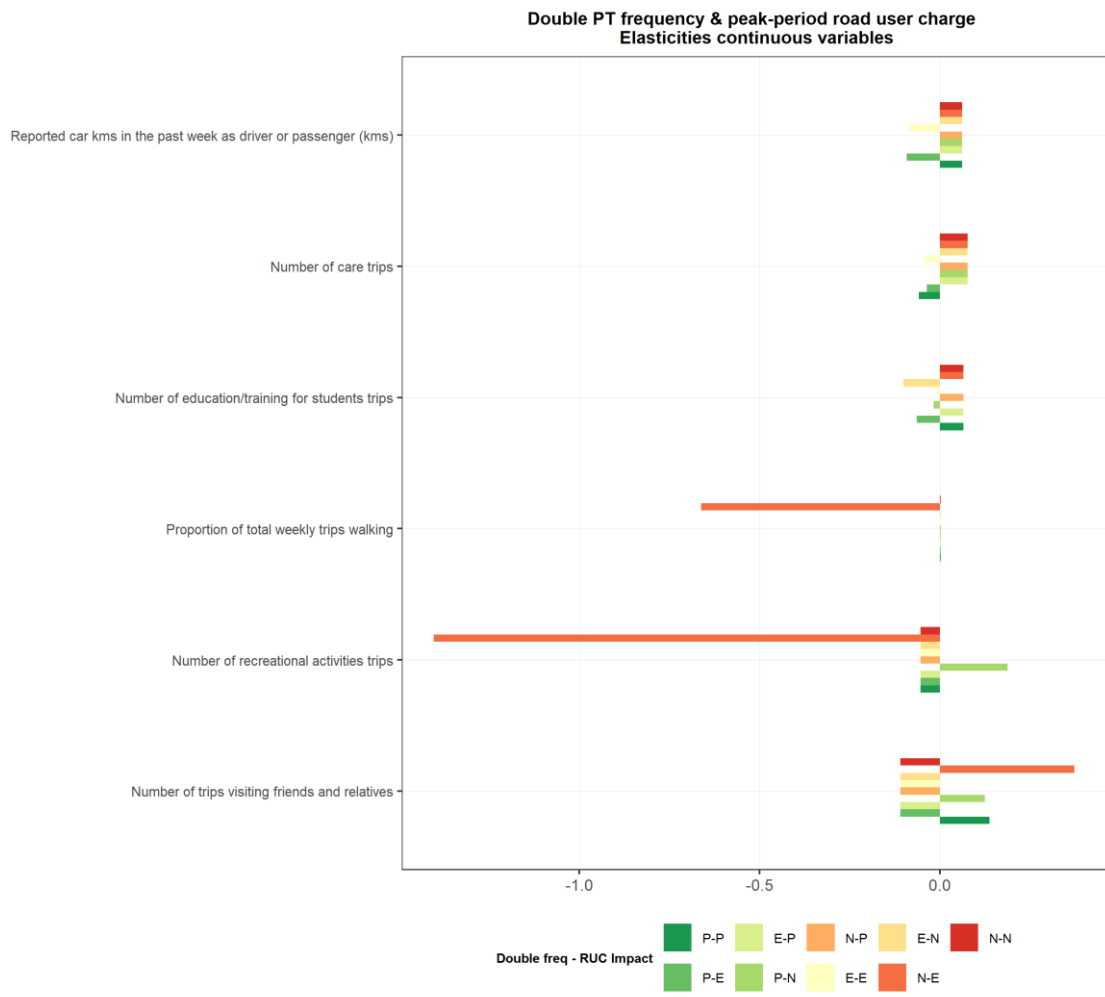
Model results and elasticities

I worked with an 85% confidence level.

Combined initiatives: 9 alternatives

Variable	Alt IFreqPT-IRUC10 impact	Mean (rob. t-value)
Alternative specific constant	Positive-positive impact	3.652 (4.77)
If the individual has a paid job (1,0)	Positive-positive impact	-1.303 (-1.53)
Number of commuting trips	Positive-positive impact	0.137 (2.19)
Number of trips visiting friends and relatives	Positive-positive impact	0.107 (2.75)
Number of care trips	Positive-positive impact	-0.067 (-2.26)
Proportion of total weekly trips by public transport	Positive-positive impact	0.736 (1.75)
Alternative specific constant	Positive-negative impact	3.713 (4.84)
If the individual has a paid job (1,0)	Positive-negative impact	-2.079 (-2.44)
If at least one electric or hybrid car (1,0)	Positive-negative impact	-1.513 (-3.55)
Number of commuting trips	Positive-negative impact	0.204 (3.31)
Number of trips visiting friends and relatives	Positive-negative impact	0.101 (2.42)
Number of recreational activities trips	Positive-negative impact	0.075 (3.33)
Number of education/training for students trips	Positive-negative impact	-0.093 (-1.60)
Alternative specific constant	Positive-neutral impact	4.679 (6.16)
If the individual has a paid job (1,0)	Positive-neutral impact	-2.116 (-2.51)
Female (1,0)	Positive-neutral impact	0.238 (1.56)
Reported car kms in the past week as driver or passenger (kms)	Positive-neutral impact	-0.170 (-2.70)
Number of commuting trips	Positive-neutral impact	0.197 (3.20)
Number of care trips	Positive-neutral impact	-0.056 (-1.92)
Number of education/training for students trips	Positive-neutral impact	-0.145 (-2.63)
Alternative specific constant	Negative-positive impact	-0.154 (-0.28)
Alternative specific constant	Negative-neutral impact	1.486 (1.54)
If the individual has a paid job (1,0)	Negative-neutral impact	-2.208 (-1.63)
If has one e-bike or e-scooter (1,0)	Negative-neutral impact	1.458 (1.67)
Number of commuting trips	Negative-neutral impact	0.212 (1.74)
Number of trips visiting friends and relatives	Negative-neutral impact	0.208 (1.95)
Number of recreational activities trips	Negative-neutral impact	-0.428 (-2.24)
Proportion of total weekly trips walking	Negative-neutral impact	-4.512 (-1.54)
Alternative specific constant	Neutral-positive impact	6.241 (5.58)
If the individual has a paid job (1,0)	Neutral-positive impact	-1.777 (-1.78)
Number of cars (petrol/diesel, electric or hybrid)	Neutral-positive impact	-0.428 (-1.57)
Age (years)	Neutral-positive impact	-0.043 (-3.24)
Number of commuting trips	Neutral-positive impact	0.196 (2.83)
Number of trips shopping	Neutral-positive impact	-0.278 (-2.87)
Proportion of total weekly trips by car as driver	Neutral-positive impact	-0.958 (-1.87)
Proportion of total weekly trips by public transport	Neutral-positive impact	-2.589 (-2.33)
Alternative specific constant	Neutral-negative impact	3.252 (4.21)
If the individual has a paid job (1,0)	Neutral-negative impact	-1.846 (-2.05)
Number of commuting trips	Neutral-negative impact	0.151 (2.08)
Number of education/training for students trips	Neutral-negative impact	-0.187 (-2.11)
Alternative specific constant	Neutral-neutral impact	4.982 (6.60)
If the individual has a paid job (1,0)	Neutral-neutral impact	-2.122 (-2.52)
Reported car kms in the past week as driver or passenger (kms)	Neutral-neutral impact	-0.159 (-2.61)
Number of commuting trips	Neutral-neutral impact	0.155 (2.53)
Number of care trips	Neutral-neutral impact	-0.060 (-1.88)
Number of education/training for students trips	Neutral-neutral impact	-0.086 (-1.49)

Elasticities continuous variables

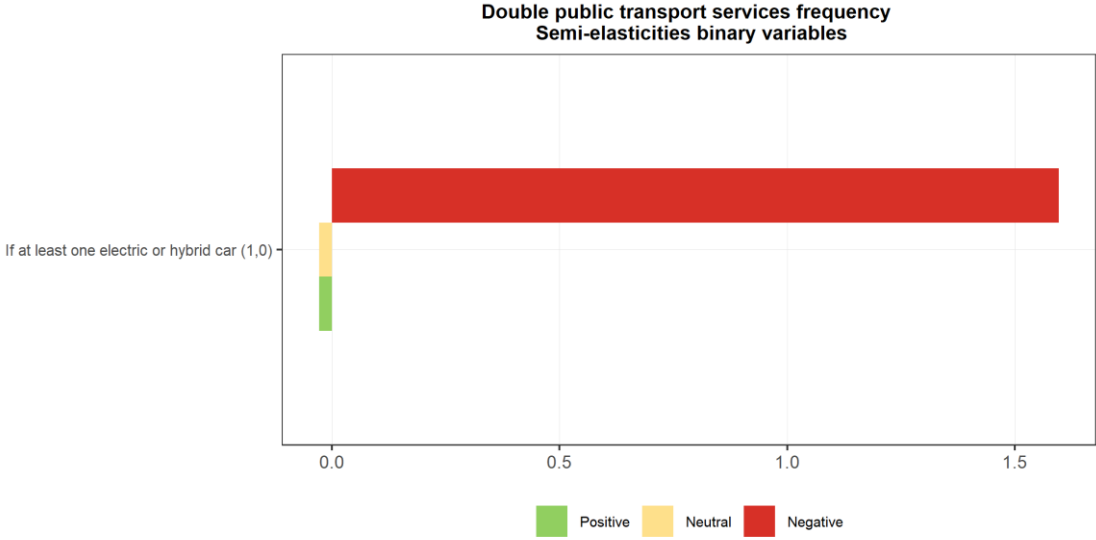
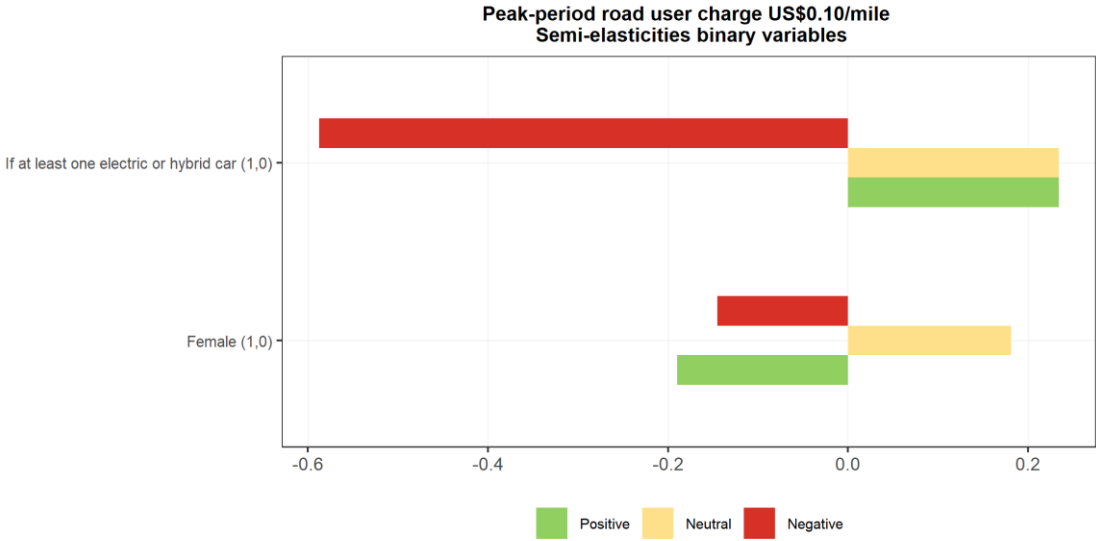


Separated models for the initiatives: 3 alternatives

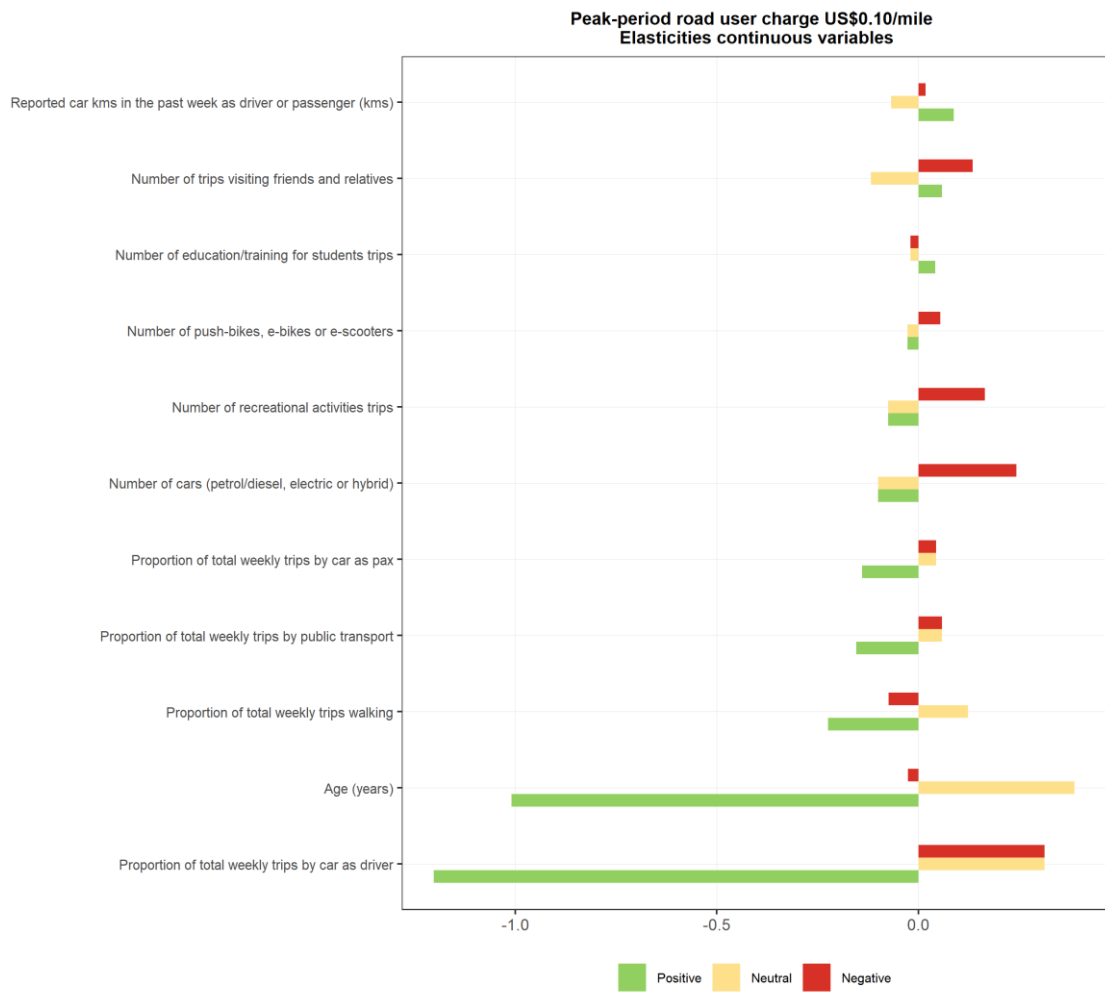
If the cell is empty, it is because it was not statistically significant in that model

Variable	Alternative	OFreqPT	IRUC10
		Mean (rob. t-value)	Mean (rob. t-value)
Alternative specific constant	Positive impact	-0.107 (-0.83)	2.534 (2.72)
Age (years)	Positive impact		-0.029 (-5.60)
Female (1,0)	Positive impact		-0.377 (-2.10)
Reported car kms in the past week as driver or passenger (kms)	Positive impact		0.172 (3.02)
Number of trips shopping	Positive impact	0.044 (1.66)	
Number of trips visiting friends and relatives	Positive impact		0.077 (1.91)
Number of recreational activities trips	Positive impact	0.105 (3.85)	
Number of education/training for students trips	Positive impact		0.069 (1.96)
Proportion of total weekly trips by car as driver	Positive impact		-2.429 (-2.70)
Proportion of total weekly trips by car as pax	Positive impact		-1.940 (-1.99)
Proportion of total weekly trips by public transport	Positive impact	1.487 (3.54)	-2.061 (-2.12)
Proportion of total weekly trips walking	Positive impact		-2.339 (-2.36)
Alternative specific constant	Negative impact	-1.692 (-2.92)	-0.918 (-3.04)
Number of cars (petrol/diesel, electric or hybrid)	Negative impact		0.224 (3.13)
If at least one electric or hybrid car (1,0)	Negative impact	0.983 (1.97)	-1.096 (-3.42)
Number of push-bikes, e-bikes or e-scooters	Negative impact		0.108 (1.84)
Age (years)	Negative impact	-0.037 (-2.40)	-0.009 (-1.82)
Female (1,0)	Negative impact		-0.323 (-1.95)
Reported car kms in the past week as driver or passenger (kms)	Negative impact	0.180 (1.78)	0.096 (1.64)
Number of trips shopping	Negative impact	0.068 (1.76)	
Number of trips visiting friends and relatives	Negative impact		0.109 (2.78)
Number of recreational activities trips	Negative impact	-0.143 (-1.50)	0.075 (3.22)
Number of education/training for students trips	Negative impact	0.131 (3.35)	
Proportion of total weekly trips walking	Negative impact		-1.325 (-3.25)

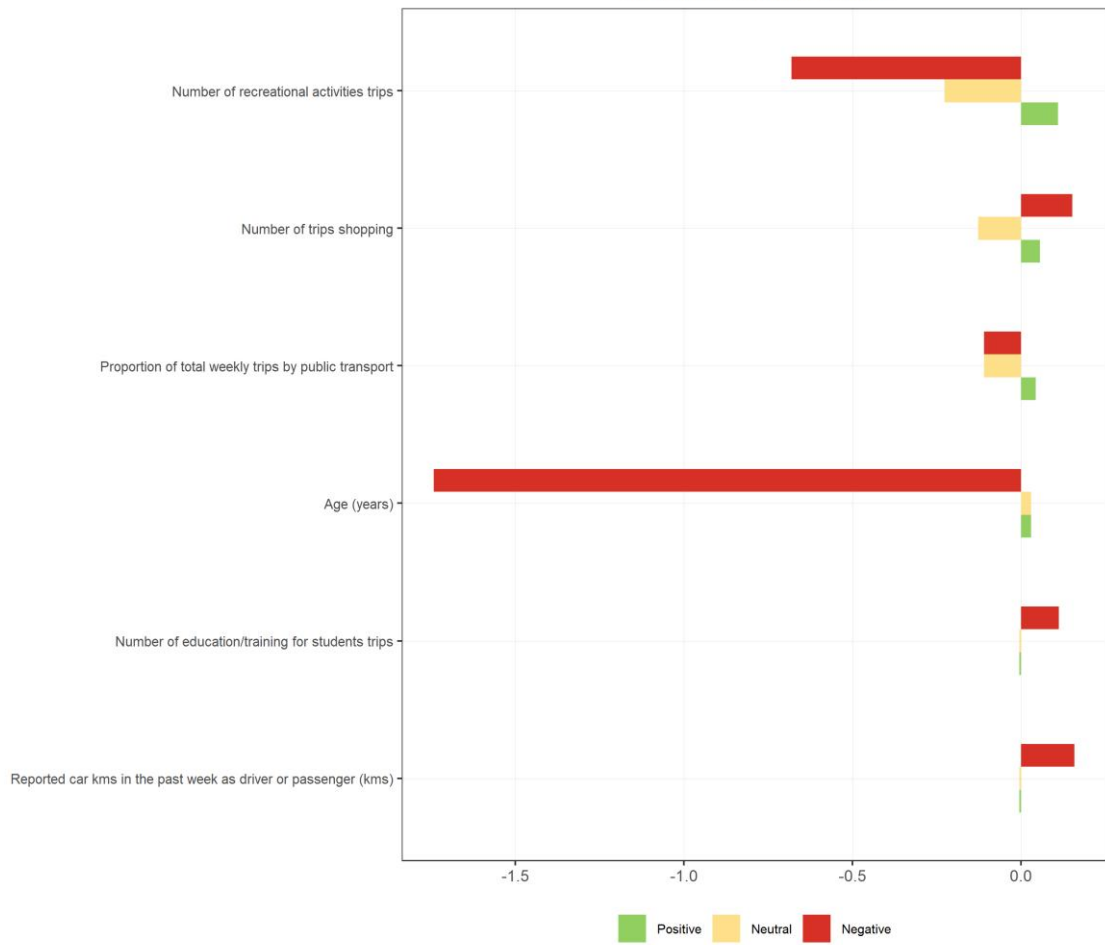
Elasticities binary variables:



Elasticities continuous variables



Double public transport services frequency
Elasticities continuous variables



Elasticities' comparison – positive impact

Variable	IFreqPT-IRUC10	IRUC10	IFreqPT	IFreqPT-IRUC10	IFreqPT-IRUC10	IFreqPT-IRUC10	IFreqPT-IRUC10
	PP	P	P	PE	EP	PN	NP
	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)
Age (years)	0.050 (0.05)	-1.009 (0.46)	0.030 (0.03)	0.050 (0.05)	-2.028 (0.74)	0.050 (0.05)	0.050 (0.05)
If has one e-bike or e-scooter (1,0)	-0.021 (0.02)	-	-	-0.021 (0.02)	-0.021 (0.02)	-0.021 (0.02)	-0.021 (0.02)
If at least one electric or hybrid car (1,0)	0.194 (0.12)	0.234 (0.13)	-0.028 (0.03)	0.194 (0.12)	0.194 (0.12)	-0.737 (0.03)	0.194 (0.12)
Female (1,0)	-0.057 (0.01)	-0.190 (0.04)	-	0.196 (0.02)	-0.057 (0.01)	-0.057 (0.01)	-0.057 (0.01)
Number of push-bikes, e-bikes or e-scooters	-	-0.027 (0.06)	-	-	-	-	-
Number of cars (petrol/diesel, electric or hybrid)	0.018 (0.02)	-0.100 (0.11)	-	0.018 (0.02)	-0.633 (0.42)	0.018 (0.02)	0.018 (0.02)
If the individual has a paid job (1,0)	0.853 (0.09)	-	-	-0.178 (0.04)	0.154 (0.06)	-0.147 (0.04)	5.822 (0.35)
Proportion of total weekly trips by car as driver	0.017 (0.02)	-1.202 (0.72)	-	0.017 (0.02)	-0.582 (0.33)	0.017 (0.02)	0.017 (0.02)
Proportion of total weekly trips by car as pax	-	-0.139 (0.29)	-	-	-	-	-
Proportion of total weekly trips by public transport	0.065 (0.11)	-0.154 (0.28)	0.044 (0.07)	-0.011 (0.03)	-0.278 (0.50)	-0.011 (0.03)	-0.011 (0.03)
Proportion of total weekly trips walking	0.002 (0.01)	-0.223 (0.35)	-	0.002 (0.01)	0.002 (0.01)	0.002 (0.01)	0.002 (0.01)
Number of commuting trips	-0.148 (0.18)	-	-	0.102 (0.10)	0.100 (0.10)	0.134 (0.13)	-0.710 (0.79)
Number of care trips	-0.058 (0.10)	-	-	-0.036 (0.07)	0.076 (0.11)	0.076 (0.11)	0.076 (0.11)
Number of education/training for students trips	0.065 (0.12)	0.042 (0.09)	-0.005 (0.03)	-0.064 (0.18)	0.065 (0.12)	-0.017 (0.08)	0.065 (0.12)
Number of trips visiting friends and relatives	0.137 (0.10)	0.059 (0.05)	-	-0.109 (0.14)	-0.109 (0.14)	0.124 (0.09)	-0.109 (0.14)
Number of recreational activities trips	-0.054 (0.12)	-0.074 (0.13)	0.109 (0.08)	-0.054 (0.12)	-0.054 (0.12)	0.188 (0.16)	-0.054 (0.12)
Number of trips shopping	0.021 (0.02)	-	0.056 (0.04)	0.021 (0.02)	-1.115 (1.01)	0.021 (0.02)	0.021 (0.02)
Reported car kms in the past week as driver or passenger (kms)	0.061 (0.08)	0.088 (0.13)	-0.006 (0.02)	-0.092 (0.17)	0.061 (0.08)	0.061 (0.08)	0.061 (0.08)

- Age seems to have a positive influence on perceiving both initiatives as having a positive impact, it actually has a negative influence on perceiving a neutral impact of doubling PT frequency (IFreqPT) and positive on road user charges (IRUC10). In the separate models, it has a negative influence on being positive towards road user charges. The same is true for the proportion of total weekly trips by PT.
- In the case of having at least one electric or hybrid car, a similar effect but opposite effect is seen, where the combined PP probability and the standalone IRUC10 are positive, but the standalone IFreqPT is negative – and the same is true for the number of education/training trips and reported car kms in the past week.

Elasticities' comparison – negative impact

Variable	IFreqPT-IRUC10	IRUC10	IFreqPT	IFreqPT-IRUC10	IFreqPT-IRUC10	IFreqPT-IRUC10	IFreqPT-IRUC10
	NN	N	N	NE	EN	PN	NP
	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)	Mean (std dev)
Age (years)	0.050 (0.05)	-0.026 (0.14)	-1.741 (0.63)	0.050 (0.05)	0.050 (0.05)	0.050 (0.05)	0.050 (0.05)
If has one e-bike or e-scooter (1,0)	-0.021 (0.02)	-	-	3.211 (0.09)	-0.021 (0.02)	-0.021 (0.02)	-0.021 (0.02)
If at least one electric or hybrid car (1,0)	0.194 (0.12)	-0.588 (0.04)	1.597 (0.07)	0.194 (0.12)	0.194 (0.12)	-0.737 (0.03)	0.194 (0.12)
Female (1,0)	-0.057 (0.01)	-0.145 (0.04)	-	-0.057 (0.01)	-0.057 (0.01)	-0.057 (0.01)	-0.057 (0.01)
Number of push-bikes, e-bikes or e-scooters	-	0.054 (0.09)	-	-	-	-	-
Number of cars (petrol/diesel, electric or hybrid)	0.018 (0.02)	0.243 (0.14)	-	0.018 (0.02)	0.018 (0.02)	0.018 (0.02)	0.018 (0.02)
If the individual has a paid job (1,0)	5.822 (0.35)	-	-	-0.250 (0.04)	0.077 (0.05)	-0.147 (0.04)	5.822 (0.35)
Proportion of total weekly trips by car as driver	0.017 (0.02)	0.313 (0.22)	-	0.017 (0.02)	0.017 (0.02)	0.017 (0.02)	0.017 (0.02)
Proportion of total weekly trips by car as pax	-	0.045 (0.10)	-	-	-	-	-
Proportion of total weekly trips by public transport	-0.011 (0.03)	0.059 (0.11)	-0.110 (0.21)	-0.011 (0.03)	-0.011 (0.03)	-0.011 (0.03)	-0.011 (0.03)
Proportion of total weekly trips walking	0.002 (0.01)	-0.073 (0.14)	-	-0.662 (0.96)	0.002 (0.01)	0.002 (0.01)	0.002 (0.01)
Number of commuting trips	-0.710 (0.79)	-	-	0.167 (0.17)	-0.089 (0.12)	0.134 (0.13)	-0.710 (0.79)
Number of care trips	0.076 (0.11)	-	-	0.076 (0.11)	0.076 (0.11)	0.076 (0.11)	0.076 (0.11)
Number of education/training for students trips	0.065 (0.12)	-0.019 (0.05)	0.112 (0.24)	0.065 (0.12)	-0.101 (0.26)	-0.017 (0.08)	0.065 (0.12)
Number of trips visiting friends and relatives	-0.109 (0.14)	0.135 (0.11)	-	0.372 (0.31)	-0.109 (0.14)	0.124 (0.09)	-0.109 (0.14)
Number of recreational activities trips	-0.054 (0.12)	0.165 (0.15)	-0.682 (0.74)	-1.403 (1.44)	-0.054 (0.12)	0.188 (0.16)	-0.054 (0.12)
Number of trips shopping	0.021 (0.02)	-	0.152 (0.11)	0.021 (0.02)	0.021 (0.02)	0.021 (0.02)	0.021 (0.02)
Reported car kms in the past week as driver or passenger (kms)	0.061 (0.08)	0.019 (0.04)	0.157 (0.24)	0.061 (0.08)	0.061 (0.08)	0.061 (0.08)	0.061 (0.08)