The Impact of Policy Measures on P&R Choice: Simulations based on a P&R Choice Model[1]

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Abstract. A comprehensive P&R (Park & Ride) choice model was used as basis for a series of simulations. Those simulations showed which effects on the use of P&R facilities might be expected after implementation of various policy measures. According to these simulations, the implementation of combined policy measures to improve the quality of both the P&R facility and the connecting public transport and to discourage car drivers to use their car for door-to-door trips have large, positively effects on the use of the P&R alternative. These simulations give important insights in the direction of effects and their relative sensibility for different strategies being various (combinations of) policy measures.

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1 INTRODUCTION

Increasing car use in and around cities in industrialized countries leads to accessibility problems in those areas, being expressed in traffic jams and parking problems. To solve these problems, Park and Ride (P&R) facilities on the skirts of the city where car drivers can switch to public transport have been proposed and in a number of cases have been realized. However, despite the growing accessibility problems, recent P&R facilities do not seem to attract the expected number of car drivers.

In an attempt to identify the reasons why P&Rs are under-used, several evaluation studies have been conducted in the Netherlands (e.g. [1], [2], [3], [4]). Such evaluations however face the challenge of how to collect the data and how to infer the decision-making process of car drivers. The decision whether or not to choose the facility is quite complex, and involves at least the accessibility of the facility, the quality of the facility, and the features of connecting public transport. To explore the trade-offs that car drivers make between a larger number of attributes describing this P&R alternative, an extensive P&R choice model has been estimated for the Netherlands. This model is used as basis for a series of numerical simulations as limited research has been conducted to explore the possible effects of optional policy strategies to change modal split in favor of P&R use.

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Thus, the goal of this paper is to gain insight in the impact of optional policy measures to be implemented in order to increase the attractiveness of the P&R facility or to discourage car drivers to use their car door-to-door.

Section 2 describes the P&R choice model, which serves as basis for the series of simulations. Section 3 presents the effects of policy measures aimed at (a) realizing a more attractive P&R facility, (b) realizing a more attractive connecting public transport service and (c) discouraging car drivers to continue their car trip after having passed the P&R facility. Finally, section 4 draws some conclusions.

2 P&R CHOICE MODEL: AS BASIS OF THE SIMULATIONS

Before discussing the influence of various policy measures on P&R choices, this section introduces the basic P&R choice model and the underlying research design.

2.1. Experimental design and data collection

Unlike previous studies of P&R choice, we decided to include a large number of attributes into our stated preference study of P&R preferences. This means that conventional experimental design may lead to respondent burden. To avoid this problem, Louviere [5] proposed the Hierarchical Information Integration (HII) approach as a way to deal with decision problems involving many attributes, whereas traditional stated preference experiments can only handle a limited number of attributes. HII assumes that individuals when confronted with decisions that involve many attributes, process information in a hierarchical manner. This implies that individuals first group the attributes that belong together into higher-order decision constructs. Then, they evaluate each construct separately, and finally integrate these evaluations to arrive at an overall preference or choice. In line with these assumptions, separate experiments for each decision construct and an additional experiment were constructed to measure the integration of the construct evaluations (e.g. [5], [6], [7]). Based on the responses observed in each experiment, a utility model was estimated for each decision construct. Furthermore, an overall integrative model was estimated which links the separate construct evaluations with the overall evaluation or choice.

In applying HII to P&R choice behavior, two decision constructs, i.e. quality of P&R facilities and quality of additional public transport were distinguished based on empirical data [8], [9]. For the decision construct *quality of P&R facilities*, where 7 attributes were included, an SP experiment with 18 profiles to be evaluated was designed. For the decision construct *quality of connecting public transport*, where 4 attributes were included, 9 profiles were required. In addition, an integrative choice experiment was constructed, from which a model is derived that links P&R choice with the construct evaluations. In each of the 18 choice sets, the respondents were requested to choose between a P&R, a car and a public transport alternative. The public transport alternative was considered to be the base alternative, which does not vary between the choice sets. As for the public transport alternative, travelers had to assume that it is free of delays. The HII structure is visualized in Figure 1.

To calibrate the model, the three SP experiments were integrated into a questionnaire, distributed through the Internet. In total 480 respondents filled out the questionnaire. The sample characteristics, not in detail discussed in this paper, reveal that a rather heterogeneous response group has been realized.

2.2. The P&R choice model

The results of the preference models for the two decision constructs are presented in Table 1. The model resulting for the decision construct *quality of P&R facility* reveal that car drivers attach most utility to social safety aspects, such as supervision by cameras and a safe and short pedestrian route. Additional provisions, for example a heated waiting room or a supermarket, are less important in the respondents' evaluation for the quality of a P&R facility. The model resulting for the decision construct *quality of connecting public transport* shows that the certainty of a seat is considered to be the most important attribute. Additional attributes of relatively large importance are the number of transfers required in the connecting public transport and the frequency of the connecting public transport.

The results of the choice model for the bridging experiment are presented in Table 2. It has to be noticed that the attributes levels for the attributes *quality of P&R facility* and *quality of the connecting public transport*, varied in value *4* (poor quality), value *6* (average quality) and value *8* (good quality), refer to the constructevaluations provided by the respondents for the experiments for the two decision constructs. The attributes in the bridging model describing the quality of the P&R facility, the quality of the connecting public transport and the attributes describing time and costs aspects of the P&R and the car alternative are all important in the decision process of car drivers.

This P&R choice model for the Netherlands as a whole was used as basis for a series of simulations. Those simulations should provide insight which effect might be expected after implementation of various policy measures.

3 SIMULATIONS

3.1 Defining a basic P&R alternative

Several policy measures can be used to realize a more attractive P&R facility. To determine the effects of these policy measures, a basic P&R alternative was defined. This P&R alternative is located close to the supply roads, thus resulting in high car accessibility. When using this P&R alternative, car drivers are able to park their cars at a well-maintained car park which is supervised by cameras and located close to the connecting public transport service, resulting in a minimum walking time (around 1 minute) to the connecting public transport platform. Moreover, the pedestrian route is open (no dark corners), but is initially deserted, as there are no additional provisions available. At the P&R facility, we assume that there is no closed waiting room. Finally, the P&R facility includes a payment machine where car drivers can pay a fee of € 4.00 to park their cars at the car park and use the connecting public transport service. Paying via a machine is not only the easiest realizable method of payment, but also the method most preferred by car drivers.

In this basic P&R alternative the connecting public transport consists of a shuttle bus service that runs every 15 minutes. We assume that the occupancy of seats is variable, resulting in a 50% chance of finding a seat. This shuttle bus brings car drivers to the existing public transport network for that urban area, implying that travelers will face one 'not guaranteed' transfer in addition to the transfer at the P&R alternative. This unfavorable connecting public transport service means that the P&R alternative takes around 20 minutes longer than a free-flow (no delay) car journey. The specific attribute levels describing the basic P&R alternative are summarized in Table 3.

A few initial steps were taken to derive the modal split between P&R, car and the current public transport alternative for the basic P&R alternative. Firstly, for both *quality of P&R facilities* and *quality of connecting public transport,* the total utility was predicted separately (based on respondent evaluations using a 10-point scale). These total utilities were incorporated into the bridging model as one value for *quality of P&R facilities* and one value for *quality of connecting public transport*. The part-worth utilities of these values were calculated using linear interpolation. Secondly, these part-worth utilities of the attribute levels describing these alternatives were summed up, both for the P&R and the car respectively. As the public transport alternative was defined as basis alternative, the total utility of public transport was coded as zero. Finally, the predicted use of the three alternatives (after having implemented the P&R alternative) was calculated using the logit model. Table 3 shows the predicted modal splits for the basic scenario, both without car delays and with 40-minute car delays after having passed the P&R facility.

Table 3 shows that the basic P&R alternative only attracts a limited number of car drivers; most car drivers continue to use the current door-to-door car alternative. However, Table 3 also indicates that, based on 40-minute car delays (compared to a no-delay situation) the number of car drivers switching either to the P&R alternative or to the current public transport alternative is multiplied by four. To measure the effects of the various policy measures on the modal split between P&R, car and current public transport, the predictions regarding this basic P&R alternative are used as reference modal split values.

3.2 Location development

Firstly, policy measures are required in order to improve the quality of the P&R facility itself. The easiest way to improve this quality is by providing a covered waiting room. This waiting room could also be heated, though this requires more investment. Installing supervisors at the P&R facility might also exert a positive influence on the use of the P&R alternative. Again this would probably increase costs. An additional policy measure is to allow private firms to develop commercial facilities at the P&R facility, for example certain shopping facilities. In general, shopping facilities help to increase the number of people present along the pedestrian routes from the car to the connecting public transport service, since people only interested in the shopping facilities will also visit the P&R. A disadvantage of attracting these additional visitors is that the walking time between the car and the public transport service might increase. Assuming that the walking time will increase from 1 to 3 minutes, the effects of the possible policy measures to improve the quality of the P&R facility itself are presented in Table 4.

Table 4 shows the effect of the considered policy measures on car drivers' evaluation concerning the quality of the P&R facility. With respect to that analysis, the introduction of the policy measures is presented in a cumulative way, which means that each introduction of a new policy measure implies an improvement in the quality of the P&R facility in relation to the previous situation. Secondly, the percentage of car drivers switching mode is predicted and calculated, both without car delays after passing the P&R facility and with car delays of 40 minutes.

Moreover, Table 4 illustrates that the number of car drivers switching to the P&R alternative increases once the various policy measures have been implemented. However, even after implementing all policy measures to improve the quality of the P&R facility, only a limited number of car drivers use the P&R alternative. If car drivers do not face any delays after passing the P&R facility only 1.1% will use the P&R facility; with car delays of 40 minutes after passing the P&R facility, only 4.6% of car drivers will choose the P&R option. An additional observation is that the number of car drivers choosing an available current public transport service tends to remain the same or is even somewhat reduced after implementing the package of policy measures. This effect is not surprising given the slight increase in the numbers of P&R users and the fact that neither the car alternative nor the current public transport alternative change after implementing the policy measures. This higher-quality P&R alternative might therefore attract both car drivers and current public transport users, although the attraction for current public transport users seems less than for car users.

3.3 Running the connecting public transport service

The previous section showed that implementing a package of policy measures to improve the P&R facility itself has a limited influence on drivers' choice in favor of P&R. Other policy measures are therefore required. This section describes a package of policy measures to improve the quality of the connecting public transport as a way of increasing the travelers' evaluation score for the P&R alternative.

Firstly, running a shuttle bus service (frequency every five minutes) is expected to increase P&R use. This high-frequency shuttle bus service is also assumed to contribute significantly to the chance of finding a seat. Let us assume that car drivers switching transport mode at the P&R facility have a 95% chance of finding a vacant seat. A high-frequency shuttle service might cost extra, but this service level might be feasible at low extra costs due to a smart location choice and logistic scheduling of various bus connections. A probably more expensive policy measure concerns providing connecting public transport services to more than one destination, so that most car drivers do not have to switch transport mode within the connecting public transport system. In addition to a higher-frequency shuttle bus service with a direct connection to car drivers' destinations, other possible measures include constructing free bus lanes, limiting the number of stops outside the city centre etc. It is assumed that these policy measures reduce the additional time required to use the P&R alternative by at least 10 minutes. A last policy measure that might be taken is to provide the P&R alternative free of charge, although obviously this means that no revenues are generated to cover investment and running costs.

In order to derive predictions of P&R use after having implemented these various policy measures, the author followed the same procedure as in subsection 3.1. Table 5 shows the evaluations of the connecting public transport service and the modal splits after having implemented the various policy measures.

Table 5 shows that increasing the quality of the connecting public transport service has a relatively large influence on the modal split if the evaluation score for this attribute increases above the value of *6*. Note that this effect results from the estimated HII model presented in Table 2, where the part-worth utility that car drivers derive from the quality of the connecting public transport service is evaluated as *4*, which is not significantly different from car drivers evaluating this utility as *6*. Table 5 also shows that if all possible policy measures to improve the quality of the connecting public transport, and consequently the quality of the connecting public transport is optimized and implemented simultaneously, the P&R alternative still attracts a limited number of extra car drivers. In contrast, offering a P&R alternative that is free of charge has a substantially higher influence on P&R use. This policy measure serves as an incentive for influencing the choice behavior of car drivers but (in our model) does not have a direct influence on their evaluation of the quality of the connecting public transport service.

The various policy measures to improve the quality of the P&R facility and the connecting public transport can be combined in order to persuade large numbers of car drivers to use the P&R facility. Combining several policy measures may have more effect on P&R use. Since providing both a free parking service and free connecting public transport seems to require considerable investment, the influence of a combined package of policy measures has been measured in two case studies: one in which a P&R alternative is provided at a cost of € 4.00, and one where the P&R facility can be used free of charge. The effects of the combined packages of policy measures have been calculated based on two settings: without car delays and with 40-minute car delays after passing the P&R facility. Table 6 shows the number of car drivers transferring at the P&R alternative after this considerable package of policy measures has been implemented.

Table 6 shows that considerably larger shifts in favor of P&R use seem possible after implementing policy measures to improve both the quality of the P&R facility and the connecting public transport. When introducing a P&R alternative that is free of charge, the aforementioned model shows that P&R use will rapidly increase to higher values, while undesirable effects (in terms of reduced use of current public transport) seem limited.

3.4 Restrictive policy measures at the destination

Finally, restrictive parking policy at the destination may also contribute to an increase in the number of car drivers transferring at the P&R facility, as the car journey becomes less attractive. Related policy measures include introducing parking fees at the destination or toll charges within the urban area. Since the cost of using the car after passing the P&R facility is never zero (due to fuel costs) it is assumed that the minimum cost for car use after passing the P&R facility is € 0.50. The aforementioned policy measures will add extra costs to that amount depending on the fee for the toll and/or parking.

Table 7 shows the influence of restrictive policy measures at the destination in order to increase the total car costs after passing the P&R facility up to hypothetical cost levels of € 3.50 and € 6.50 respectively. Furthermore, this analysis assumes that the quality of the P&R facility and the connecting public transport is not upgraded from the basic alternative.

In addition, Table 7 makes clear that introducing restrictive policy measures at the destination has only a limited effect on P&R use. An explanation for this limited effect is the assumption that neither the quality of the P&R facility nor the connecting public transport are improved (compared to the basic P&R alternative), and are thus relatively low. Furthermore, the influence of restrictive parking policies has a greater influence on current public transport use than on the use of P&R services. Although this result is hopeful for a modal shift in favor of public transport, it still seems necessary to provide an attractive alternative for travelers who will not (or cannot) use the public transport alternative. Moreover, high increases in current public transport use only occur in a highly congested urban area. Therefore, an effective combination of policy measures to improve both the quality of the P&R facility and the connecting public transport (and thus discourage door-to-door car use through restrictive policy measures at the destination) should be found in order to realize both an increase in P&R use and current public transport use.

Therefore, the analyses suggest that a combination of policy measures to improve the quality of the P&R facility and the connecting public transport plus restrictive policy measures at the destination might have a positive effect on both the use of the P&R facility and the current public transport alternative. Two combinations of policy measures are presented in Table 7. In one combination, the charge to use the P&R facility remains at € 4.00, while the other combination allows the P&R facility to be used free of charge.

Furthermore, Table 7 shows that implementing a combination of policy measures to improve the quality of both the P&R facility and the connecting public transport plus price measures to discourage car drivers to make the complete journey by car may have a considerable effect on P&R use. Adding the possibility of parking the car at the P&R facility and using the connecting public transport free of charge might cause an even more rapid increase in P&R use. In a setting based on 40-minute car delays, the model predicts that almost one-third of the car drivers might switch to the P&R alternative.

4 CONCLUSIONS AND DISCUSSION

Although the analyses in this paper show the strengths and weaknesses of the underlying model (particularly the lack of real-world validation) and hence should be interpreted with care, several conclusions can be drawn that seem to be relatively robust.

Firstly, implementing a package of policy measures to increase the quality of the P&R facility itself seems to have only limited effects on P&R use. This also applies for a package of policy measures that merely aimed to increase the quality of the connecting public transport. Secondly, a higher-quality P&R alternative realized by a combination of policy measures to increase the quality of the P&R facility and the quality of the connecting public transport will mainly result in additional car drivers switching at the P&R. This outcome implies that policy measures to improve the quality of the P&R facility contributes to some decrease in the number of cars entering the urban area. Thirdly, larger effects are possible when providing a P&R alternative that is free of charge. However, the cost consequences of this policy scenario (investments and running costs) may be significant. Fourthly, restrictive parking policies such as (higher) parking fees at the destination will cause a shift in favor of both the P&R and the current public transport use as the car alternative becomes less attractive. In particular the current public transport alternative seems to profit more from higher parking fees at the destination than the P&R alternative. A higher level of congestion seems to strengthen this effect. Therefore, in order to provide an attractive alternative for travelers who will not (or cannot) use the current public transport alternative, a smart combination of policy measures to improve both the quality of the P&R facility and the connecting public transport, plus discourage full car use by implementing restrictive policy measures at the destination, seems the most effective strategy.

When interpreting the results of those simulations, some considerations have to be kept in mind. First, the results apply to the sample that was used in the present study. To the extent, that preferences differ between population segments, the effects in a specific study area will differ as a function of differences in population composition. Secondly, the results directly reflect our operational decisions related to the specification of the model. Because our focus was primarily on preferences and not on choice, the specification of the choice component was rather straightforward and alternative specifications were not tested. Consequently, the findings are based on the assumption that travelers behave according to the MNL model, which is not necessary true and was not tested in the present study. Similarly, these simulations assume that preferences and choices expressed during the experiments will also serve as the basis for actual behavior in the real world. Predictions are therefore often a maximum, as they assume perfect information, the realization by policy of the attributes varied in the experiment, the lack of any counterbalancing factors, the lack of any constraints that prevent people from choosing a P&R facility, etc. In other words, predictions are conditional predictions.

Further, it has to be noticed that the delays that car drivers counter in urban areas due to congestion and parking problems were presented in the HII model as being static. According to the model, the congestion and parking problems do not change at the moment car drivers decide to use alternatives for driving further by car. In real world situations, the congestion and parking problems in urban areas will to some degree decrease at the moment that a substantial number of car drivers park their cars at P&R and use connecting public transport to enter the urban area. Less problems with congestion and parking at their turn generates a higher utility level for the car alternative. Thus, in real life situations the process is dynamic based on feedforward and feedback loops and the utilities of the P&R and the car alternative might change continuously (in particular when the level of real-time and tailor made information is improving). This might result in some equilibrium, however, this seems an interesting subject for further research. The conclusion from these thoughts is that it is less likely in real life situations that the introduction of P&R facilities will contribute with the same extent to the solving of congestion and parking problems in urban areas as suggested by the model results. The question to what extent P&Rs are really appropriate to solve congestion and parking problems requires further research. To this end, a before-after study might provide more insights in the real influence of P&R facilities on congestion and parking problems in urban areas. The present policy to plan and implement P&R facilities throughout the country offers a good opportunity to perform such analyses. Nevertheless, given the results of this study we expect that a smart implementation of P&R policies will contribute to the relaxation of some of our urban mobility problems, since a significant number of car drivers appear to consider P&Rs as a comfortable alternative for traveling by car in congested urban areas.

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List of tables and figures

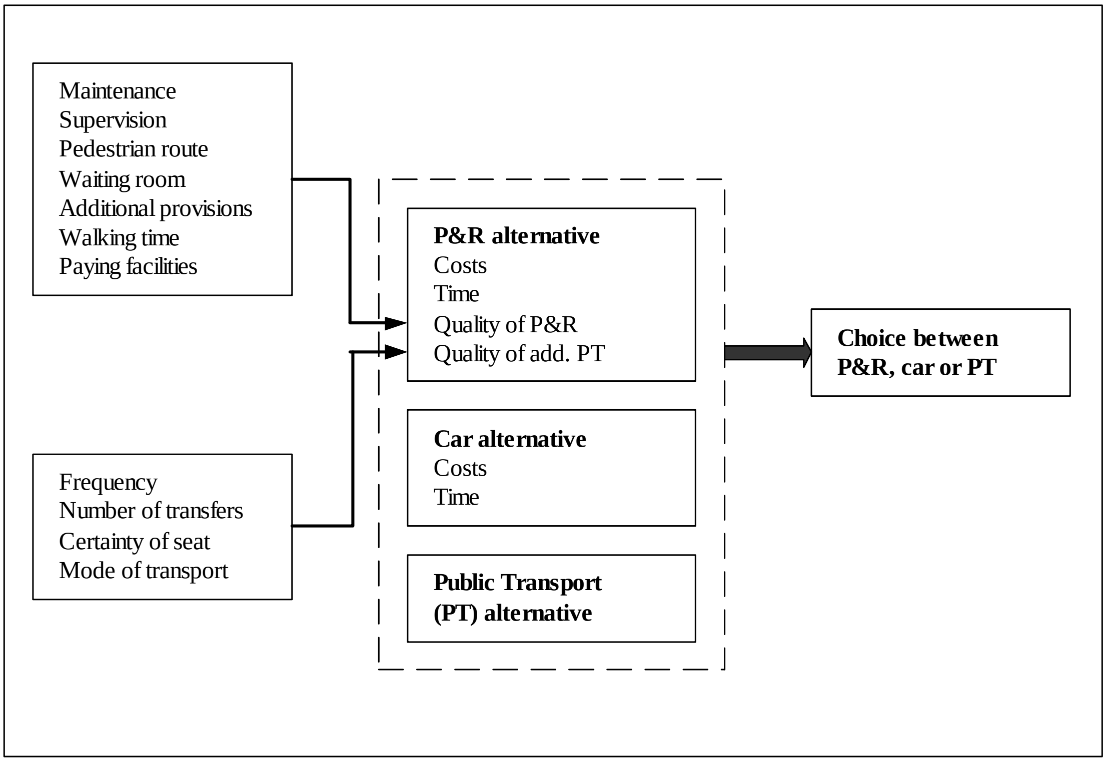

Figure 1. Underlying HII-structure of the P&R choice model

Table 1. Part-worth utilities for the preference models for the quality of P&R facility (N=480) and quality of connecting public transport (N=414)

Decision construct: quality of P&R facility	P-w utility	Sign. level
Average utility (intercept)	5.22	0.00
1 Supervision		
No supervision	-0.61	0.00
Cameras	0.19	0.00
Cameras and supervisors	0.41	
2 Maintenance		
Clean, good state of repair	0.61	0.00
Holes in asphalt	-0.31	0.00
Graffiti and holes in asphalt	-0.31	
3 Pedestrian route car - PT		
Obscure and deserted	-0.29	0.00
Open but deserted	-0.02	0.57
Open and well-populated	0.30	
4 Additional provisions		
No additional provisions	-0.33	0.00
Kiosk	-0.06	0.03
Supermarket	0.40	
5 Walking time car - PT		
1 minute	0.31	0.00
3 minutes	0.13	0.00
5 minutes	-0.44	
6 Waiting room		
No waiting room	-0.32	0.00
Covered but unheated	0.11	0.00
Covered and heated	0.21	
7 Payment facilities		
Payment machine	0.20	0.00
Manned ticket service	-0.01	0.67
Electronic (via chip card)	-0.18	
R^2	0.17	

Decision construct: quality of connecting PT	P-w utility	Sign. level
Average utility (intercept)	5.29	0.00
1 Certainty of finding a seat		
5% chance	-1.07	0.00
50% chance	0.04	0.38
95% chance	1.04	
2 Number of transfers		
0 transfers	0.40	0.00
1 guaranteed transfer	0.10	0.02
1 not guaranteed transfer	-0.50	
3 Frequency of PT		
Every 5 minutes	0.41	0.00
Every 10 minutes	0.10	0.03
Every 15 minutes	-0.51	
4 PT Mode		
Metro / Train	0.13	0.00
Tram	0.10	0.03
Bus	-0.23	
R^2	0.22	

Table 2. Part-worth utilities for the bridging model (N=364)

Bridging model	P-w utility	Sign. level
Alternative specific constant for P&R	0.07	0.34
1 Quality of P&R		
Value 4	-0.39	0.00
Value 6	-0.04	0.60
Value 8	0.43	
2 Quality of PT		
Value 4	-0.16	0.03
Value 6	-0.20	0.01
Value 8	0.38	
3 Extra time using P&R		
0 minutes	0.43	0.00
10 minutes	-0.04	0.61
20 minutes	-0.41	
4 Extra costs using P&R		
€ 0	0.53	0.00
€ 2	0.03	0.77
€ 4	-0.54	
Alternative specific constant for car	2.60	0.00
5 Extra time using car		
0 minutes	0.79	0.00
20 minutes	-0.05	0.37
40 minutes	-0.73	
6 Extra costs using car		
€ 0.50	0.31	0.00
€ 3.50	0.04	0.44
€ 6.50	-0.35	
Rho square	0.81	

Table 3. Attribute levels describing the basic P&R alternative with the predicted use of this basic P&R alternative

Basic P&R alternative	Attribute levels		
P&R facility	Supervised by cameras		
	Clean, good state of repair		
	Open, but deserted, pedestrian route		
	No additional provisions		
	Walking time from car to PT = 1 minute		
	No waiting room		
	Payment machine		
Connecting public transport	50% chance of finding a seat		
	One not guaranteed transfer via connecting PT		
	Frequency = every 15 minutes		
	Shuttle bus service		
Costs when using P&R	A fee of € 4.00		
Additional time when using P&R	20 minutes compared to free-flow car journey		
	Predicted use (%)		
	P&R	Car	PT
Without car delays	0.8	96.8	2.4
With car delays of 40 minutes	3.2	87.0	9.8

Table 4. Influence of improving quality of the P&R facility on evaluations and choices

		Eval. P&R	Predicted use (%)		
			P&R	Car	PT
Without car delays	Basic P&R alternative	5.9	0.8	96.8	2.4
	Covered/unheated waiting room	6.3	0.9	96.8	2.4
	Heated waiting room	6.4	0.9	96.7	2.4
	Installing supervisors	6.6	0.9	96.7	2.4
	With shopping facilities (→ well-populated P&R, 3 min to walk)	7.5	1.1	96.5	2.4
With car delays of 40 min	Basic P&R alternative	5.9	3.2	87.0	9.8
	Covered/unheated waiting room	6.3	3.5	86.7	9.8
	Heated waiting room	6.4	3.6	86.6	9.8
	Installing supervisors	6.6	3.8	86.5	9.8
	With shopping facilities (→ well-populated P&R, 3 min to walk)	7.5	4.6	85.7	9.7

Table 5. Influence of improving quality of the connecting public transport on evaluations and choices

		Eval. P&R	Predicted use (%)		
			P&R	Car	PT
Without car delays	Basic P&R alternative	4.1	0.8	96.8	2.4
	Frequency = every 5 minutes	5.0	0.8	96.8	2.4
	95% chance of finding a seat	6.0	0.8	96.8	2.4
	No transfer required in PT	6.9	1.0	96.6	2.4
	Reduce extra P&R time by 10 min.	6.9	1.4	96.2	2.4
	Free of charge P&R alternative	6.9	4.1	93.6	2.3
With car delays of 40 min	Basic P&R alternative	4.1	3.2	87.0	9.8
	Frequency = every 5 minutes	5.0	3.2	87.0	9.8
	95% chance of finding a seat	6.0	3.2	87.0	9.8
	No transfer required in PT	6.9	4.1	86.2	9.7
	Reduce extra P&R time by 10 min.	6.9	5.8	84.6	9.6
	Free of charge P&R alternative	6.9	15.2	76.2	8.6

Table 6. Influence of a combined package of strategies to improve both P&R and connecting PT on the number of car drivers switching to P&R

		Predicted use (%)		
		P&R	Car	PT
Without car delays	Basic P&R alternative	0.8	96.8	2.4
	Improving quality of P&R and connecting PT (P&R charge = € 4)	2.1	95.6	2.4
	Improving quality of P&R and connecting PT (free of charge)	5.8	91.9	2.3
With car delays of 40 minutes	Basic P&R alternative	3.2	87.0	9.8
	Improving quality of P&R and connecting PT (P&R charge = € 4)	8.2	82.5	9.3
	Improving quality of P&R and connecting PT (free of charge)	20.7	71.3	8.1

Table 7. Influence of restrictive policy measures at destination on the modal split

	Introduction of restrictive policy measures	Predicted use (%)		
		P&R	Car	PT
Without car delays	Basic P&R alternative	0.8	96.8	2.4
	Increase in costs when using car after passing P&R (up to € 3.50)	1.0	95.9	3.1
	Increase in costs when using car after passing P&R (up to € 6.50)	1.5	94.0	4.5
With car delays of 40 minutes	Basic P&R alternative	3.2	87.0	9.8
	Increase in costs when using car after passing P&R (up to € 3.50)	4.0	83.6	12.4
	Increase in costs when using car after passing P&R (up to € 6.50)	5.5	77.5	17.0

	Restrictive policy measures combined with optimal improving of the quality of P&R and connecting PT	Predicted use (%)		
		P&R	Car	PT
Without car delays	Basic P&R alternative	0.8	96.8	2.4
	Improving quality of P&R and PT, with P&R charge of € 4.00 and parking fees at destination of € 6.50	3.9	91.7	4.4
	Improving quality of P&R and PT free of charge, and parking fees at destination of € 6.50	10.5	85.4	4.1
With car delays of 40 minutes	Basic P&R alternative	3.2	87.0	9.8
	Improving quality of P&R and PT, with P&R charge of € 4.00 and parking fees at destination of € 6.50	13.6	70.9	15.5
	Improving quality of P&R and PT free of charge, and parking fees at destination of € 6.50	31.5	56.2	12.3