

Attitudes and Behavioral Responses to Parking Measures

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This paper reports the results of a study of attitudes and behavioral responses of car drivers to planned parking measures at the campus of the Eindhoven University of Technology, the Netherlands. In an on-street questionnaire, car drivers were asked their opinion about restricting access to the campus area for cars of non-university car drivers through (i) a barrier, (ii) proper identification when entering the campus area, and (iii) payment. The responses of more than 700 car drivers are used in a multinomial logit analysis. Most car drivers indicate to continue driving to the university by car. Almost half of the car drivers indicate that they will change their travel behavior should they have to pay for entering the campus area by changing transport mode or parking their car outside the campus area. Respondents are invariant with respect to different types of identification. The most favorite way of paying is by bank/credit card, followed by a special university card.

Keywords: Attitudinal responses, Parking measures, Restricted access, Revealed preference, University Campus

1. Introduction

During the last decades, parking facilities in downtown areas have become less appealing. Due to increasing car use and increasing concentration of offices in downtown areas the demand for parking spaces has exceeded their supply. In The Netherlands, the official policy with respect to spatial development has been to develop high density working areas near central railway stations and to restrict the number of parking spaces. Reducing both land use and car use were the main objectives of this policy. It strengthened the trend of increasing

shortage of parking spaces in downtown areas. In the meantime, the supply and management of parking facilities has increasingly become a private business, resulting in rapidly increasing parking fees. To escape high fees, many car drivers tend to use free parking facilities just outside the downtown areas, where often residential-areas and semi- or non-commercial buildings are located. In turn, this tendency has triggered initiatives at these locations to influence travel behavior in an attempt to make car users switch to other transport modes or to distribute parking over a wider area.

This paper reports the results of a parking study conducted at the campus of the Eindhoven University of Technology which is located adjacent to the downtown area and the central railway station of the city of Eindhoven, The Netherlands. Both the downtown and the station areas have parking fees and parking duration restrictions. The quality of parking at the campus of the Eindhoven University of Technology has become worse in recent years due to major changes in the general layout of the campus area, and changes in the downtown area and the surroundings of the railway station. New office buildings and new traffic regulations in these areas have caused an increase in the demand for public parking while the number of available parking spaces has decreased. These developments have worsened the parking situation at the campus resulting in illegal parking and dangerous situations. To set up effective parking management, insight is needed into the parking behavior of car drivers and in the car drivers' opinions regarding various aspects of parking facilities (e.g., Isler et al., 2005). In addition, it is valuable to know how car drivers will respond to proposed parking measures. For example, the University Board plans to introduce a (partial) closure of the university campus for some groups of car drivers (for example, students, visitors of the university, and visitors of the inner city area). However, Farrel and O'Mahony (2005) stated that 'parking measures devalue the fringe benefits of employees' and hence it was considered important to learn their opinions.

The aim of the study described in this paper is to obtain more insight into car drivers' attitudes and preferences with respect to a set of possible parking measures. In particular, this paper focuses on two research questions: (i) *How will car drivers react if the university campus is closed for certain groups of car drivers by constructing a barrier or by requiring identification?*, and (ii) *What means of identification and what means of payment do car drivers prefer if a barrier is used?*

The remainder of this paper is organized as follows. First, a short overview of previous research findings on responses to parking measures is given. Next, attention is paid to the adopted research approach and data collection. The analyses of responses and preferences and the results are described in the next section. The paper ends with conclusions.

2. Responses to parking measures

Previous studies give some insight into potential responses to suggested (workplace) parking measures. The findings of these studies were used to define possible responses and relevant explanatory attributes. The studies are grouped according to their main focus: CBD or university campus. For example, Shoup (1997) describes the effects of cashing out employer-paid parking on the travel behaviour of workers of eight different firms in different central business districts in California. He found that cashing out reduces traffic congestion (less solo drivers), vehicle emissions (less vehicle trips per employee per day), and gasoline consumption. According to Shoup, cashing out will not affect destination choice.

Shifan and Burd-Eden (2001) investigated the likely response of visitors of the city center to an increase in parking costs and a decrease in parking availability using a stated preference survey. The increase of parking costs varied from 1 USD to 2.5 USD. The decrease in parking availability was specified by means of an increase in parking search time that ranges between 10 and 20 minutes. They defined seven potential responses: continue to arrive by car, shift to public transport, shift to taxi, shift to walk, cancel the trip, cancel the destination, and change time of day. The study shows that most workers are not willing to change their travel behavior. Of those workers who will change their travel behavior, the majority will choose another mode of travel or time of day. More than half of the non-workers will change their travel behavior. The most favorite responses were change of destination and cancellation of trip.

Hensher and King (2001) investigated the impact of pricing scenarios on CBD parking share. They set up a stated preference survey in which car drivers and public transport users were asked to consider six alternatives: park close to the CBD, park elsewhere in the CBD, park outside the CBD, park free beyond the fringe of the CBD and travel by public transport to the CBD, and do not travel to the CBD. The available parking facilities in the CBD were described by means of three attributes: hours of operation, tariff schedule, and walk time from parking to main destination. The simulations show that the imposition of a curtailment of hours of operation at specific locations under existing tariffs will lead to a continuation of driving to the CBD. Increases in tariffs however will secure significantly greater use of public transport and a noticeable switch from parking close to the CBD to parking elsewhere in the CBD. There is virtually no loss in travel to the CBD.

Hess (2001) investigated the effect of free parking on mode choice and parking demand of commuters in Portland's CBD. Hess defined three choice alternatives: drive alone, ride in a carpool, and use transit. From the estimated multinomial logit model of commuters' mode choice it could be concluded that parking costs and travel time by transit influence mode choice decision of commuters. Hess found that a daily parking charge of 6 USD would result in 21 fewer cars driven for every 100 commuters.

O'Fallon *et al.* (2004) investigated car drivers' responsiveness to policy tools on mode choice in three urban areas. They conducted a stated choice experiment that included 11 policy tools that could affect the decision to drive a car to work or study. Respondents could choose between 7 mode choices: drive a car, become a passenger in a car, arrange carpooling, walk and catch public transport, drive, park and ride public transport, cycle, and other. They found that nearly one-half of the car drivers always chose to continue to drive their car in response to the scenarios presented. Especially, employment practices (such as company-owned vehicles, providing on-site parking, and using the car for work-related trips during the business day) significantly constrain the willingness of employees to choose not to drive a car.

Besides parking studies that focus on responses to measures in CBD areas, a limited number of studies have been carried out in the context of a university campus. Pretty (1994) studied the effect of the introduction of parking charges on a university campus on mode switching behavior of car drivers. He found that parking charges led to a greater use of other modes of transport and a greater use of parking facilities outside the campus by commuters. The elasticity of the demand for car parking differed between students (-0.18) and staff (-0.22).

Farrell and O'Mahony (2005) studied the effects of workplace parking charges, parking cash-out policies, and removal of parking spaces on university employees' attitudes and potential travel behavior. They found that almost one third said that they would continue to drive to

work by car if a 5.00 euro daily charge was applied. A similar number of respondents said they would use public transport on some days. In response to the parking cash out scheme, 66% would continue driving to work. In the case of removing parking spaces, almost 65% of the respondents will travel by public transport everyday or at least some days.

Isler et al. (2005) investigated universities parking management strategies. They found that universities have implemented a variety of parking measures such as parking restriction measures to meet the accessibility and mobility needs of the university environment with the desired land uses of an educational institute. The success of parking measures depended on the location of the campus: urban or suburban. Urban campuses have significantly lower motor vehicle usage for trips to and from campus, as do suburban campuses. They also found that universities did not have enough quantitative data to understand how parking measures really cause drivers to change their mode choice. This is also true for the Eindhoven University of Technology.

3. Research approach and data

This study represents an effort to reduce this data problem and investigate the likely effects of parking measures at the campus of the Eindhoven University of Technology. Parking facilities at the campus are free to use by the public. The study was designed to collect data about car drivers' attitudes and preference about alternative measures, differentiating between scenarios that involved paid parking and measures of restricting parking otherwise. Respondents were invited to respond to the following question: *Suppose the University area will be closed for cars of non-university students and employees and the only way you can enter the area with your car is by using a free parking pass, what would you do?* The respondents could choose from the following four predefined responses:

- No change in parking behavior;
- Park the car somewhere outside the University area;
- Do not use the car anymore but another means of transport (in the questionnaire, the transport mode 'other' represents public transport and bicycle);
- Other (e.g., work at home, change arrival time).

In addition, they were asked to respond to the following scenario: *Suppose the University area will be closed for cars of non-university students and employees, and the only way you can enter the area with your car is by paying parking fees, what would you do?* The amount of money was not specified. Respondents could choose from the same four predefined responses as defined above.

Respondents were also prompted about their preferences related to alternative means of identification (Automatic identification by means of a special chip in the car; Showing some ID-card to a card reader; Other (e.g., identification to a gatekeeper or receptionist), and to alternative payment methods (Cash payment; With own bank or credit card; With special university card; With special chip in the car; Other). The frequency of responses and their relationship to selected socio-demographics and travel characteristics and evaluation scores was investigated.

The following personal characteristics were included in the analysis: gender, age, relation with the university, and origin. Their inclusion was based on the following hypotheses.

- a. *Gender*: Male car drivers are less willing to change their travel behavior than female car drivers. In addition, male car drivers will have a higher preference for automatic identification and payment than female car drivers (e.g., Arentze et al., 2004).
- b. *Age*: Older car drivers are less willing to change their behavior than young car drivers, and have a higher preference for traditional identification (to gatekeeper) and payment (cash) (e.g., Arentze et al., 2004; Farrel and O'Mahony, 2005).
- c. *Relation with the university*: Students are more willing to change their behavior and prefer automatic identification and payment (e.g., O'Fallen et al., 2004; Pretty, 1994).
- d. *Origin*: Car drivers from Eindhoven will change their behavior more easily than car drivers from outside Eindhoven, and because of time savings prefer automatic identification and payment (e.g., Arentze et al., 2004).

As for travel related characteristics, visit frequency and arrival time were incorporated in the analysis to investigate the following hypotheses:

- e. *Visit frequency*: The more frequent car drivers visit the campus, the less they are willing to change their behavior and the more they prefer automatic identification and payment.
- f. *Arrival time*: Car drivers who arrive early at the university area are not likely to change behavior because they are not used to searching for a parking space (e.g., Arentze et al., 2004). Because of time savings, car drivers who arrive late prefer automatic identification and payment more than car drivers who arrive early in the morning.

In September 2004, over 700 car drivers were asked to fill out an on-street questionnaire. The questionnaires were administered at all parking lots at the university campus by students. Respondents were selected at random. The questionnaire consisted of four parts. The first part concerned the respondent's current parking behavior (e.g., parking frequency and arrival time). In the second part, the respondent was asked to evaluate various aspects of the parking facilities they use most at the campus. In the third part, the respondent was asked to respond on the parking issues discussed in this paper. In the final part, data on the personal characteristics of the respondent were collected.

Table 1 presents an overview of the personal and some travel characteristics of the respondents. In general, it shows that the sample is what one would expect at a technical university: a large number of male car drivers, the majority of the car drivers are younger than 45 year of age, more employees than students using the car, and most car drivers coming from outside Eindhoven. The distribution of the visit frequency reflects the almost equal distribution of full-time and part-time jobs. Finally, results indicate that majority of the car drivers arrive early in the morning.

Table 1. Some personal and travel characteristics of the respondents

Characteristic	Level	Frequency	Percentage
Gender	Male	559	75.6
	Female	179	24.2
	Unknown	1	0.1
Age	Younger than 25 years	232	31.4
	Between 25 and 45 year	332	44.9
	Older than 45 years	174	23.5
	Unknown	1	0.1
Relation with University	Student	286	38.7
	Employee	369	49.9
	Other (e.g., visitors of University or Downtown)	83	11.2
	Unknown	1	0.1
Origin	Eindhoven	224	30.3
	Outside Eindhoven	511	69.1
	Unknown	4	0.5
Visit Frequency	4-5 times / week	297	40.2
	1-3 times / week	234	31.7
	<i>Less than 1 time/week</i>	208	28.1
Arrival time	Before 9.00 am	415	56.2
	Between 9.00 am -1.00 pm	285	38.6
	<i>After 1.00 pm</i>	35	4.7
	Unknown	4	0.5

4. Analyses and Results

The first step of the analyses focuses on the responses of car drivers to possible access restrictions of the university area. It suggests that the majority of the car drivers indicate that they will not change their parking behavior when they do not have to pay for entering the campus area (table 2). Only a small number of car drivers will change their behavior (8.3 percent), evenly distributed across parking outside the campus area and choosing another transport mode. The responses change dramatically if payment is involved. More than half of the car drivers indicate a change in their travel behavior. The most favorite response is choosing another transport mode (e.g., public transport or bike).

Table 2. Behavioral responses of car drivers to restricted access of the university area

Measure	Responses	Frequency	Percentage
Restriction without payment	No change	676	91.6
	Park car elsewhere	23	3.1
	Choose other mode	27	3.6
	Other	12	1.6
Restriction with payment	No change	341	46.2
	Park car elsewhere	153	20.7
	Choose other mode	201	27.3
	Other	43	5.8

To analyze to what extent personal and travel-related characteristics influence the probability of a particular response, multinomial logit models were estimated. The results of these

models are presented in tables 3 and 4. Effect coding was used to represent the explanatory variables. This coding system means that a two level variable is represented by one parameter. The variable itself has two values -1 (level 1) and +1 (level 2). In addition, a three level variable is represented by two parameters and now the variable can have three values: -1, 0, and +1 (level 1: +1 0), (level 2: 0 +1), and (level 3: -1 -1). The choice option 'No change' was used as a base alternative, implying that the results should be interpreted relative to this base. Given a maximum of 1.00, McFadden's rho-square values indicate that the models perform satisfactory. The large difference in rho-square between the two estimated models presented in respectively table 3 and 4 is caused by the fact that car drivers are more unanimous about the 'No change' option if no payment is involved. This is also expressed by the relative large negative values of the constants for the options 'Park elsewhere', 'Other mode', and 'Other' (table 3). These negative constants combined with negative coefficients mean that these options are less attractive compared to the option of 'No change' that is defined by the base alternative (utility = 0.0).

Table 3. Effects on behavioral response to restricted access other than paying

Characteristic	Level	Effect***		
		Park elsewhere	Other mode	Other
Constant		-3.7857	-3.0365	-4.1390
Visit frequency	4-5 times / week	-0.0387	-0.1879	-0.8110
	1-3 times / week	-0.3613	0.2106	0.1324
	Less than 1 time/week ²	<i>0.4000</i>	<i>-0.0227</i>	<i>0.6768</i>
Arrival time	Before 9.00 am	-0.2536	-0.3119	-0.1016
	Between 9.00 am-1.00 pm	0.6865	-0.4046	-0.1163
	After 1.00 pm	<i>-0.4329</i>	<i>0.7165</i>	<i>0.2179</i>
Relation with University	Student	-0.6427	-1.3825	-1.7230
	Employee	-0.5350	0.5387	-0.1339
	Other	<i>1.1777</i>	<i>0.8438</i>	<i>1.8569</i>
Origin	Eindhoven	0.1106	0.2479	0.6959
	Outside Eindhoven	<i>-0.1106</i>	<i>-0.2479</i>	<i>-0.6959</i>
Age	Younger than 25 years	-0.3954	1.8911	0.0000
	Between 25 and 45 years	0.4894	-0.9796	0.0000
	Older than 45 years	<i>-0.0940</i>	<i>-0.9115</i>	<i>0.0000</i>
Gender	Male	0.2798	0.1131	0.1981
	Female	<i>-0.2798</i>	<i>-0.1131</i>	<i>-0.1981</i>
Rho-square		0.768		

* **Bold** means significant at 95 percent confidence level

** *Italic* is base level of characteristic

If restricting access is managed by implementing measures *other than paying*, it appears that car drivers indicate they will not change their behavior (table 3). This finding is based on the negative signs of the parameters. Especially students do not intend to change their current travel behavior. Their utility of 'Other mode' and 'Other', is significantly negative indicating that they do not prefer these alternatives in relation to the base alternative (No change).

However, note that other visitors attach positive utilities to these alternative options. This is expected because visitors will have no access to the parking facilities at the campus area. Respondents living in Eindhoven will change their current travel behavior in favor of the option 'Other' (work at home or carpooling). Young respondents indicate they are more likely to change to 'Other mode'. In contrast, older respondents are less likely to change, confirming the corresponding hypotheses, formulated in section 3.

If car access restriction involves *payment*, it appears that more car drivers will change their behavior as expressed by the small negative values of the constants (table 4). The visit frequency influences the utility of the options 'Park elsewhere' and 'Other mode', significantly. Frequent visitors indicate they are less likely to 'Park elsewhere' and use 'Other mode' (both alternative have a negative utility), and are more likely to continue their current travel behavior. As expected, students indicate they are more likely to change their current travel behavior and 'Park elsewhere' or use 'Other mode'. Respondents from Eindhoven indicate more often that they will change their travel behavior and switch to using bicycle or public transport. The same holds for young respondents. Middle-aged respondents are less likely to change their current travel behavior with respect at work at home and arrival time.

Table 4. Effects on behavioral response to restricted access by paying

Characteristic	Level	Effect***		
		Park elsewhere	Other mode	Other
Constant		-0.9042	-0.6712	-2.0398
Visit frequency	4-5 times / week	-0.3441	-0.4643	0.0741
	1-3 times / week	-0.0635	0.1502	-0.2308
	Less than 1 time/week ²	<i>0.4076</i>	<i>0.3141</i>	<i>0.1567</i>
Arrival time	Before 9.00 am	-0.1503	0.0538	0.0000
	Between 9.00 am-1.00 pm	0.1529	-0.1465	0.0000
	After 1.00 pm	<i>-0.0026</i>	<i>0.0927</i>	<i>0.0000</i>
Relation with University	Student	0.6423	0.8657	-0.1623
	Employee	0.0203	-0.1399	0.2123
	<i>Other</i>	<i>-0.6626</i>	<i>-0.7258</i>	<i>-0.0500</i>
Origin	Eindhoven	-0.0940	0.3644	0.1578
	Outside Eindhoven	<i>0.0940</i>	<i>-0.3644</i>	<i>-0.1578</i>
Age	Younger than 25 years	0.2722	0.4204	0.3725
	Between 25 and 45 years	0.1046	0.0592	-0.6267
	Older than 45 years	<i>-0.3768</i>	<i>-0.4796</i>	<i>0.2542</i>
Gender	Male	-0.1786	0.0690	0.0105
	Female	<i>0.1786</i>	<i>-0.0690</i>	<i>-0.0105</i>
Rho-square		0.206		

* **Bold** means significant at 95 percent confidence level

** *Italic* is base level of characteristic

The second part of the questionnaire concerned respondents preferences for alternative means of identification and method of payment. The main results are shown in table 5. It appears that car drivers are equally distributed across 'automatic identification' and 'showing parking

card'. A pay card is the most favorite means of payment. Again, multinomial logit models were estimated to analyze whether these preferences are systematically related to the set of explanatory variables.

Table 5. Preferences for alternative means of identification and method of payment

Measure	Preferences	Frequency	Percentage
Means of identification	Automatic identification	331	45.8
	Showing parking card	356	48.8
	Other	43	5.9
Method of payment	Cash payment	95	13.0
	With own bank/credit card	221	30.3
	With special university card	224	30.7
	With special chip in the car	126	17.3
	Other	64	8.8

Table 6. Effects of personal characteristics on preferences for alternative means of identification

Characteristic	Level	Effect***	
		Automatic	Parking card
Constant		2.4268	2.4464
Visit frequency	4-5 times / week	0.0963	-0.3296
	1-3 times / week	0.5138	0.4739
	<i>Less than 1 time/week²</i>	<i>-0.6101</i>	<i>-0.1443</i>
Arrival time	Before 9.00 am	0.2919	0.2765
	Between 9.00 am-1.00 pm	-0.1422	-0.1145
	After 1.00 pm	-0.1497	-0.1620
Relation with University	Student	0.2203	0.4063
	Employee	0.9312	1.0431
	Other	<i>-1.1515</i>	<i>-1.4494</i>
Origin	Eindhoven	0.0392	0.0501
	Outside Eindhoven	<i>-0.0392</i>	<i>-0.0501</i>
Age	Younger than 25 years	1.4679	1.5804
	Between 25 and 45 years	-0.7208	-0.7463
	Older than 45 years	<i>-0.7471</i>	<i>-0.8341</i>
Gender	Male	-0.2865	-0.2670
	Female	<i>0.2865</i>	<i>0.2670</i>
Rho-square		0.268	

* **Bold** means significant at 95 percent confidence level

** *Italic* is base level of characteristic

The results of the model estimation are presented in tables 6 and 7. In general, it appears that car drivers prefer automatic identification and identification with parking cards above other means of identification (e.g., call) that was defined as base alternative (table 6). Both the respondent's relation with the university and the respondent's age have a significant influence on the utility of the choice alternatives. The negative influence on the utility of automatic

identification (-1.1515) and identification by means of a parking card (-1.4494) of 'Other visitors' is expected because these measures imply they will no longer be able to park at the university campus. Table 6 also shows, as hypothesized, that older respondents prefer the traditional way of identification. In order to estimate a less complex model to analyze payment preferences, the original five answer categories were grouped into three categories: payment by a chip in the car, payment using a card, and other methods of payment (e.g., cash). The parameter estimates show that in general, car drivers prefer the pay card above the other alternatives (table 7). Because of the similarity, the choice alternatives bank/credit card and university card are combined. Employees have a higher preference for the car chip and pay card, while 'Other visitors' dislike these method of payment.

Table 7. Effects of personal characteristics on preferences for alternative means of payment

Characteristic	Level	Effect***	
		Car chip	Pay card
Constant		-0.1959	1.0106
Visit frequency	4-5 times / week	0.1285	-0.0383
	1-3 times / week	0.2576	0.0733
	<i>Less than 1 time/ week²</i>	<i>-0.3861</i>	<i>-0.0350</i>
Arrival time	Before 9.00 am	-0.2501	-0.1389
	Between 9.00 am-1.00 pm	-0.3779	-0.2491
	After 1.00 pm	<i>0.6280</i>	<i>0.3880</i>
Relation with University	Student	-0.0782	0.1252
	Employee	0.5788	0.4191
	Other	<i>-0.5006</i>	<i>-0.5443</i>
Origin	Eindhoven	-0.1120	-0.1032
	Outside Eindhoven	<i>0.1120</i>	<i>0.1032</i>
Age	Younger than 25 years	0.0990	0.0506
	Between 25 and 45 years	-0.1361	0.1353
	Older than 45 years	<i>0.0371</i>	<i>-0.1859</i>
Gender	Male	-0.0771	-0.1131
	Female	<i>0.0771</i>	<i>0.1131</i>
Rho-square		0.167	

* **Bold** means significant at 95 percent confidence level

** *Italic* is base level of characteristic

5. Conclusion, discussion and recommendations

This paper describes a study on attitudinal responses of car drivers to possible parking measures for the campus of the Eindhoven University of Technology. In general, and consistent with previous research conducted in other cities and countries, the results of the study indicate that the majority of car drivers will not change their travel behavior when they do not have to pay for entering the campus area. There is also some evidence of differences in

response for this scenario. As hypothesized, attitudes depend on the relation of the car drivers with the university, the car drivers' origin and age. In the event, however, they have to pay for entering the campus area, almost half of the car drivers indicate that they will change their travel behavior. The most preferred response is changing transport mode, followed by parking the car outside the campus area. As hypothesized, visit frequency, the relation with the university, the car drivers' origin and age all influence the response to this scenario.

In the event car drivers have to pay, both automatic identification and showing a parking card to a card reader are equally popular in the sample. As hypothesized, attitudes do depend on the car drivers' relation with the university and age. Employees prefer automatic identification and identification with a parking card while other visitors do not. Older respondents prefer the traditional way of identification (call) while younger respondents prefer automatic identification or identification with parking card. The most favorite ways of payment are paying with own bank/credit card and with a special university card. The car drivers' relation with the university influences this preference significantly. Employees prefer payment by car chip or pay card above cash payment.

Overall then, the findings of this study by and large confirm those of previous studies. Some small differences reflect differences in the general use of transport modes. For example, as in other studies, one response to parking charges is to switch to other transport modes. In previous studies, this switch typically meant switching from car to public transport. In the Eindhoven case, it means not only switching to public transport but also the bicycle, reflecting the more general popularity of the bicycle for the work commute. Not all findings however are consistent. Pretty (1994) found a higher elasticity for staff than for students. In our study, however, we found that students are more inclined to change their travel behavior than employees do, especially when they have to pay for the use of parking facilities.

With the restriction of access to parking facilities, the University board aims to reduce the parking occupancy rate in general and the presence of cars of non-university related car drivers in particular. The findings of this study suggest that these goals will be achieved when the campus area is closed for cars for drivers other than university students and employees with barriers, appropriate ID, and parking fees. In the latter case, the board has to take into account that a large proportion of the car drivers will look for a parking space in the fringe of the campus area (almost 21 percent). This may be an undesired effect. We intend to investigate such effects in a follow-up study after the parking measures have been implemented.

The findings of the study suggest that the most effective policy involves some payment scheme. The introduction of a paid parking regime can be seen as an intrusion on employees and students privacy, involves a lot of hassle, and it may slow down the process of entering the campus and maybe even traffic in the vicinity of the campus (e.g., Shoup, 2005). Shoup introduces an intelligent payment regime called the 'smart parking' concept. In this concept cars are equipped with in-vehicle meters and the parking price depends on the location and availability of free parking spaces. The first interest of the University Board was to know how car drivers will react to payment in general. It has to be noted that this issue is very sensitive in the university community. In a follow-up study, the sensitivity of car drivers to price and associated hassles (trading off between more parking space and restricted access for the public at large using intrusive control systems) will be investigated in more detail.

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