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Empirical evidence on cruising for parking

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ABSTRACT

The literature on car cruising is dominated by theory. We examine cruising for parking using a nation-wide random sample of car trips. We exclude employer-provided and residential parking. We focus on the Netherlands, where levels of on-street and off-street parking prices are locally the same. We demonstrate then that due to this price setting the average cruising time in the Netherlands is only 36 s per car trip. Furthermore, we show that cruising is not random. It is more common in (large) cities that receive more car trips, particularly for shopping and leisure activities. Cruising time increases with travel duration as well as with parking duration. Cruising has a distinctive pattern over the day with a peak in the morning, so the order of arrival is essential to parking. Because cruising has a spatial and time component, policies may be considered that reduce cruising time through flexible pricing of parking or improved information about vacant parking spaces.

1. Introduction

There is a very wide body of literature on car congestion, both theoretical and empirical (Small and Verhoef, 2007), but the literature on cruising for parking is considerably thinner. Notable theoretical contributions have been provided by Glazer and Niskanen (1992), Arnott and Rowse (1999, 2009), Anderson and de Palma (2004) and Arnott and Inci (2006). As far as we know, there is little corresponding empirical literature on the determinants of cruising. In the theoretical literature, it is emphasised that cruising for on-street parking is mainly a consequence of underpricing of on-street parking and is then socially wasteful. By increasing parking prices to the appropriate level, the number of vacant parking places increases, so cruising time will fall. As emphasised by Arnott and Inci (2006), given perfect information about parking spaces and optimal pricing of parking, cruising time is (close to) zero.[1]

Cruising for parking leads to additional costs of trips in terms of time and fuel.[2] Further, cruising may have several serious externalities, which make it an important concern for policy makers. Cruising usually takes place in intensively used areas which means that pollutants and noise are emitted at places where they are relatively harmful. Further, cruising may negatively affect other traffic since it may slow down overall traffic in busy areas, an effect similar to that of congestion externalities.[3]

In the current paper, we focus on cruising time, viz. the car driver's search time for a parking space. Shoup (2005) reports that, based on a sample of 22 US studies, the average share of traffic cruising is 30% and the average cruising time just under

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[1] According to theory, welfare is maximised when off-street and on-street prices prices are identical and cruising time is zero given four assumptions: (i) congestion, if present, is optimally priced by a road tax, (ii) on-street and off-street parking are perfect substitutes, (iii) car drivers have perfect information and (iv) off-street parking is provided in a competitive market (Calthrop, 2001; Arnott and Inci, 2006).

[2] Shoup (2005) observes that cruising may considerably inflate overall vehicle travel since it makes trips longer: some parking places in Los Angeles induce 3000 extra vehicle kms per year for cruising.

[3] For Los Angeles, where curbside parking is mainly free, the monthly emission cost is about $44, and the monthly-congestion costs about $73 per parking place, see Shoup (2005).

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8 min in downtown areas. This information is difficult to generalise, also because these studies measure cruising in areas where it may have been expected, and is even much more difficult to generalise to other countries where the level of curb parking prices are much higher.[4]

When curb parking is not free, which is usually the case in European cities, cruising time will be much lower. One of the motivations of our paper is to provide information on cruising in such a context. In many European countries, e.g. Belgium, off-street prices are also close to on-street prices. In particular, we focus on the Netherlands, where, on average, curb parking prices are exactly equal to off-street parking prices. Given this price setting, the incentives of car drivers to search for a cheaper (free) parking space are limited. Note that given this price setting cruising time may still occur due to the car driver's lack of information about the exact location of parking facilities (so not all cruising time can be considered to be an external cost).

So, the first objective of the current paper is to provide descriptive information about cruising using a nation-wide dataset. We exclude employer-provided and residential parking. We show that in 30% of car trips there is some cruising involved. Average cruising time is 36 s per car trip, which is small compared to an average travel time of 20 min. So, cruising time involves only a few per cent of overall travel time.

The second objective of the current paper is to examine the determinants of cruising, which is for example helpful to improve pricing policy. To specify empirical models we are motivated by micro-economic theory, which assumes rational decision-making of car drivers. In essence, we aim to explain variation in cruising time as a function of travellers' demand characteristics (e.g. income, parking duration) and supply characteristics (e.g., type of destination). It appears that the effects of these characteristics on cruising time are by and large in line with theory, so cruising time is not random but may be interpreted as a choice variable for the individual car driver. We also demonstrate that cruising has a spatial and time of arrival component, implying that by improving parking policy through flexible pricing of parking, cruising may be reduced further.

2. Theoretical setting

To provide a theoretical justification of the empirical cruising model, we discuss an extremely stylised partial equilibrium static model.[5] The essential assumption we make is that car drivers choose between different parking facilities and that car drivers have to cruise *within* each parking facility (e.g. the same street) before they can park their car. The cruising time within each parking facility is known to the car driver and exogenously given (so we ignore the equilibrium effect of cruising behaviour on cruising time for parking facility). Given these assumptions it is straightforward to derive testable propositions while keeping the mathematical arguments to a minimum.

The parking facilities are assumed to be identical in all aspects (including any walking time to the final destination), except for a parking fee and the cruising time. The parking duration is exogenously determined. The driver has perfect information, so given the choice of a parking facility, cruising time is known. Cruising time varies per parking facility: the higher the parking fee for a parking facility, the lower the cruising time (otherwise some parking facilities will never be used, see e.g. Calthrop, 2001). The specific parking facility, and therefore cruising time, is optimally chosen by car drivers.

It is further assumed that car drivers minimise the sum of cruising time costs and monetary parking costs. Cruising time costs are equal to the number of persons in the car times the value of time per person. The value of time depends positively on income. Furthermore, it is assumed that the value of time falls with travel duration. Given these assumptions (and second-order conditions), it is possible to derive testable hypotheses. For the formal model, see Appendix A.

First, the model implies that *high-income* drivers cruise less, because higher income drivers have a stronger preference to avoid cruising time. Second, a longer *parking duration* (at the destination) induces more cruising, because the savings per unit of cruising time are higher. Third, cruising time will increase with *travel duration*. Fourth, the number of passengers in a car reduce cruising time, as the marginal cost of cruising increases with the *number of passengers* (as the total time loss increases in the number of passengers). However, one may also argue that cruising is stressful, and if passengers reduce this stress (e.g. by providing directions) then cruising time may increase, because the value of cruising time increases.

3. Empirical analysis

3.1. Institutional background

The Netherlands is among the countries with the highest share of paid parking in the world. The city of Amsterdam has one of the highest on-street parking prices (€5 per hour in the centre) and also other municipalities usually have a form of paid parking. About 80% of residents live in a municipality where on-street paid parking is in use.[6] Total annual revenues for parking (private and public) are about €1 billion, about €125 Euro per car. The average hourly on-street parking fee of €1.55 is

[4] The lack of data on parking stands in remarkable contrast with the richness of data on congestion. This implies an interesting paradox: road pricing did not yet find broad introduction, and the few interesting cases have been extensively discussed in the scientific literature. Paid parking has been introduced in numerous cities, but it has received only minor attention in the scientific literature, a major factor being the lack of systematically collected data (Gutiérrez-i-Puigarnau and van Ommeren, 2011).

[5] This model may be interpreted as a reduced form of structural models such as Calthrop (2001).

[6] Municipalities in the top 20% in terms of population density always have paid parking. In the next two quintiles the share is about 75% and 55%. Even in the bottom quintile, this share is at least 10%.

Table 1
Distribution of cruising time.

No cruising	0.70
1 min	0.24
2 min	0.04
3 min	0.01
More than 3 min	0.01

almost exactly equal to the average hourly off-street parking fee of €1.52 (PDN, 2009). In addition, there are usually no large difference between off and onstreet parking fees in the same neighbourhood.

3.2. The data

Our data are derived from the Dutch National Travel Survey (MON) for the years 2005–2007. A (randomly-chosen) proportion of respondents, who have made (at least) one car trip (as driver or passenger) on a certain day, are asked to report their cruising time for a parking spot for one particular trip. Cruising time is reported for all parking destinations except employer-provided and residential parking.[7] The cruising time reported only includes in-vehicle search time for a parking space and excludes any other time losses due to searching (e.g. additional walking to the destination). The question about cruising is formulated as follows: "*How much time have you searched for a parking spot?*" The reported cruising time (in minutes) is a subjective estimate of cruising time, so our estimate likely contains measurement error. If the measurement error is completely random, then this has no effect on the consistency of the reported estimates. It is plausible however that drivers systematically overestimate (or underestimate) cruising time. We do not worry about this, because we will use linear regression models and as long as measurement error is not related to the explanatory variables included in this model and measurement error is additive, the estimates will be consistent.

We have 11,425 observations, of which 7081 refer to on-street and 4344 to off-street parking in a private or public parking lot. For our main results, we do not distinguish between on-street and off-street parking, as on-street and off-street parking parking tariffs are usually locally identical. In the survey, there is no information whether the car driver had to pay for parking. This is not as problematic as it may seem, because, as emphasised above, local variation in parking prices is minimal, and we control for area fixed effects as explained later on.

The descriptives of cruising time show that 30% of the car drivers cruise before finding a parking spot, but the large majority of this group cruises for just 1 min. Average cruising time is only 36 s.[8] Cruising time seldomly exceeds 3 min (see Table 1). We emphasise here that any systematic overestimation in the reported cruising times would not change our main message that the average cruising time is very low.

3.3. Econometric specification

To determine the effects of explanatory variables, we will use *area fixed effects linear regression models*.[9] Areas are defined by four digit postcodes. Area fixed effects essentially control for unobserved spatial variation in factors such as the supply of parking and the location-specific level of parking tariffs.[10] So, we control for a selection effect, as we use a sample of car drivers who have chosen a certain destination: it is likely that the decision to travel by car depends on the expected cruising time at the destination. In our analysis, we distinguish between 2365 areas that are small (on average, an area contains about 6700 inhabitants).

In the regression models, we control for gender and age. Economic theory provides no clear idea about the effect of gender and age on cruising. We use a quadratic specification for age. We specify income in logs (in the survey, income is asked for in six broad categories; we take the mid-value of each category) and include additional dummies for respondents who do not report their income and for those who do not have any personal income.

Furthermore, we include number of passengers, the logarithm of duration of the car trip (excluding cruising), the logarithm of the parking duration as well as the arrival time *at the destination*. The potential endogeneity of the car trip and parking duration variables is ignored. Although cruising, travel and activity time are, at least theoretically, simultaneously determined, the exogeneity assumption is empirically reasonable because cruising time is only a few per cent of average travel time and negligible compared to average parking time.

We will also include two types of variables that are related to the supply of parking. First, the supply varies per type of destination, so the relationship between cruising time and the parking fee is destination specific. This results in longer cruising times at certain destinations. So we control for the type of activity at destination (leisure, shopping, and 'other' (e.g. hos-

[7] Cruising costs are however substantial in residential areas in Amsterdam and likely in a few other large cities, as shown by Van Ommeren et al. (2011).

[8] Average cruise time for on-street parking is 30 s; for off-street parking 50 s. These descriptives suggest that on-street parking is less attractive (e.g. more expensive) than off-street parking, but other explanations cannot be excluded. For example, it may be the case that search within off-street buildings is more time consuming.

[9] Tobit analyses generate similar qualitative results, but these analyses rely on stronger assumptions to identify the marginal effects we are interested in, so we prefer regression analyses (see Angrist and Pischke, 2009). Another issue is that Tobit analyses do not generate consistent estimates when the number of observations per fixed effect is small.

[10] Note that the theoretical model incorporates the relationship between the cruising time and parking tariffs, but this relationship is likely location-specific.

Table 2
Analysis of cruising time.

	(I) Area FE	(II) Municipality FE	(III) OLS	(IV) Descriptives mean (sd)
Male	0.005	−0.002	−0.001	0.48
	(0.021)	(0.020)	(0.020)	(0.50)
Age	0.002	0.002	0.001	49
	(0.004)	(0.003)	(0.003)	(16)
Age squared/100	−0.004	−0.004	−0.004	26
	(0.004)	(0.004)	(0.004)	(16)
Income unknown	0.120	0.101	0.088	0.14
	(0.030)	(0.027)	(0.031)	(0.34)
No income	0.032	0.012	0.002	0.08
	(0.036)	(0.033)	(0.034)	(0.28)
Income (in log)	−0.044	−0.039	−0.033	9.86
	(0.022)	(0.020)	(0.019)	(0.49)
Number of passengers	0.014	0.016	0.013	0.16
	(0.011)	(0.010)	(0.010)	(0.90)
Leisure activity	0.096	0.081	0.082	0.38
	(0.029)	(0.026)	(0.025)	(0.49)
Shopping activity	0.176	0.183	0.171	0.31
	(0.031)	(0.028)	(0.026)	(0.46)
Other activity	0.023	0.025	0.043	0.10
	(0.045)	(0.040)	(0.031)	(0.29)
Trip duration (in logminutes)	0.030	0.038	0.040	2.62
	(0.011)	(0.010)	(0.011)	(0.95)
Parking duration (in logminutes)	0.025	0.028	0.028	4.23
	(0.008)	(0.008)	(0.007)	(1.35)
Arrival time	Yes	Yes	Yes	
Year dummies	Yes	Yes	Yes	
Municipality population (in log)			Yes	
Area fixed effects	Yes	No	No	
Municipality fixed effects		Yes	No	
No. of fixed effects	2365	432	0	
Average group size	4.8	26.0		
Number of observations	11,425	11,425	11,425	
Peak cruising time (in hours and min)	10.59	7.54	8.26	
	(2.32)	(1.58)	(1.40)	

Notes: Dependent variable is cruising time in minutes. Robust std. errors in parentheses. Reference category of activity is work.

pital visit)), where the reference category is work (commuting and business trips). Second, in dynamic models, cruising time may be zero at certain times (e.g. in the morning) and then increase during the day until a peak is reached and then falls back to zero (e.g. at night), see Calthrop (2001). So, a dynamic model implies that the *time order* of arrival is relevant (see also, Arnott et al., 1991 in a spatial context). At most types of destinations (the main exception is residential parking which is excluded in the analysis), the demand for parking is zero early in the morning, then increases and then falls before the evening, implying that cruising will *peak* during the day. We have first estimated models where we included hourly dummies for travel between 6 am and 22 a.m. These results suggest a non-linear relationship with a morning peak, but as all dummies are statistically insignificant, this interpretation may be spurious. Therefore, we show the results for a cubic specification[11] of arrival time h, so $f(h) = \alpha h + \beta h^2 + \gamma h^3$, and, for consistency, impose that $f(0) = f(24)$.[12] Given estimates of α, β and γ, we have calculated the peak cruising time (and its standard error using the delta method).[13]

The means and standard deviations of the explanatory variables can be found in the last column of Table 2. They show that the sample is quite representative for car drivers. Furthermore, it appears that 69% of destinations refer to leisure (visiting family and friends, recreation, entertainment) or shopping, and 21% refer to work-related parking.

3.4. Main results

The main results can be found in the first column of Table 2. They show that income has a negative effect on cruising time, consistent with the notion that higher incomes have a higher value of travel time. This result suggests that a doubling of income reduces cruising time by 4 s (about 10% of the mean cruising time). Cruising times are substantially higher for leisure (about 10 s), and particularly shopping activities (18 s), than for working. Our preferred explanation is that this is a supply

[11] A quadratic specification imposes a maximum at noon, so this specification is too restrictive.

[12] The latter restriction implies that $\alpha = -\beta 24 - \gamma 576$, so $f(h) = \beta(h^2 - 24h) + \gamma(h^3 - 576h)$. So, we estimate β and γ given this restriction and then calculate α.

[13] In the theoretical model, we have ignored that car drivers search over space for a vacant parking space, so cruising may be closely related to walking time. We do *not* control for walking time (from the parking space to the travel destination), because this variable is highly endogenous. For example, car drivers that (maybe unexpectedly) are not able to find a vacant parking space may find a parking space that is further away from the destination. In the data, there is a strong positive relationship between cruising and walking time, but this relationship cannot be interpreted as a causal effect.

Table 3
Analysis of municipality spatial variation in cruising time.

	(I)	(II)	(III)
Municipality size/100,000	0.0278		0.0064
	(0.0051)		(0.0107)
Incoming car trips		0.0992	0.0803
		(0.0149)	(0.0397)
Province dummies (12)	Yes	Yes	Yes
Number of observations	432	432	432

Notes: Weighted least squares; *incoming car trips* is standardised such that mean car trips equals mean municipality size/100,000.

effect and that parking is supplied near shopping centres below peak levels, which creates cruising at certain hours. We believe that this is the most plausible explanation. We cannot exclude other ('demand') explanations. For example, another explanation is that the costs of cruising depend on the drivers' value of time, that tends to be higher for work-related activities.

The estimate for arrival time implies that cruising peaks in the morning (to be exact, at 10.59 as reported at the bottom of Table 2) and is minimal around midnight. The difference in cruising time between the maximum (peak) and minimum (the trough) is 16 s with a standard error of 7 s. Hence, cruising time first increases over the day because parking spaces have been taken by earlier arrivals, and then falls later on.

This is consistent with a range of parking models which demonstrate that the order of arrival is essential to parking (e.g. Arnott et al., 1991; Zhang et al., 2008). Furthermore, we find that both car travel duration and parking duration have a positive effect on cruising, in line with economic theory. A doubling of travel duration, as well as parking duration, increases cruising time by about 3 s. Finally, we do not find any effect for the number of passengers in a car.

3.5. Sensitivity analyses

As a sensitivity analysis, we have re-estimated models without and with area fixed effects defined at the level of the municipality (see columns (2) and (3)). In essence, the results remain the same (implying that the observed explanatory variables are orthogonal to spatial structure). The main difference is that peak cruising time is now more precisely estimated, and the 95% confidence interval of peak is between 6 and 10 a.m.

We have also re-estimated all models separately for off-street and on-street parking (see Appendix B). For proper interpretation of these results, we emphasise that we do not know whether drivers who park off-street first have searched on-street (or the other way around). In principle, it is possible to estimate a simultaneous choice of on-street and off-street parking, but this requires a much larger dataset. The results are similar to the results discussed above. However the results seem to imply that the marginal effects are higher for off-street parking, except for the effect of travel time. Other differences are likely caused by the reduction in sample size for each parking destination. Note that the sample size is too small to repeat the analysis for the central business district of large cities, where one may anticipate that the sizes of the effects are more pronounced.

3.6. Spatial variation in cruising

In the above analysis, we have used municipality fixed effects to control for spatial variation in cruising. Here, we aim to understand whether the variation between municipalities with respect to cruising, i.e., whether it is related to any characteristic specific to the municipality. Hence, we aim to explain the estimated coefficients of the 432 municipality fixed effects that were used as control variables in the municipality fixed effects analysis reported in Table 2 (see II).

We explain the spatial variation in cruising at the level of the municipality, captured by these 432 estimated coefficients, by two explanatory variables: *municipality size* (number of inhabitants) and *number of incoming car trips* per municipality. Municipality size is obtained from administrative data, whereas the number of incoming car trips per municipality is derived from our survey sample. As the effect size of number of incoming car trips is difficult to interpret, we report the effect of a standardised number of car trips variable for which holds that mean car trips equals mean municipality size. Because the number of car trips is based on survey data, it is measured with sampling error. A standard solution to this statistical issue is to use weighted least squares, where the weights are derived from the number of observations per municipality. We also control for higher-level spatial variation in the fixed effects by including 12 province dummies (one province contains almost 40 municipalities, on average).

The results can be found in Table 3. If we only include municipality size, then it appears that municipality size has a strong effect on cruising time: an increase of 100,000 inhabitants increases cruising time by about 3 s (see column (I)).[14] However, if we also allow for the effect of number of car trips, then it appears that the municipality size effect is mainly through the number

[14] We have also investigated a quadratic specification, but this specification is rejected in favour of the linear specification.

of incoming trips per municipality, as the effect of the latter variable is about three times higher than of municipality size (see columns (II) and (III)).

4. Discussion

One of our main findings is that the level of cruising for parking in The Netherlands is remarkably low compared with the level of cruising reported in a country such as the USA. This is noteworthy since the supply of parking place is limited in typical Dutch cities with old centres developed in the pre-car period attracting large numbers of visitors. The main explanation for this must be the gradual introduction of paid parking by municipalities starting in the 1990s. The low share of cruising time is a sign of the effectiveness of on-street pricing policies.

The current low level of cruising in the Netherlands (36 s per trip) implies an increase of average trip duration due to cruising of about 3%. This excludes any additional walking time due to cruising, which may be substantial. In terms of trip length computed in kms, the average increase will be less than 3% (since cruising speeds are much lower than the average travel speed). The low share of cruising in total travel makes it a modest issue in environmental and external nuisance.

We find that in municipalities that are major attractors of car trips, but where paid parking is the norm, cruising times are higher than at other places, but the differences are not so strong as some expect. For example, the difference between a small village and a 100,000 inhabitants city will be only three seconds of cruising, on average. Our finding that cruising durations depend on the moment in time at which cars are parked is a signal that there is a case for a stronger time differentiation of parking prices with higher prices for cars that start to park in the morning.

5. Conclusion

The literature on cruising is dominated by theory (Glazer and Niskanen, 1992; Arnott and Rowse, 1999, 2009; Anderson and de Palma, 2004; Arnott and Inci, 2006) with few empirical evidence on the determinants of cruising (Shoup, 2006). This is the first article that investigates cruising for parking using a nation-wide random sample of car trips (excluding residential and employer-provided parking). We find that in about 30% of the trips considered car drivers cruise for parking, and the average cruising time per trip is 36 s. This implies that the average loss due to cruising time is limited, which the result of the Dutch policy of paid parking: paid parking is the norm in cities and the average hourly on-street parking fee is almost identical to the off-street parking fee. According to theory, given a number of assumptions, the optimal level of cruising is zero and parking prices for on-street and off-street parking should be the same. The latter condition seems to hold in the Netherlands.

We find that car drivers choose their cruising time in line with predictions of a standard economic model which assumes that car drivers choose cruising time trading off costs of cruising (time losses) with benefits of cruising (e.g. lower parking prices). Cruising increases with car travel duration and with parking duration, but falls with income. We also find that cruising is more common with shopping and leisure than for work-related activities.

We finally demonstrate that cruising has a distinct spatial variation that is related to city size, or more precisely, number of incoming car trips, although this relationship is not very strong. So, it seems possible that dynamic Information Systems (or Internet information) about available parking spaces in large cities may reduce cruising times even further. Cruising has a distinct pattern over the day with a peak in the morning so the order of arrival is essential to parking (as argued by Arnott et al. (1991)). This implies that a stronger within-day differentiation in parking fees is a promising route to reduce cruising.

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Appendix A

A. basic cruising model

We suppose that car drivers choose between parking spaces that vary in their cruising time and parking fee. It is assumed that car drivers minimise the sum of the cruising and monetary parking costs: $nv(T_t)T_c + p(T_c, x)T_p$, where n is the number of persons in the car, v is the value of time (per person), which is a negative function of the travel time (excluding cruising) T_t, so $\partial v/\partial T_t < 0$, and a function of the variable x, which represents supply variables such as the type of activity (e.g. shopping). Furthermore, T_c is the self-chosen cruising time and T_p denotes the exogenous parking duration. Finally, $p(T_c,x)$ denotes the marginal costs of parking that depends on the cruising time T_c. It is assumed that the fee structure is such that the cruising time is lower at places where the price of parking is higher ($p' < 0$) but at a decreasing rate ($p'' > 0$), where $p' = \partial p/\partial T_c$. Given these assumptions each driver chooses a unique parking space. The first order condition is now that $nv + p'T_p = 0$. It is then straightforward to show that:

$$dT_c/dn = -v(p''T_p)^{-1} < 0; \quad dT_c/dv = -n(p''T_p)^{-1} < 0; \quad dT_c/dT_p = -p'/p'' > 0;$$

and

$$dT_c/dT_t = -n\partial v/\partial T_t (p''T_p)^{-1} > 0.$$

Furthermore, it is true that:

$$\frac{dT_c}{dx} = -\frac{\partial^2 p}{\partial T_c \partial x} \bigg/ \frac{\partial^2 p}{\partial T_c \partial T_c},$$

so the sign of dT_c/dx depends on the sign of $\partial^2 p/\partial T_c \partial x$. If it is negative (so the effect of T_c on p is stronger for higher x), then dT_c/dx is positive.

Appendix B

Analysis of cruising time.

	(I) On-street FE	(II) On-street FE	(III) On-street OLS	(IV) Off-street FE	(V) Off-street FE	(VI) Off-street OLS
Male	−0.033	−0.018	−0.014	0.104	0.033	0.031
	(0.024)	(0.022)	(0.010)	(0.046)	(0.040)	(0.040)
Age	0.000	0.005	0.005	0.003	−0.001	−0.005
	(0.004)	(0.004)	(0.003)	(0.008)	(0.007)	(0.007)
Age squared/100	−0.003	−0.004	−0.003	−0.003	0.004	0.004
	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Income unknown	0.095	0.065	0.052	0.260	0.166	0.166
	(0.034)	(0.029)	(0.028)	(0.068)	(0.052)	(0.068)
No income	−0.042	−0.038	−0.040	0.146	0.085	0.059
	(0.040)	(0.036)	(0.029)	(0.076)	(0.066)	(0.077)
Income (in log)	−0.027	−0.020	−0.026	−0.121	−0.086	−0.052
	(0.025)	(0.022)	(0.022)	(0.047)	(0.040)	(0.035)
Number of passengers	0.026	0.025	0.021	0.006	0.001	−0.002
	(0.012)	(0.011)	(0.012)	(0.022)	(0.020)	(0.019)
Leisure activity	0.091	0.067	0.071	0.147	0.122	0.100
	(0.030)	(0.026)	(0.025)	(0.074)	(0.097)	(0.056)
Shopping activity	0.065	0.082	0.067	0.272	0.237	0.221
	(0.035)	(0.031)	(0.027)	(0.076)	(0.060)	(0.052)
Other activity	−0.040	−0.008	0.003	0.145	0.120	0.156
	(0.046)	(0.041)	(0.035)	(0.120)	(0.097)	(0.069)
Travel duration (in logminutes)	0.039	0.036	0.032	0.001	0.022	0.046
	(0.012)	(0.011)	(0.011)	(0.026)	(0.021)	(0.026)
Parking duration (in logminutes)	0.011	0.020	0.017	0.058	0.048	0.053
	(0.009)	(0.008)	(0.008)	(0.020)	(0.016)	(0.012)
Arrival time	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Municipality population (in log)			Yes			Yes
Area fixed effects	Yes	No	No	Yes	No	No
Municipality fixed effects	Yes	Yes	No	Yes	Yes	No
No. of fixed effects	2045	425	0	1529	396	0
Average group size	3.5	16.4		2.8	10.8	
Number of observations	7081	7081	7081	4344	4344	4344
Peak cruising time (in hours)	14.120	7.956	9.528	12.938	10.108	9.845
	(1.659)	(3.271)	(3.016)	(3.703)	(3.246)	(3.150)

Notes: dependent variable is cruising time in minutes. Robust std. errors in parentheses. Reference category of activity is work.

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