Economic Studies on Public Facility Use

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Chapter 6

CONCLUSIONS

The present dissertation consisted of four essays, in which revealed preference analyses were applied to study whether use of public facilities is efficient. The policy objective of the essays is to come up with recommendations for optimising the use of public facilities.

Chapter 2 related to congestion externalities of university computer use. Congestion may induce incumbent computer users to lengthen their use duration, to reserve a place for later. We have tested for this hoarding behaviour using administrative data on the use of university computers by students. We have shown that computer occupancy rates have a strong and positive effect on computer use duration. In particular, our results showed that the congestion elasticity of

computer duration is about 0.61. We have investigated several alternative explanations for this, but the latter result appeared to be mainly driven by hoarding behaviour.

Hoarding behaviour presumably leads to considerable welfare losses, because current users with a low (or zero) demand overconsume the good, at the expense of potential new users with a higher demand. A longer computer duration increases congestion, so hoarding creates congestion externalities to new users, in particular during peak-hours. This suggests that there are substantial welfare losses due to hoarding. Our findings on computer hoarding favour congestion pricing of computer use (as suggested in the context of parking by Vickrey in 1954). Because congestion pricing may be difficult to implement for university computers, a second-best policy which puts limits on computer duration might be considered, despite the other inefficiencies created by such limits (Calthrop, 2001; Arnott and Rowse, 2009b). A third potential way to deal with university computer hoarding is to ask students to bring their own mobile IT devices. This was the focus of Chapter 5.

Chapter 3 introduced a methodology to estimate the effect of parking prices on car drivers' choice between street and garage parking. The methodology was applied during daytime hours to an area where cruising for parking is absent, street parking is ubiquitous and garage parking is discretely located over space. So, in this area, the average distance to the final destination is longer for garage parking than for street parking. We found that drivers are willing to pay a premium for street parking which ranges from € 0.37 to € 0.60.

Given a parking duration of one hour, the demand for street parking is price elastic: the price elasticity of demand for the share of street parking is -5.5. However, this price elasticity is much smaller for shorter parking durations. Our estimates imply that even small reductions in street parking prices induce a strong increase in the stock of cars parked on-street. Our estimates

also imply that a policy which contains a street premium (so street prices exceed garage prices) is welfare improving, because drivers with longer parking durations are induced to use parking locations that are, on average, farther away. Therefore, this policy reduces total walking time.

Chapter 4 studied the effect of student commute time on university presence and academic achievement. Many governments in the world subsidise university education because social returns to education are expected (Rauch, 1993; Moretti, 2004). Chapter 4 did *not* aim to provide a full cost-benefit analysis on subsidising university education, but it has important implications for the *way in which* governments should subsidise university education. Chapter 4 developed a theoretical model which predicted that students with a longer commute time (i) visit the university less often, but (ii) conditional on visiting the university on a given day, students with a longer commute time stay longer. This model also predicted that (iii) the weekly hours present remain the same, while (iv) academic achievement falls with commuting time. This result is intuitive, because by coming less often and staying longer, students with longer commutes use their time at the university less efficiently. Chapter 4 then tested for these predictions using information on Dutch university students. It appears that above theoretical predictions are true in our data. To be more specific, it appears that an additional hour of one-way commuting time induces students to reduce their presence by 0.65 days per week. Although total time present per week therefore hardly depends on commute time, we have evidence that students with long commute times have lower average grades, but the magnitude of this effect is unclear.

The finding that student commute time decreases student productivity (at least to some extent) has interesting implications for government and university policies, because student commute times are often explicitly, but also implicitly, affected by these policies. Our finding

that commute time decreases academic achievement suggests that subsidizing education through public transport subsidies (as occurs in the Netherlands and Germany, for example), is likely less efficient than subsidising university education in other ways (e.g., lowering tuition fees). The opposite should hold true for subsidies for university accommodation close to the university.

Chapter 5 was about student ownership and on-campus use of mobile IT devices like laptops, tablets, and smartphones. The upsurge of mobile IT device ownership among university students may potentially have important implications for the supply of university IT facilities. Chapter 2 has shown that free provision of university computers leads to inefficiencies like university computer hoarding during peak moments. Clearly, a good case could be made for university Bring Your Own Device (BYOD) strategies for an *efficiency* point of view. From an *equity* viewpoint, IT practitioners and teaching staff still have many uncertainties regarding university BYOD strategies. For example, it is not known how university BYOD strategies would affect in particular the 'socio-economically weak segment of students' (e.g., Atkinson et al., 2005; Kirkwood and Price, 2005; Margaryan et al., 2011). There are, in general terms, three main reasons why a student may be negatively affected by university BYOD strategies: (i) the student has no access to mobile IT technologies; (ii) the student finds it cumbersome to bring a laptop or tablet to the university; and (iii) the student has a preference for university computers. Using (binary and multinomial) logit models, Chapter 5 tested to what extent student income, parental income, gender, being of immigrant origin and living situation (e.g., living with parents) have an effect on laptop, tablet, and smartphone ownership. In addition, Chapter 5 studied the propensity of bringing these mobile IT devices to the university, and the attitudes of students towards making laptop use mandatory. It appears that student income, parental income, gender, second generation immigrant, and household type (e.g., living with parents) have a statistically

significant but small effect on mobile IT device ownership. The demand for tablets is relatively income inelastic, and the demand for laptops and smartphones extremely so. Therefore ownership rates are high for all student groups, including lower income students. However, students leave their laptops (and tablets) at home most of the time, mainly because they find it cumbersome to carry a laptop, and the vast majority of students hold the opinion that abolishing computer labs while facilitating laptop use is a bad idea, despite the didactical advantages this may have during lectures. Thus, it appears that the current high ownership rates of mobile IT devices by no means imply students' preference or support for university Bring Your Own Device (BYOD) strategies. Hence, even though a good case could be made for BYOD strategies from an efficiency viewpoint, several important objections need to be taken into account from practical perspective.

The present dissertation has focused on rather diverse kinds of (semi-) public facilities, which were either (i) priced (parking spaces), (ii) non-priced (university computers), or (iii) *indirectly* priced (university facilities). In the present dissertation, I have analysed the consequences of (not) pricing these facilities in an adequate way. In case of parking and computer use, a too low price leads to hoarding, which is inefficient. In case of university facilities, subsidies to commute travel may have the unintended effect that students will choose residence locations farther from universities, which reduces the optimal use of university facilities and therefore their grades (at least to some extent).

University facilities (including university computers) and parking spaces have in common that they require substantial investments that are largely irreversible, which implies that these facilities are of little value when not used. This is an important issue particularly because the demand for the facilities may change over time and is often highly uncertain at the moment

of investment. For example, the use of (semi-) public computers depends strongly on the availability of substitutes, most notably mobile IT devices.

In the empirical studies of this dissertation, the *supply* of public facilities was typically regarded as given. It was shown that policy makers can steer public facility use to a considerable extent. This indicates that it is often prudent not to make too large investment in the supply of public infrastructure. In case that demand is larger than expected, the policy maker may increase the price of facility use. When it turns out that there is structural excess demand for the use of the public facility, then the high price will be an indicator to justify additional investments in the supply of the public facility. In case the demand is *lower* than expected, additional investments are not necessary, of course. In extreme cases, the price of good use can be reduced towards zero.

The pricing of public facilities is not always a popular measure, and may lead to resistance. Not seldom, equity arguments are used to oppose the pricing of public facilities. Policies regarding mandatory use of laptops are sometimes regarded as unfair, because students with lower incomes supposedly cannot afford laptops (Atkinson et al., 2005; Kirkwood and Price, 2005; Margaryan *et al.*, 2011). This turns out to be untrue because, in the present dissertation, I have shown that the demand for laptops is rather income *inelastic*. Similarly, subsidies to parking are usually seen as a way to help poor car drivers, while most car drivers are relatively rich, so most subsidies to parking benefit the rich (Shoup, 2005).

The outcomes of the present dissertation can be used to make a case in favour of pricing of public facility use, in particular when facility use leads to externalities to the general public.