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Title and Abstract

Title: Commuting for meetings

Abstract

Urban traffic congestion is a significant burden on developed economies. As most people know from experience, the costs of congestion are not only related to the (average) delay. The difficulty or even impossibility of predicting travel time is also an inherent feature of urban congestion and should be taken into account by economic analysis.

Many efforts to incorporate the cost of random delays into policy assessment have drawn on a model of preferences regarding the timing and duration of a trip. Such scheduling preferences were first introduced in Vickrey (1969, 1973) has led to a substantial literature on the value of random travel time variability (Noland and Small, 1995; Bates and al., 2001; Fosgerau and Karlström, 2010; Engelson and Fosgerau, 2011 etc.). This literature considers a traveller about to undertake a trip where the

travel time is random; he chooses departure time to maximize expected utility, where utility depends on the departure time and the arrival time. It is then possible to examine how indirect utility depends on the distribution of random travel time. When we take into consideration that a traveller might be on his way to a meeting of some kind, it becomes clear that there are interactions involved that seem quite important. These interactions are overlooked by the literature just reviewed, which takes the perspective of a single individual.

We develop an economic model for a meeting between two people. The model describes two players each initially engaged in some activity from which they each derive utility at a declining rate. Each must choose a departure time from his activity, and after a random travel time with known distribution each arrives at the meeting. The players only derive utility at the meeting after both have arrived, and thus waiting for the other player is costly. Players choose departure time to maximize their payoff, the expected utility. We consider Nash equilibrium where neither player has incentive to change departure time given the departure time of the other and compare this to the set of Pareto optima.

Our findings may be summarized as follows. We find that Nash equilibrium exists in our model and is unique. A player's payoff depends on the joint travel time distribution of both players. Specifically, payoffs are non-increasing in the variance of the difference of travel times, which means that not only the variance of the individual travel times but also their correlation matters. These conclusions are natural but do not arise in the extant literature discussed above. Moreover, there is a continuum of Pareto optima in the model, and these Pareto optima correspond one-to-one to the probability that the first player is late. Nash equilibrium is not Pareto optimal, and there exists a continuum of Pareto optima that yield strict increases in payoff for both players relative to Nash equilibrium. With penalties to each player for arriving later than the other, it is possible to implement any Pareto optimum as a Nash equilibrium. Some Pareto optima may also be implemented through a scheme that compensates players for waiting for the other.

These results have implications that seem not to have been discussed before. First, evaluation of measures to reduce travel time variability could seek to take into account the interaction with other people than the travelers who are directly affected, namely those who might be waiting for the travelers when they arrive late. Second, there might be occasions where alternative policy measures have different effects on the distribution of travel times within a city. In such cases, the present results suggest that measures that have greater effect on the variance of differences in travel times for different transport corridors should be given more emphasis, ceteris paribus. Finally, employers could conceivably implement penalty or compensation schemes for their employees that lead to a Pareto optimum as the Nash outcome, where the penalty or compensation depends on the difference in arrival times.

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