

Exam Environmental and Transport Economics January 2015

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You get 3h to do this exam – it is an open book exam – please respect the number of lines to answer the question – Good Luck!

1. The national road that connects 2 cities is heavily congested. Assume there is more or less a constant demand for trips in the morning to go from O to D and in the afternoon, the flow is reversed. The road counts 2 times 3 lanes. The distance is 20 km and there is a good express bus service between the two cities. In the present equilibrium there are, per hour in one direction, 5940 cars going from O to D and there are 600 bus users. Each bus is used by 30 passengers. Individuals are indifferent between the two modes, they chose the mode with the lowest generalized cost. Value of time in the car and in the bus is 12 Euro/h. When there is no congestion the car trip takes 20 minutes. In the present equilibrium, the trip takes 30 min, so there is an extra delay of 10 min. The reason is that the total use of the road exceeds the capacity. Each of the 3 lanes has a capacity of 1500 vehicles per hour. Whenever the number of equivalent vehicles (= number of cars + 3xnumber of busses) exceeds this capacity there are extra delays (now 10 min more) – this delay increases linearly whenever the capacity is exceeded. If the total number of equivalent vehicles per lane is smaller than 1500, there are no delays. The generalized cost of a car trip consists of 5 Euro for the car costs + costs of time. The generalized cost of bus use for the passenger consist of ticket costs (2 Euro) + access costs to the bus stop (2 Euro) + expected waiting time + time costs. 2000 people live close to a bus stop, for all the other people the access cost to the bus stop is prohibitive. We assume the speed of a bus is identical to that of a car when they use the same lanes. A bus user has an additional waiting cost and we assume that the waiting cost is valued at 40 Euro/hour, with a uniformly distributed arrival time at the bus stop, his average waiting time is a function of the number of busses. Assume the total number of busses varies proportionally with the number of bus users as there are on average always 30 passengers per bus. The bus company break even thanks to a subsidy per passenger trip of 1 Euro. The new regional government is considering different alternatives to alleviate road congestion.

A. Calibrate a small model for this problem

B. A first alternative is to reserve one of the 3 lanes for busses. The government would then also eliminate the subsidy for the bus users. Compute the new equilibrium. (8 lines)

C. Is this a better alternative for society as a whole? (max 8 lines)

D. Another proposal is to leave all 3 lanes for cars and busses but to charge a congestion charge to cars and busses. Again the subsidy for busses is eliminated. Compute the new equilibrium (8 lines)

E. Is this a better equilibrium for society? (max 8 lines)

F. Still another proposal coming from young people is not to have bus lanes or congestion pricing but to install free wireless in the express busses like they did in Sweden. One would however keep the subsidy of one Euro per bus passenger. How would this affect the equilibrium and is it a good proposal?

2. Comment on this statement that I found in a brochure from the green movement.

“Whenever there is no real congestion pricing, an extension of road capacity can never be welfare improving”

Is it correct or not and why (max 8 lines)

3. The EU has a fuel efficiency regulation for cars. It forces every manufacturer that sells cars on the European market to have an average emission rate below 95 g of CO₂/ vehicles kilometer. Is this an efficient regulation? And if not can you suggest an alternative? (Max 10 lines)