LETTER

The smarter, the cleaner? Collaborative footprint: A further look at taxi sharing

A recent paper (1) states that a cultural shift and a transformative change is needed that changes consumption patterns to reduce human pressure on the environment (the environmental footprint of humanity), keeping it within planetary boundaries. The excellent paper of Santi et al. (2) addresses one of the new forms of consumption that could help in reaching this goal. Santi et al.'s report shows the feasibility of a shareable taxi service in New York City and its benefits: reduction in cost of service, total travel time, trips, vehicular traffic congestion, and air pollution.

However, a complete evaluation of the environmental sustainability of this approach requires considering not only direct impacts, but also indirect impacts linked to these new consumption patterns. The 40% total travel time cuts (or cumulative trip length) and the design of a faring system to share the reduction of costs involved between all of the participants would lead to a reduction in taxi fares that would have a double effect on consumer decisions: a substitution effect and an income effect. If these effects lead to extra emissions that partially or totally offset the original savings, a rebound effect is generated (3). This effect, which has been frequently studied in the analysis of the total environmental effects of efficiency solutions, is a key driver to assess carbon pressure of the taxi-sharing system.

The expected price reduction would lead to a transport modal shift (substitution effect) from alternative transportation modes—both cleaner (metro, bus, bicycle, walking) and dirtier (car)—that would now be in comparison less competitive than the taxi service. Therefore, falling taxi fares would result in a taxi services demand increase, with the concomitant rise in direct emissions. The income effect also contributes to rebound, but with an expected lower effect. First, transport is an emission-intensive activity, so almost any other alternative consumption choices will reduce harmful emissions. Second, if additional consumption goes to goods (instead of services), local emissions concentrations would be lower, because emissions in the production of goods are produced all over the global production chain (4).

Previous estimations, compiled by Flores-Guri (5), find that in New York City the price elasticity of taxi demand is in the range of −0.22 to −1.05. Therefore, a 40% decrease in price (a fair estimate considering the 40% reduction in travel time) would lead to an estimated increase in taxi demand in the range 8.8–42%. This is the substitution effect, to which must be added the harder-to-estimate income effect, leading to the overall rebound effect, which should be compared with the potential 40% reduction in direct emissions. Thus, at the lower range of this estimate there are still benefits from the proposal, but at the upper range of this estimate the proposal becomes effectively environmentally detrimental. If we define a "carbon collaborative footprint," including the rebound effect and quantifying CO_2 emissions embodied in the whole global production chain required to satisfy a certain collaborative consumption pattern, it would depend crucially on how much taxi demand is going to increase.

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