Research Title:

Designing pricing strategies for sustainable urban mobility futures via high-fidelity simulation of large-scale cities

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With continued development and intensification of Israel, the challenges of increased car usage, traffic congestion, air pollution and energy consumption as well as the availability of land for roads become more pressing. Demand-oriented solutions, particularly pricing schemes, have been increasingly considered as viable strategies for improved outcomes in cities. However, analytical method that adequately assessing the impacts of pricing schemes along with its equity, network performance, sustainability, and demand-supply interactions implications, are missing. This research aims to close this gap by using state-of-the-art high-fidelity large-scale simulations and tools where city-specific pricing strategies for a futuristic Tel-Aviv metropolitan area (for 2040) were examined and recommended. We quantify the effects of pricing strategies across large geographical areas together with future automated technologies on trip patterns, congestion, energy and emissions. Our results indicate that simply introducing an automated on-demand (AMoD) service with single and shared rides at half the cost of taxi would increase congestion by 4%, energy consumption by 12% and emissions by 1.4%. By Appling congestion charging together with AMoD, congestion would increase by 3.2% but emissions would decrease by 5%, and energy consumption will be left unchanged. A pricing policy which will enforce 25% reduction in cars owned per household would result in decreases in energy consumption and emissions by 7% and 9%, respectively. These outcomes suggest that infrastructure and demand-based pricing are likely to be effective, if are designed right, in reducing car trips and their harmful environmental consequences. We consider this an important avenue for further research. Additionally, both congestion pricing and car pricing strategies reduce the cannibalization of mass transit. In fact, pricing car ownership boosts the usage of mass transit. We expect these simulation results to provide valuable insights to policymakers and other researchers. Furthermore, they are of immediate value to cities similar to futuristic Tel-Aviv metropolitan area which are dense and mass transit oriented.