Exploring the dynamic relationship between mobility, the spread of COVID-19, and the role of vaccines *

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Abstract

The novel coronavirus disease 2019 (COVID-19) outbreak, which began at the end of 2019, has caused great turmoil worldwide and is yet to be contained. Therefore, mitigating the number of people infected by Coronavirus remains a major policy goal for several countries. The purpose of this study is to analyze the dynamic relationship between the mobility and the rate of change in the number of new infections in Japan. Another goal is to evaluate the effects of various policies, such as the human mobility control and vaccination, as well as the impact of climate factors on the number of infections.The analysis reveals that: [1] in the early stages of the emergency declaration, a certain effect on infection control was observed, but in the later stages when the emergency declaration was repeatedly invoked, no effect was observed at all; [2] in contrast, the recent increase in the infection rate had a deterrent effect on the subsequent spread of infection, and this phenomenon, which may have been caused by self-restraint, was even stronger in the recent period; [3] vaccination rates had no significant effect in terms of reducing the susceptible population, but it did significantly reduce the relationship between the increase in the flow of people and the rate of change in the number of newly infected people, suggesting that it may be useful in implementing economic revitalization policies.

Keywords: COVID-19, Vaccination, impulse response analysis, SIR model, mobility control policy

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