Driving restrictions have been used in many cities to alleviate air pollution and traffic congestion, such as Mexico City, Sao Paulo and Bogota. In order to successfully hold the Olympic Games in 2008, a series of driving restrictions was implemented in Beijing to mitigate air pollution and traffic congestion. This paper tries to answer the question whether the car driving restrictions and purchase lottery could effectively improve air quality in Beijing. The graph and table below show the policy timeline.

**Introduction**

Driving restrictions have been used in many cities to alleviate air pollution and traffic congestion, such as Mexico City, Sao Paulo and Bogota. In order to successfully hold the Olympic Games in 2008, a series of driving restrictions was implemented in Beijing to mitigate air pollution and traffic congestion. This paper tries to answer the question whether the car driving restrictions and purchase lottery could effectively improve air quality in Beijing. The graph and table below show the policy timeline.

**Methodology**

1. **The effects of driving restrictions on air quality**
   1) The first model estimates the effects of driving restrictions on aggregate API which is calculated from the station-level API using the stations in restricted areas (i.e. within 5th ring areas).
   2) The second model estimates the effects of driving restrictions on station-level API using station fixed effects.
   3) The third model compares the effects of driving restrictions on restricted areas and non-restricted areas.

2. **The effects of driving restrictions on public transportation and congestion**
   The last model estimates the effects of driving restrictions on public transportation and congestion. The outcome variable could be subway ridership, bus ridership, total public transportation ridership and congestion index (All in log form).

   The models are shown on the left below, and the graph on the right below shows the discontinuities of aggregate API occurred at the point of policy change.

**Conclusion and Discussion**

1. There are strong evidence that driving restrictions are effective in Beijing, especially the odd-even one during Olympics, in the sense that air quality is improved and there are more public transportation use and less congestion.
2. Stricter enforcement (more penalty to violators) does improve air quality significantly.
3. Both the restricted areas and non-restricted areas have air quality improvement during the restrictions periods, though the effects in non-restricted areas are not as large as those in restricted areas. One possible explanation is that driving within 5th ring areas and outside 5th ring areas are complements but not perfect complements.
4. Driving in restricted days and non-restricted days are substitutes.

**Beijing V.S. Mexico City**

A question is naturally occurred that why driving restrictions are effective in Beijing but not in Mexico City. From my perspective, it is due to the following reasons.

1. Car purchase lottery in Beijing reduces the possibility for people to buy a second car to some extent.
2. Many households in Beijing are struggling to buy houses and cannot afford to buy a second car just to substitute for the previous car on the restricted days.
3. Beijing has very cheap public transportation, so there would be a large number of people who would turn to low emission public transportation instead of driving.
4. Davis (2008) points out that in Mexico City, public transportation and private cars are kind of complements, because many subway and bus stations are remote and people should drive private cars to get there. But in Beijing, it is not the case. Public transportation system is dense and convenient, so it should be substitute of private cars instead of complement as in Mexico City.

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