# The Impact of Municipal Mergers on River Water quality
## －Evidence from Water Monitoring Data in Taiwan－

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### 1. Background

Lipscomb and Mobarak (2017) indicated that the change of county borders can affect water quality since the incentive of making external cost for downstream residents had increased after huge county splits. This paper aims to identify the impact of municipal mergers on river water quality, since the conflict of water usage between countries or sectors in response to the continuing trend of globalization and international competition is not only a global concern but also one of the trickiest issues in Taiwan. I used DID design with the monthly river water monitoring data from 2006-2020 and the event of new special municipalities establishment and municipal merger in Taiwan.

Rivers, the main and common source of fresh water in Taiwan, have been dammed and polluted to meet various demand for water use, electricity generation and even semiconductor manufacturing process, which led to conflicts over water resources between domestic and industrial sector.

Therefore, central, and local government had implemented the plan of constructing wastewater pipe and recycling system from 1992 together. This plan aims to keep the pollutant in domestic wastewater from entering the river and recycle them as the water resource for industrial use.

At the same time, Taiwan also experienced a huge change of administrative boundaries after 2010. Four new special municipalities have been established, and three of them are created by merging neighboring cities and counties. Those new special Municipalities can assign the president of district where is under their control and hire more officials, which makes the mayor of special municipalities responsible for more political responsibilities such as residents' welfare than the mayor of cities/counties. Moreover, after municipal merger, the number of local governments a river can pass through might decrease, which reduce the communication cost, and the time of paper works for water management between local governments. Hence, in this paper, I assume the river water quality will be improved in those new special municipalities and municipal mergers than general cities/counties.

### 2. Methods and Data

This paper use DID design with 15 years monthly water quality data from 299 river water monitoring stations in Taiwan. Biochemical Oxygen Demand (BOD) is the water quality index that was used as dependent variable in the analysis. The higher the magnitude, the dirtier the water is. I also used station fixed effect and clustered at river-level to capture time-invariant individual traits and some unobservable spatial characteristics between stations in the same river, respectively. Due to station fixed effect, there is no coefficient of treatment dummy was missing in the estimation results. To check the common trend assumption, I used river water quality index from each monitoring station in 2010 as benchmark to conduct event study. Figure shows that around 2006-

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2012, there is few impacts of new SMs or Municipal mergers on river water quality improvement. The structural gap is happened from 2013, two years later after new SMs and municipal mergers showed up.

## 3. Results

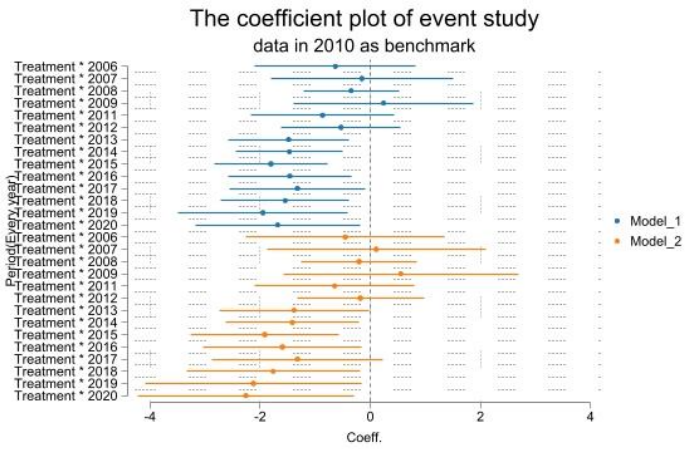
The estimation results of DID design shows that the new special municipalities and municipal mergers reduce the magnitude of water quality index, Biochemical Oxygen Demand (BOD), by 1.19 mg/L and 1.38 mg/L, respectively. With the information from the figure of event study, the impact of new SMs or Municipal mergers on river water quality improvement took quite a while to be effective because the aggregation of new local governments, bureau creation and recruiting and training new officials might take times.

## 4. Conclusion

River water quality has improved in new special municipalities and municipal mergers. The change of administrative boundaries might can be the tool of improving water quality.

## 5. Reference

Lipscomb, M., and A. M. Mobarak, (2017) Decentralization and Pollution Spillovers: Evidence from the Re-drawing of County Borders in Brazil. The Review of Economic Studies, 84(1) (298).




Estimation Results

| | (1) | (2) |
|---|---|---|
| After2010 | 0.1629 | 0.1629 |
| | (0.202) | (0.202) |
| Treat_NewSM | 0.0000 | |
| | (.) | |
| DIDestimator | -1.1875** | |
| | (0.563) | |
| Treat_Merger | | 0.0000 |
| | | (.) |
| DIDestimatorM | | -1.3817* |
| | | (0.727) |
| Constant | 4.4638*** | 4.6919*** |
| | (0.163) | (0.183) |
| Observations | 38886 | 33915 |
| $R^2$ | 0.3870 | 0.3986 |
| Adjusted $R^2$ | 0.3829 | 0.3945 |
| F | 2.2340 | 1.8160 |
| Station FE | Yes | Yes |
| Cluster SE at River-level | Yes | Yes |

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$