

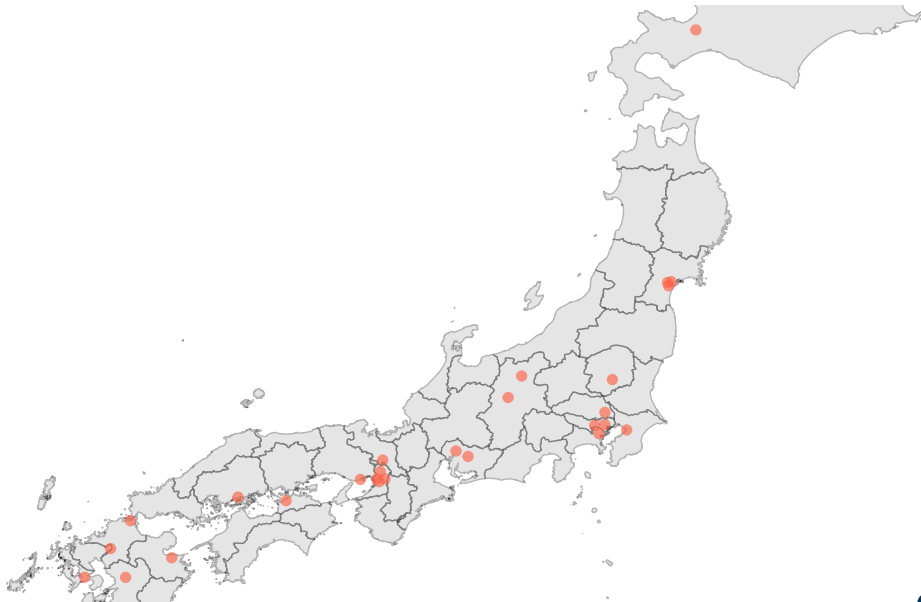
IMPACT OF STADIUMS ON RESIDENTIAL LAND VALUES

EVIDENCE FROM JAPAN

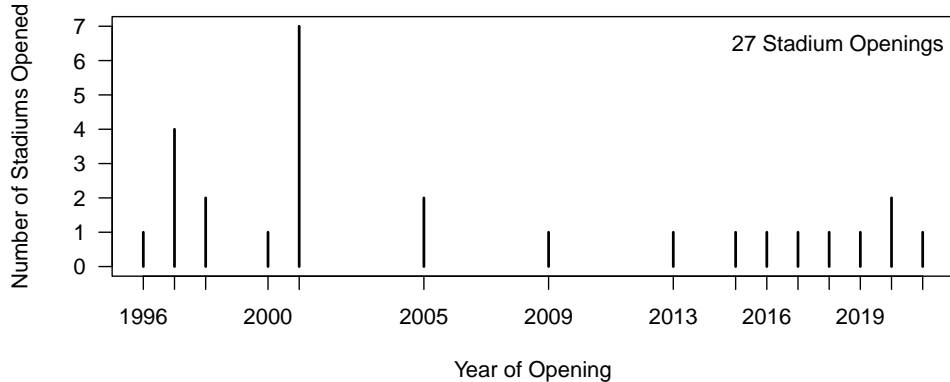
Hiroaki Funahashi Alexander Cardazzi

RESEARCH QUESTION

- ▶ What is the effect of stadium openings on land values?
 - ▶ Positive: Tu (2005), Ahlfeldt & Maennig (2010), Ahlfeldt & Kavetsos (2014), Chikish et al. (2019)
 - ▶ Negative: Dehring et al. (2007), Joshi et al. (2020), Humphreys & Nowak (2017), Hyun (2022)
- ▶ While this question has been studied extensively, we contribute to the literature by:
 - ▶ Studying Japan, a new setting in this space.
 - ▶ Using novel data and up-to-date methodologies.
- ▶ We explore stadium openings across Japan between 1995 through 2022.
 - ▶ Land Market Value Publication (LMVP) is released by the Ministry of Land, Infrastructure, Transport, and Tourism.
 - ▶ Collect a panel of parcel-by-year per-square-meter land values.
 - ▶ We compare parcels near (within 5 km of) early-opening stadiums to parcels near later-opening stadiums.
 - ▶ Parcel fixed effects allow for a repeat-sales type of analysis.



IDENTIFICATION: TIMING OF STADIUM OPENINGS



DIFFERENCE-IN-DIFFERENCES (TWFE)

$$\ln(\text{Land Value}_{it}) = \delta \times \text{Open}_{s(i)t} + X_{it}\beta + \alpha_i + \tau_t + \epsilon_{it}$$

Control Variables:

- | | | |
|-----------------------|-----------------------|------------------------|
| ▶ Floor Area Ratio | ▶ log(Dist. to Train) | ▶ % of Pop. Aged 65 |
| ▶ Acreage | ▶ Gas | ▶ Pop. Density |
| ▶ Building Coverage | ▶ Sewage | ▶ log(Per-Capita Inc.) |
| ▶ log(Habitable Area) | | ▶ Fiscal Soundness |

DIFFERENCE-IN-DIFFERENCES (TWFE)

TABLE 1: Effect of Stadium Construction on Land Values

	log(Land Value)	
Stadium Opened	-0.020 (0.033)	-0.007 (0.018)
Controls	No	Yes
Parcel FE	Yes	Yes
Year FE	Yes	Yes
R2 Adj.	0.972	0.983
Num.Obs.	17388	17388

TABLE 2: Goodman-Bacon Decomposition

Comparison	Weight	Estimate
Earlier vs Later Treated	0.497	0.025
Later vs Earlier Treated	0.503	-0.065
Aggregate	1.000	-0.020

Notes: N = 17,388

Method 1: Local Projections DiD – Compare treated units to only “clean” control units. [\(go to math\)](#)

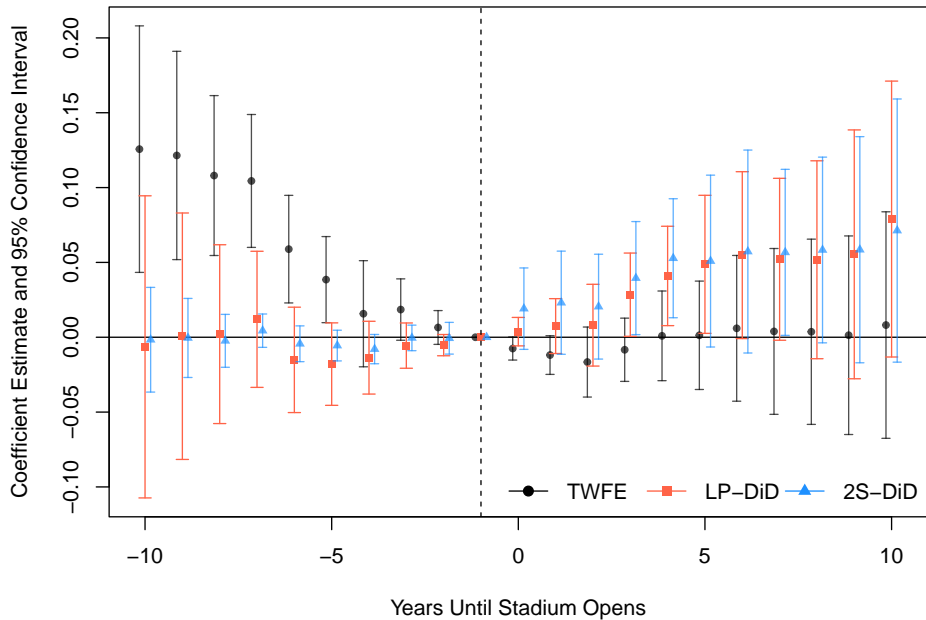
Method 2: Two-Stage DiD – Use untreated observations to get unbiased estimates of FEs. Subtract these FEs from the full sample, and estimate the DiD parameter after.

[\(go to math\)](#)

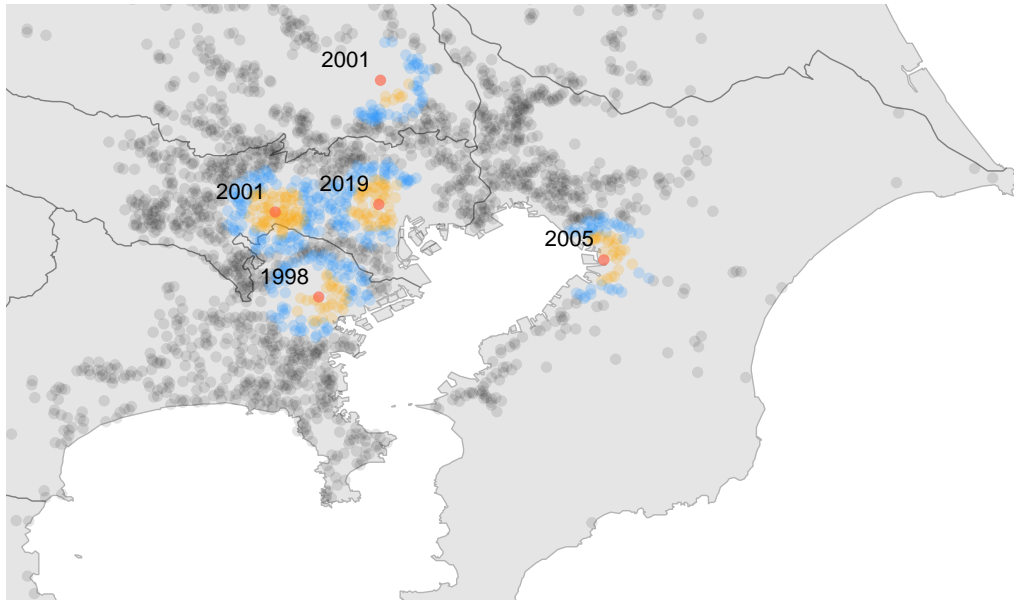
TABLE 3: Effect of Stadium Construction on Land Values

	log(Land Value)				
Stadium Opened	-0.007 (0.018)	0.008 (0.020)	0.000 (0.018)	0.044** (0.021)	0.044*** (0.014)
Estimator	TWFE	TWFE	TWFE	2S-DiD	LP-DiD
Controls	Yes	Yes	Yes	Yes	Yes
Parcel FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Sample	Full	Year < 2021	Year < 2021	Year < 2021	Year < 2021
Comparison	Full	Full	-10 to -1 vs 0 to 10	-10 to -1 vs 0 to 10	-10 to -1 vs 0 to 10
R2 Adj.	0.983	0.984	0.985	0.148	0.664
Num.Obs.	17388	16744	16744	16744	7827

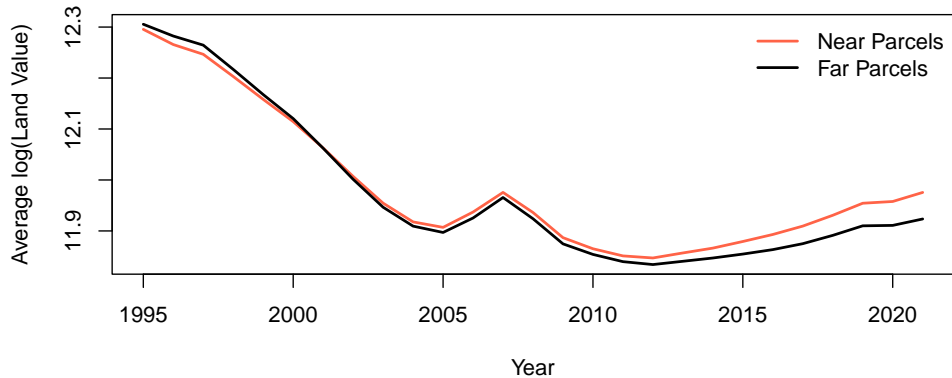
Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the stadium level. Estimations only include parcels that are within five kilometers of a new stadium. All columns that do not say "Full" exclude data from 2021 for comparability reasons.



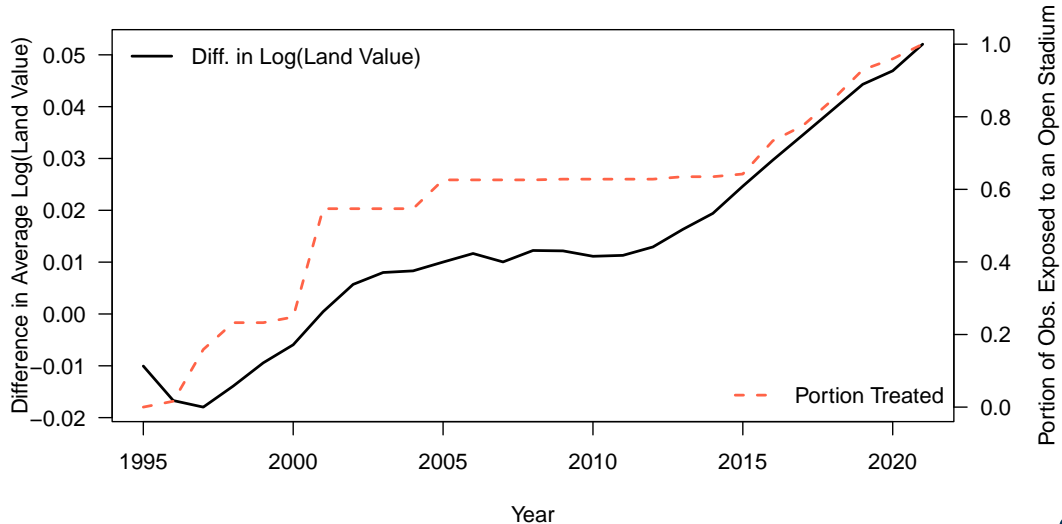
BUT WHAT ABOUT “FAR” PARCELS?



PRICE TRENDS OF NEAR AND FAR PARCELS



DIFFERENCE BETWEEN NEAR AND FAR PARCELS



INCORPORATING “FAR” PARCELS

- ▶ Our first analysis leverages the timing of stadium openings for identification.
- ▶ Most other studies in the literature use proximity to the stadium for identification.
- ▶ Given the structure of our data, we can combine these two approaches. We can examine the difference in price between near and far parcels of early-opening stadiums before and after relative to the near-far price difference for later-opening stadiums.
 - ▶ This makes for a **triple difference** design, or DiDiD.
 - ▶ Olden & Møen (2022) demonstrate that only a single parallel trends assumption is needed for valid inference, so long as the assumption is violated in the same way across groups.

INCORPORATING “FAR” PARCELS

$$\ln(\text{Land Value}_{it}) = \delta \times (\text{Open}_{s(i)t} \times \text{Near}_i) + X_{it}\beta + \alpha_i + \tau_{s(i)t} + \epsilon_{it}$$

WHERE: $\tau_{s(i)t}$ controls for stadium-by-year effects

TABLE 4: Goodman-Bacon Decompositions

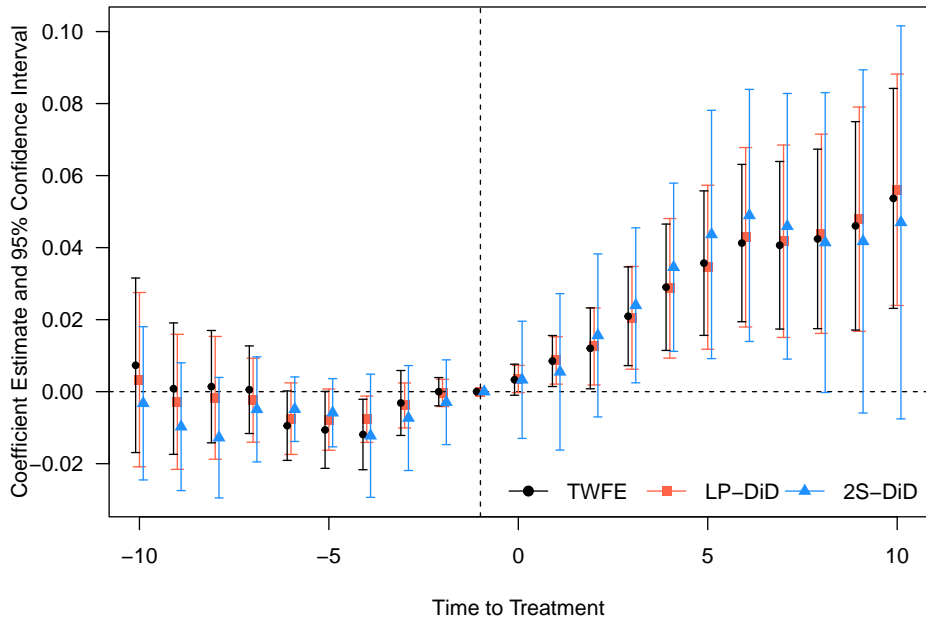
Comparison	Near Parcels		Far Parcels	
	Weight	Estimate	Weight	Estimate
Earlier vs Later Treated	0.497	0.025	0.456	-0.014
Later vs Earlier Treated	0.503	-0.065	0.544	-0.068
Aggregate	1.000	-0.020	1.000	-0.043

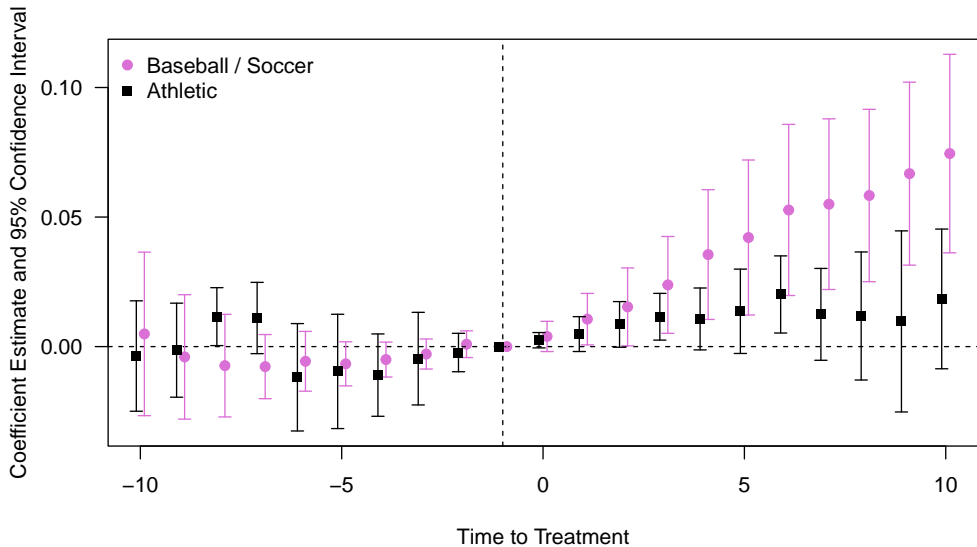
Notes: Number of “Near” and “Far” observations: 17,388 and 22,761.

TABLE 5: Effect of Stadium Construction on Land Values

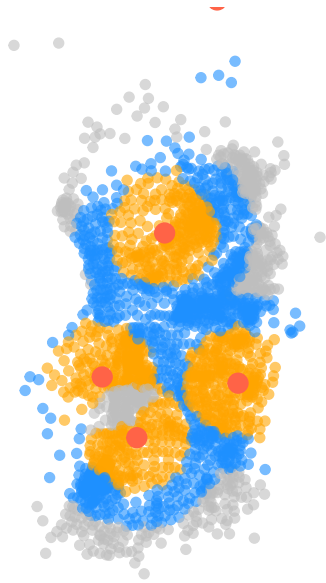
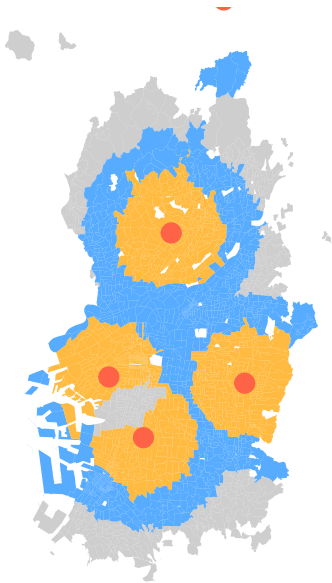
	log(Land Value)				
Stadium Opened x Near	0.038*** (0.010)	0.039*** (0.010)	0.029*** (0.008)	0.029** (0.013)	0.029*** (0.007)
Estimator	TWFE	TWFE	TWFE	2S-DiD	LP-DiD
Controls	Yes	Yes	Yes	Yes	Yes
Parcel FE	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	No	Yes	No
Stadium-Year FE	Yes	Yes	Yes	No	Yes
Sample	Full	Year < 2021	Year < 2021	Year < 2021	Year < 2021
Comparison	Full	Full	-10 to -1 vs 0 to 10	-10 to -1 vs 0 to 10	-10 to -1 vs 0 to 10
R2 Adj.	0.992	0.992	0.992	0.099	0.823
Num.Obs.	40149	38662	38662	38662	28902

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the stadium level.





BUT WHAT ABOUT MARKET DATA?



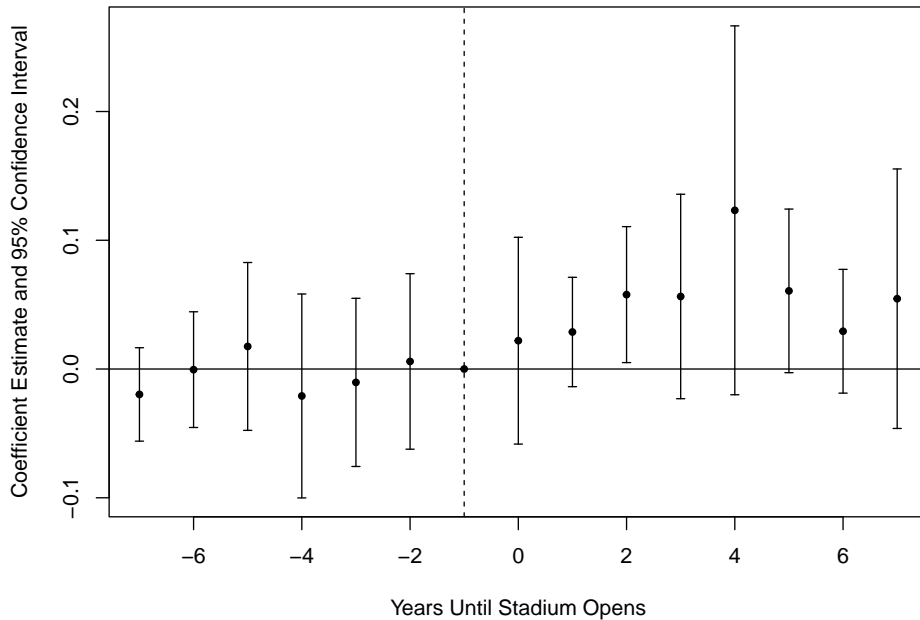
$$\begin{aligned} \ln(\text{Price}_{it}) = & \delta (\text{Open}_{s(i)t} \times \text{Near}_{d(i)}) + \beta \ln(\text{Area}_i) \\ & + \alpha_{d(i)} + \tau_{c(i)s(i)t} + S_{d(i)} + U_{d(i)} + \epsilon_{it} \end{aligned}$$

WHERE: $\tau_{c(i)s(i)t}$ controls for city-by-stadium-by-quarter effects
 $S_{d(i)}$ controls for parcel shape-by-district
 $U_{d(i)}$ controls for parcel use-by-district

TABLE 6: Effect of Stadium Construction on Transaction Prices

	log(Transaction Price)	
Stadium Opened x Near	0.046** (0.017)	0.048** (0.018)
Controls	Yes	Yes
District FE	Yes	Yes
Year-Quarter-Stadium FE	Yes	Yes
Year-Quarter-City FE	Yes	Yes
R2 Adj.	0.738	0.738
Num.Obs.	93051	93051

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Standard errors are clustered at the stadium level.



We find robust evidence of stadium openings increasing land values.

- ▶ Our estimates suggest an increase in land value of about 4.4%, most of which (68%) is due to proximity.
- ▶ Effects concentrate in team-centric stadiums.
- ▶ Our results are robust to alternative definitions of “near” and “far.”
- ▶ A limitation is that we use assessment values rather than transaction prices.
 - ▶ Assessments are determined by transaction prices, and typically 1.1-1.2x transaction price (Nakagawa et al. 2009, Kanasugi & Ushijima 2018, ?).
 - ▶ We find qualitatively similar results using transaction data, but have less of a timeline to work with. We also sacrifice our repeat-sales set up.

$$\text{TWFE : } Y_{i,t} = \delta^{DD} D_{i,t} + \mu_i + \tau_t + u_{it}$$

$$\begin{aligned} Y_{i,t} - Y_{i,t-1} &= (\delta^{DD} D_{i,t} + \mu_i + \tau_t + u_{i,t}) \\ &\quad - (\delta^{DD} D_{i,t-1} + \mu_i + \tau_{t-1} + u_{i,t-1}) \\ &= \delta^{DD} \Delta D_{it} + (\mu_i - \mu_i) \\ &\quad + (\tau_t - \tau_{t-1}) + (u_{i,t} - u_{i,t-1}) \end{aligned}$$

$$Y_{i,t} - Y_{i,t-1} = \delta^{DD} \Delta D_{it} + \tau_t + u_{it}, \text{ where } D_{i,t} = 0 \text{ or } \Delta D_{i,t} = 1$$

$$Y_{i,t+h} - Y_{i,t-1} = \delta_h^{DD} \Delta D_{it} + \tau_t^h + u_{it}^h, \text{ where } D_{i,t+h} = 0 \text{ or } \Delta D_{i,t} = 1$$

$$\text{TWFE : } Y_{i,t} = \delta^{DD} D_{i,t} + X_{it} \beta + \mu_i + \tau_t + u_{it}$$

$$\text{Stage 1 : } Y_{it} = \mu_i + \tau_t + X_{it} \beta + u_{it}, \text{ where } D_{it} = 0$$

$$\text{Stage 2 : } Y_{it} - \widehat{\mu}_i - \widehat{\tau}_t - X_{it} \widehat{\beta} = \delta D_{it} + u_{it}$$

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