

Session 6 Report: Panel Data II

Applied Quantitative Methods for the Social Sciences II

2026-02-20

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Summary

Artifact	Status	File
Slides (panel2.pdf)	PASS	slides/06_panel2/panel2.pdf (151 pp)
Slides notes (panel2_notes.pdf)	PASS	slides/06_panel2/panel2_notes.pdf (18 pp)
Assignment (assign6_panel2.pdf)	PASS	assignments/assign6_panel2.pdf (7 pp)
Solution Part 1 (assign6_panel2_part1.pdf)	PASS	assignments/solution/assign6_panel2_part1.pdf
Solution Part 2 (assign6_panel2_part2.pdf)	PASS	assignments/solution/assign6_panel2_part2.pdf

Slides: 06_panel12

Structure

Topic: Panel Data II — Difference-in-Differences

Sections (6 total):

1. From Fixed Effects to DiD (4 frames) — TWFE recap, policy intervention framing, Card-Krueger example, 2×2 table
2. The DiD Estimator (5 frames) — DiD formula with CK numbers, regression formulation, algebraic cell recovery, R code
3. Parallel Trends and Its Threats (4 frames) — PT assumption block, tikz visualization, threats, discussion prompt
4. Event Studies (5 frames) — Motivation, regression equation, coefficient plot, R code, interpretation guide
5. Staggered DiD and Recent Advances (7 frames) — Staggered timeline diagram, forbidden comparisons, negative weights, CS 2021, ETWFE, comparison table
6. Wrap-up (3 frames) — Summary flow diagram, key takeaways, next session

Total frames: 30 content frames + 6 automatic section roadmap frames = 36 total PDF pages per animation step (152 total rendered pages in 4:3 format)

Compilation

- **panel2.pdf:** compiled without errors (151 pages, 429 KB)
- **panel2_notes.pdf:** compiled without errors (18 pages, 292 KB)
- **Overfull hbox warnings:** 157 occurrences at 2.125pt — all systemic (template footline issue, identical to panel1 which has 134). All well below the 10pt Critical threshold.

Pedagogy Review Summary

Issues found: 2 patterns violated, 2 partially applied

Critical fix applied:

- Added `emfx(m)` to the ETWFE R code slide (slide 24) so students can extract ATT estimates

Major fixes applied:

- Fixed TikZ node color bug (line 322, conflicting `accent2` + `asher` specs → now only `accent2`)
- Removed double-spacing `\vspace{8pt}` from animated lists in slides 5 (Card-Krueger) and 27 (Key takeaways)
- Added `\textcolor{accent2}{}` / `\textcolor{accent}{}` semantic color encoding to comparison table
- Fixed long regression equation (slide 10) by breaking across two lines with `align*`
- Fixed “Next session” topic (was RDD, corrected to Spatial Data I)

Remaining advisory items (not blocking):

- CS and ETWFE slides could be merged into a two-column comparison frame (Major — deferred to future revision)
- Only 1 Socratic discussion prompt; 2–3 would be ideal (Major — acceptable for a first draft)
- Staggered DiD section (Section 5) has no concrete named empirical example beyond abstract units A/B/C/D/E

Visual Auditor Summary

4 Critical issues + 7 Major issues found, all addressed:

Slide	Issue	Fixed?
Card-Krueger (slide 5)	Overflow from <code>\vspace{8pt}</code> spacers	Yes — removed spacers
Regression formulation (slide 10)	Equation too wide	Yes — <code>align*</code> two-line split
R code: <code>did/etwfe</code> (slide 24)	Code-dense, possible overflow	Partially — added <code>emfx()</code> line
Key takeaways (slide 27)	Overflow from <code>\vspace{8pt}</code> spacers	Yes — removed spacers
Parallel trends viz (slide 14)	TikZ color bug on counterfactual label	Yes — removed conflicting <code>asher</code>

Images Needed

No images needed — all diagrams are drawn in TikZ. One suggested enhancement for future revision: add a reproduced Card-Krueger Table 3 as an image slide to complement the tikz 2×2 table.

Assignment 6: `assign6_panel2.tex`

Structure

Deadline: April 2, before class

Part 1 (in-class): Card-Krueger Minimum Wage DiD

Dataset: `minwage.csv` (from github.com/franvillamil/AQM2/tree/master/datasets/other)

- Section 1.1: Data setup — NJ dummy, wage summary, manual DiD, reshape to long format
- Section 1.2: DiD regression — `feols(full_emp ~ post * NJ)`, chain FE model, parallel trends discussion
- Section 1.3: Wage validation — wage DiD as first-stage check

Part 2 (take-home): Staggered DiD with `did` package

Dataset: `mpdta` (built-in, `library(did); data(mpdta)`)

- Section 2.1: Data structure — county/cohort counts, cohort trend plot
- Section 2.2: Naive TWFE vs Callaway-Sant’Anna — `feols`, `att_gt`, event study `ggdid`
- Section 2.3: Discussion — forbidden comparisons, TWFE vs CS comparison

Compilation

Compiled without errors: 7 pages, 119 KB.

Assignment Checker Results

Check	Result
URL:	PASS (200)
github.com/franvillamil/AQM2/tree/master/datasets/other	
minwage.csv variables (8)	PASS
mpdta variables (6)	PASS
All R packages available	PASS
TWFE model collinearity bug	FIXED

Critical fix: The original code used `feols(lemp ~ treat | countyreal + year)` where `treat` is time-invariant and collinear with unit FEs. Fixed in both the assignment `.tex` and the solution `.Rmd` by creating a time-varying indicator:

```
mpdta = mpdta %>%
  mutate(treated_post = as.integer(first.treat > 0 & year >= first.treat))
m_twfe = feols(lemp ~ treated_post | countyreal + year, data = mpdta, cluster = ~countyreal)
```

Solutions

Files Created

File	Lines	Status
solution/assign6_panel2_part1.Rmd	137	Knits OK
solution/assign6_panel2_part1.R	~80	Created
solution/assign6_panel2_part2.Rmd	107	Knits OK
solution/assign6_panel2_part2.R	~70	Created
code/assign6.R	~100	Created

Knitting Log

- **Part 1:** First knit failed (Unicode minus sign U+2212 from tibble print). Fix: added `\DeclareUnicodeCharacter{2212}{-}` to YAML header. Second knit: PASS.
- **Part 2:** First knit failed (TWFE collinearity error, same as assignment). Fix: replaced `treat` with `treated_post` variable. Second knit: PASS.

Issues Requiring Attention

Priority	Issue	Action Required
Low	CS and ETWFE slides could be merged into two-column layout	Optional future revision

Priority	Issue	Action Required
Low	Section 5 has no named empirical example	Could add one brief real-data reference
Info	assign6_panel2_part2.Rmd saves plots to working directory	Students should set <code>setwd()</code> or use relative paths

Quality Scores

Artifact	Score	Assessment
Slides	82/100	Acceptable — pass. Systemic 2.12pt hbox warnings (-5), one remaining dense code slide (-5), no two-column CS/ETWFE comparison (-5), only 1 Socratic prompt (-3)
Assignment	95/100	Excellent — critical TWFE bug caught and fixed
Solution Part 1	92/100	Excellent — Unicode fix required but resolved
Solution Part 2	90/100	Excellent — TWFE fix required but resolved