

# 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\_panel2

### 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, 2x2 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 `\emph{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 \vspace{8pt} spacers	Yes — removed spacers
Regression formulation (slide 10)	Equation too wide	Yes — align* two-line split
R code: did/etwfe (slide 24)	Code-dense, possible overflow	Partially — added emfx() line
Key takeaways (slide 27)	Overflow from \vspace{8pt} spacers	Yes — removed spacers
Parallel trends viz (slide 14)	TikZ color bug on counterfactual label	Yes — removed conflicting asher

## 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](https://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
<b>TWFE model collinearity bug</b>	<b>FIXED</b>

**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.R Students should set <code>setwd()</code> or use relative paths saves plots to working directory	students should set <code>setwd()</code> or use relative paths

## Quality Scores

Artifact	Score	Assessment
Slides	<b>82/100</b>	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	<b>95/100</b>	Excellent — critical TWFE bug caught and fixed
Solution Part 1	<b>92/100</b>	Excellent — Unicode fix required but resolved
Solution Part 2	<b>90/100</b>	Excellent — TWFE fix required but resolved