Parallel Trend Assumption

DiD example

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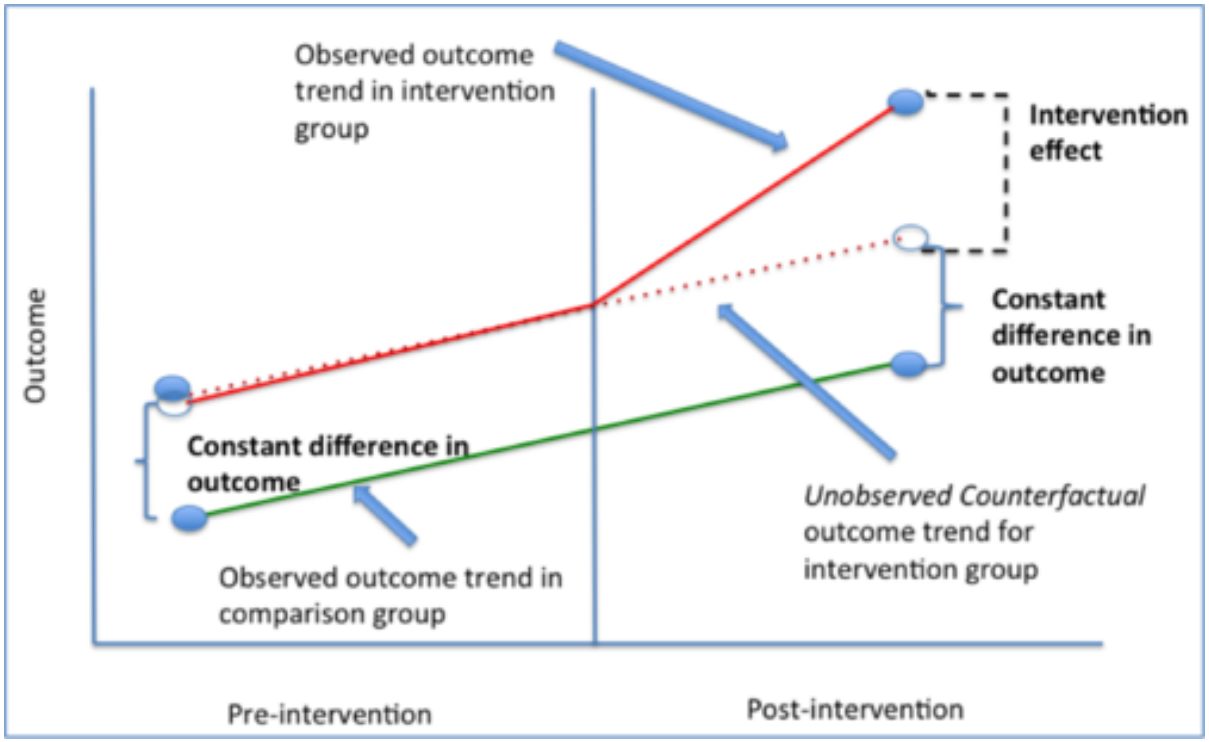
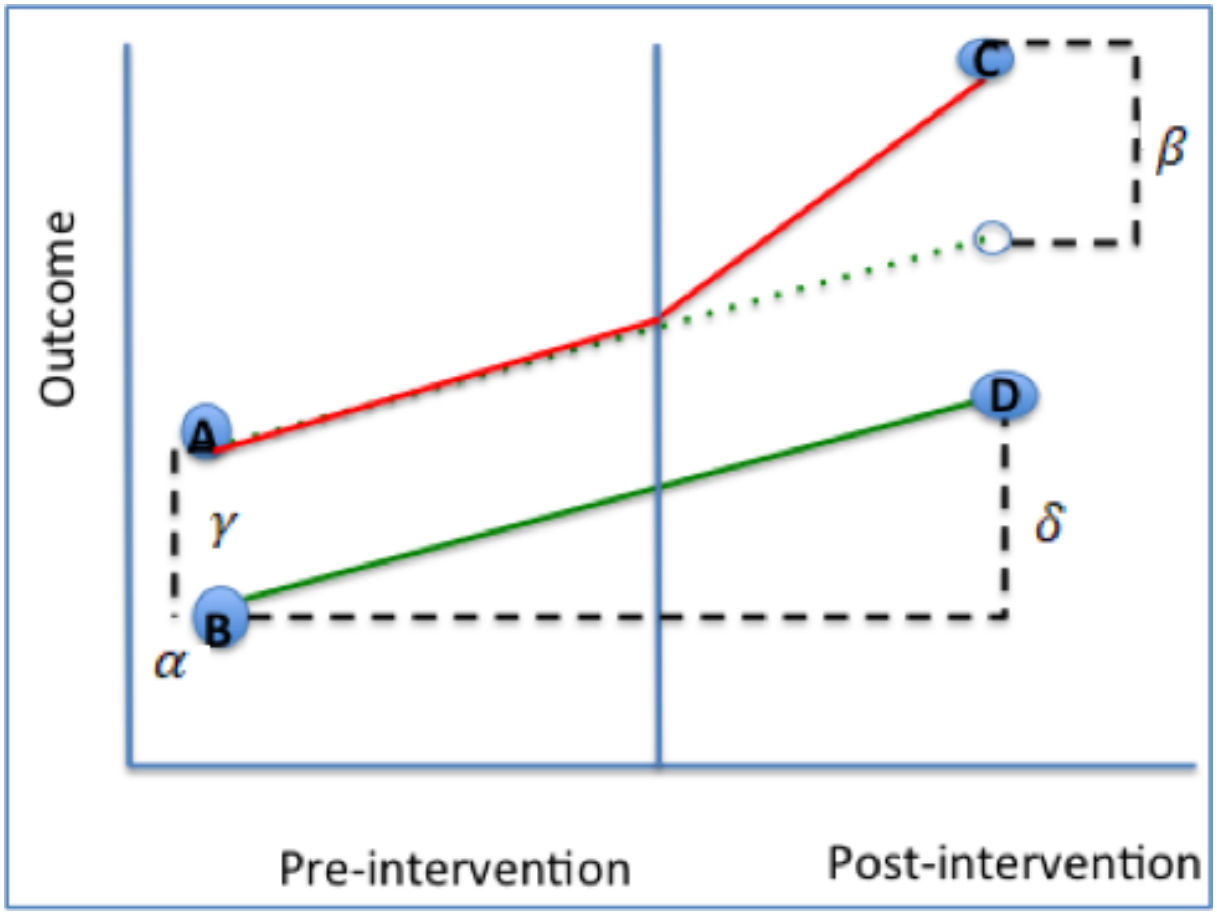
Supuesto de tendencia paralela



Diferencia en Diferencias

$$y_{it} = \alpha + \beta_{did} After_t \cdot Treatment_i + \delta After_t + \gamma Treatment_i + \varepsilon_{it}$$

Supuesto de tendencia paralela



Example: Card and Krueger (1994)

Card, David and Alan Krueger (1994), "Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania," *American Economic Review*, 84(4): 772-793.

Example: Card and Krueger (1994)

What happens to the number of workers hired when the government increases the minimum wage? Using the tools of introductory microeconomics, we might expect the number of workers hired to fall (start with competitive market equilibrium, then impose a price floor). Two economists, David Card and Alan Krueger, decided to empirically test this. They took advantage of the fact that state governments can change the minimum wage applicable in their own state (it just has to be at least as high as the federal minimum wage). One of their main ways to identify the effect of a minimum wage increase is a difference-in-differences strategy.

Example: Card and Krueger (1994)

"On April 1, 1992, New Jersey's minimum wage rose from $4.25 to $5.05 per hour. To evaluate the impact of the law we surveyed 410 fast-food restaurants in New Jersey and eastern Pennsylvania before and after the rise. Comparisons of employment growth at stores in New Jersey and Pennsylvania (where the minimum wage was constant) provide simple estimates of the effect of the higher minimum wage. We also compare employment changes at stores in New Jersey that were initially paying high wages (above $5) to the changes at lower-wage stores. We find no indication that the rise in the minimum wage reduced employment."

Example: Card and Krueger (1994)

You have a subset of their data in Stata format (minwage_short.dta). Each observation is at the store level. Variable names ending with "1" are collected before the policy change, and variable names ending with "2" are collected after the policy change. This is panel data: 410 firms $\times 2$ time periods. Each store was randomly drawn from the population, and we can assume is independent of other stores in the sample.

- The outcome we will analyze is full-time equivalent ("FTE") employment, emptot1 and emptot2. This was formed by counting a part time worker as half a full-time worker.

Question 1. Firm-Level Observations (Wide Data)

(a) You want to estimate the difference-in-differences in FTE employment due to the minimum wage increase. Based on your results, did the increase in the minimum wage increase or decrease FTE employment? Explain.

Question 1(a)

	After Policy	Before Policy	Difference A-B
New Jersey	20.89725	20.43058	0.46667
Pennsilvania	21.09667	23.38	-2.28333
Difference NJ-PA	-0.19942	-2.94942	2.75

In this case, the difference-in-difference estimator, gives the effect of the policy change. In particular, the increase of the minimum wage in New Jersey provoked a relative gain of 2.75 FTE employees.

Question 1(b)

(b) You could have gotten the result in part (a) using a regression.

(i) Form a variable named demp.

In do file.

(ii) What does the constant represent?

It is the average differene of the employment after and before the policy (in Pennsilvania).

What does the coefficient for New Jersey represent?

It is the difference-in-difference estimator.

(iii) Does the increase in the minimum wage increase or decrease FTE employment?

The increase in the minimum wage increases the FTE employment.

Is this effect significant at the 95% level of confidence?

This effect is statistically significant at the 95% level of confidence.

Question 2. Firm-Time-Level Observations (Long Data).

(a) Looking only at New Jersey, what is the mean FTE employment before the policy change?

In New Jersey, the mean FTE employment is 20.43058, before the policy. While after the policy it is 20.89725.

Calculate the difference in mean (after-before) and the standard error of the difference in mean.

Difference(after-before)=0.4666667 with a standard error of 0.7480039, which means that the difference is not statistically significant.

What assumption must one make in order to interpret this difference in mean as the effect of the policy change?

We need to assume that the employment did not change in New Jersey.

Question 2(b)

(b) Looking only at the after period, what is the mean FTE employment for New Jersey?

The mean FTE employment after the policy, for New Jersey, is 20.89725.

For Pennsylvania?

The mean FTE employment after the policy, for Pennsylvania, is 21.09667.

Calculate the difference in mean (New Jersey-Pennsylvania) and the standard error of the difference in mean.

Difference(New Jersey-Pennsylvania)=-0.1994175 with a standard error of 1.183642, which means that the difference is not statistially significant.

Question 2(b)

What assumption must one make in order to interpret this difference in mean as the effect of the policy change?

We need to assume that before the policy there were no differences between New Jersey and Pennsylvania.

Question 2(c)

(c) Write down the regression equation you would estimate to obtain the difference-in-differences estimate of the effect of the policy change.

$$y_{it} = \alpha + \beta \cdot After_t * Treatment_i + \delta \cdot After_t + \gamma \cdot Treatment_i + \varepsilon_{it}$$

where, y_{it} is our variable of FTE employment, $After_t$ is a dummy variable that takes the value of one if the period is after the implementation of the policy and zero before the policy, $Treatment_i$ is a dummy variable that takes the value of one for the state of New Jersey and zero for Pennsylvania. The coefficient β corresponds to our difference-in-difference estimator.

Question 2(c)

What assumption must one make in order to interpret the difference-in-differences estimate as the effect of the policy change?

We need to assume that, in the absence of treatment, the FTE employment in New Jersey would have changed by the same amount as in Pennsylvania (parallel trend assumption).

Question 2(d)

(d) Estimate the equation in part (c). Does the increase in the minimum wage increase or decrease FTE employment?

The increase in the minimum wage increases the FTE employment.

Is this effect significant at the 95% level of confidence?

However, this effect is not statistically significant at the 95% level of confidence.

Question 2(e)

(e) Starting with your specification in part d, add a dummy for each firm as explanatory variables. What is the difference-in-differences estimate and its standard error?

In this case, the difference-in-differences estimate did not change, it is still 2.75. However, the standard error is lower, now it is 1.154355, which means that the estimated effect of the minimum wage on FTE employment is statistically significant at the 95% level of confidence.