# Glossary – Panel models terminology

OLS= ordinary least squares regression

The error term has two components:

*i* = county, *t* = year, = error term, = individual component of the error term, = idiosyncratic component of the error term

after substitution:

**Pooled OLS:** usual OLS, which ignores the panel structure. In most cases inconsistent = not good. Only consistent if individual component of the error term is missing

**Fixed effects:** also called **within estimator** or **least squares dummy variables**. Each individual (county) has separate intercept, but they all have the same slope, one for all counties and years. Used when individual error correlated with repressors.

**Random effects:** situation when individual error is NOT correlated with regressors. Estimated as usual regression that is one intercept and one slope for all counties and years. Instead of OLS, generalised least squares (GLS) is used which is constructed based on variance of the two error components.

**Variable coefficients models:** relax assumptions that the slope coefficient is the same for all counties

Two types:

1. **Fixed coefficients model** – estimates separate slope and separate intercept for each county. Hence it has many coefficient (more than twice the number of counties)
2. **Random coefficients** model assumes that coefficients vary around a common average

This gives one intercept and one slope - same for all counties and it also gives estimate of variance of the intercept and slope coefficients (By this I don’t mean the standard errors of estimates which are calculated for every regression model but estimates of how much does each coefficient vary across the counties).

**First differencing:** first differences of the model are calculated (lagging and subtracting). Then OLS applied on differenced data, so one intercept and one slope for all countries. Recommended if strongly persistent in time

**Between model:** computed on time (or group) averages of data. That is, we would calculate average for each country over the years. We would get one intercept and one slope for all countries. I don’t think that this is preferable, as the intragroup variability is disregarded

For the second and third type described above (Fixed effects and Random effects) the effect can be either **one-way** or **two-way.** I think that the one that we have implicitly assumed talking about these models is one-way. One-way effect is described by the equations on the top of this document. By the two-way is meant that besides county (individual) component, the error has also time component, so it looks like:

After substituting:

There are tests to determine whether one-way or two-way model fits better and the Fixed effects and Random effects items described above can be generalized for the two-way effect

Source:

Yves Croissant and Giovanni Millo (2008) https://cran.rproject.org/web/packages/plm/vignettes/plm.pdf