

**Πανεπιστήμιο Θεσσαλίας**  
**Πολυτεχνική Σχολή**  
**Τμήμα Μηχανικών Χωροταξίας, Πολεοδομίας & Περιφερειακής Ανάπτυξης**

**ΜΑΘΗΜΑ ΕΠΙΛΟΓΗΣ: ΟΙΚΟΝΟΜΕΤΡΙΑ**

*Ομαδοποιημένα διαστρωματικά δεδομένα  
και δεδομένα πάνελ*

**ΔΙΑΛΕΞΗ 11**

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## Ομαδοποιημένα διαστρωματικά δεδομένα και δεδομένα πάνελ

- Διαστρωματικά δεδομένα (cross-sectional data)
- Δεδομένα χρονολογικών σειρών (time series data)
- *Ομαδοποιημένα διαστρωματικά δεδομένα (pooled cross section)*
- *Δεδομένα πάνελ ή διαχρονικά δεδομένα (panel data)*

## Ομαδοποιημένα διαστρωματικά δεδομένα και δεδομένα πάνελ

- Δεδομένα για  $N$  διαστρωματικές μονάδες (χώρες, περιφέρειες, νοικοκυριά, επιχειρήσεις, άτομα κ.ο.κ) και  $T$  χρονολογικές σειρές (έτη, τρίμηνα, μήνες κ.ο.κ)
- Οι έρευνες που γίνονται για τα νοικοκυριά ή σε ατομικό επίπεδο μπορούν να αποτελέσουν βάση με δεδομένα πάνελ;

## Πλεονεκτήματα ομαδοποιημένων διαστρωματικών δεδομένων και δεδομένων πάνελ

Πλεονεκτήματα ομαδοποιημένων διαστρωματικών δεδομένων και δεδομένων πάνελ

- Αύξηση μεγέθους δείγματος
- Ακριβέστερες εκτιμήτριες
- Στατιστικά ελέγχου με περισσότερες δυνατότητες

# Επιλογή ομαδοποιημένων διαστρωματικών δεδομένων ή δεδομένων πάνελ

EViews

File Edit Object View Proc Quick Options Window Help

Ομαδοποιημένα διαστρωματικά δεδομένα

Workfile: PANEL2 - (c:\doctora\official\model\panel2.wf1)

View Proc Object Print Save Details+/- Show Fetch Store Delete Genr Sample

Range: 137 -- 37 obs  
Sample: 137 -- 37 obs

Filter: \*

|   |   |  |   |  |
|---|---|--|---|--|
| <input checked="" type="checkbox"/> a00 | <input checked="" type="checkbox"/> e_large_scale89 | <input checked="" type="checkbox"/> ebanking95 | <input checked="" type="checkbox"/> eenterp01 | <input checked="" type="checkbox"/> empl_ind |
| <input checked="" type="checkbox"/> a01 | <input checked="" type="checkbox"/> e_large_scale90 | <input checked="" type="checkbox"/> ebanking96 | <input checked="" type="checkbox"/> eenterp02 | <input checked="" type="checkbox"/> empl_ind |
| <input checked="" type="checkbox"/> a02 | <input checked="" type="checkbox"/> e_large_scale91 | <input checked="" type="checkbox"/> ebanking97 | <input checked="" type="checkbox"/> eenterp03 | <input checked="" type="checkbox"/> empl_ind |

Group: A00 Workfile: PANEL2::Panel2\

| View | Proc | Object   | Name      | Freeze   | Default  | Sort     | Transpose | Edit+/- | Smpl+/- | Title | Sample |
|------|------|----------|-----------|----------|----------|----------|-----------|---------|---------|-------|--------|
| 5    |      |          |           |          |          |          |           |         |         |       |        |
| obs  |      | Y00      | Y_T_100   | TEU00    | X_M00    | FDI00    | GDPGR00   |         |         |       |        |
| obs  |      | Y00      | Y_T_100   | TEU00    | X_M00    | FDI00    | GDPGR00   |         |         |       |        |
| 1    |      | 12.00000 | 15.20000  | 80.06000 | 0.240000 | 3.880000 | 7.000000  |         |         |       |        |
| 2    |      | 8.800000 | 10.60000  | 40.20000 | 0.340000 | 2.890000 | 5.000000  |         |         |       |        |
| 3    |      | 8.300000 | -8.000000 | 55.87000 | 0.740000 | 7.950000 | 4.000000  |         |         |       |        |
| 4    |      | 1.700000 | -1.400000 | 55.58000 | 0.560000 | 5.900000 | 4.000000  |         |         |       |        |
| 5    |      | 3.500000 | -2.600000 | 60.69000 | 0.630000 | 4.870000 | -5.000000 |         |         |       |        |
| 6    |      | 7.100000 | -2.400000 | 69.99000 | 0.790000 | 2.800000 | 6.000000  |         |         |       |        |
| 7    |      | 11.20000 | -23.10000 | 48.11000 | 0.460000 | 0.290000 | 5.000000  |         |         |       |        |
| 8    |      | 5.400000 | -3.200000 | 74.60000 | 0.900000 | 8.790000 | 3.000000  |         |         |       |        |
| 9    |      | 18.20000 | 10.30000  | 74.93000 | 0.880000 | 5.890000 | 4.000000  |         |         |       |        |
| 10   |      | 7.500000 | 4.800000  | 70.87000 | 0.650000 | 5.450000 | 1.000000  |         |         |       |        |
| 11   |      | 8.300000 | -2.100000 | 55.09000 | 0.940000 | 10.15000 | 4.000000  |         |         |       |        |
| 12   |      | 7.500000 | -0.800000 | 76.54000 | 0.860000 | 0.700000 | 3.000000  |         |         |       |        |
| 13   |      | 15.00000 | -3.900000 | 86.59000 | 0.740000 | 7.080000 | 7.000000  |         |         |       |        |
| 14   |      | 3.900000 | -9.000000 | 77.78000 | 0.590000 | 5.270000 | 8.000000  |         |         |       |        |
| 15   |      | 2.200000 | -9.900000 | 54.18000 | 0.680000 | 3.310000 | 6.000000  |         |         |       |        |
| 16   |      | 7.800000 | 10.30000  | 11.77000 | 0.850000 | 0.930000 | 5.000000  |         |         |       |        |
| 17   |      | 7.700000 | -11.60000 | 7.610000 | 0.610000 | 9.900000 | 6.000000  |         |         |       |        |
| 18   |      | 11.90000 | 11.00000  | 42.43000 | 2.150000 | 1.050000 | 5.000000  |         |         |       |        |
| 19   |      | 13.20000 | 4.000000  | 23.16000 | 1.040000 | 1.900000 | 9.000000  |         |         |       |        |
| 20   |      | 9.000000 | 6.000000  | 70.12000 | 0.930000 | 4.400000 | 1.000000  |         |         |       |        |
| 21   |      | 5.400000 | 0.900000  | 67.67000 | 1.060000 | 92.67000 | 1.000000  |         |         |       |        |
| 22   |      | 5.400000 | 0.200000  | 68.08000 | 1.120000 | 22.50000 | 1.000000  |         |         |       |        |
| 23   |      | 12.40000 | 5.600000  | 63.59000 | 1.350000 | 7.570000 | 1.000000  |         |         |       |        |
| 24   |      |          |           |          |          |          |           |         |         |       |        |

Group: A01 Workfile: PANEL2::Panel2\

| View | Proc | Object    | Name     | Freeze   | Default  | Sort     | Transpose | Edit+/- | Smpl+/- | Title | Sample |
|------|------|-----------|----------|----------|----------|----------|-----------|---------|---------|-------|--------|
| 20   |      |           |          |          |          |          |           |         |         |       |        |
| obs  |      | Y01       | Y_T_101  | TEU01    | X_M01    | FDI01    | GDPGR01   |         |         |       |        |
| 1    |      | -20.00000 | 12.00000 | 86.43000 | 0.230000 | 5.070000 | 3.000000  |         |         |       |        |
| 2    |      | 12.20000  | 8.800000 | 41.80000 | 0.310000 | 2.180000 | 4.000000  |         |         |       |        |
| 3    |      | 1.600000  | 8.300000 | 60.85000 | 0.700000 | 5.980000 | 5.000000  |         |         |       |        |
| 4    |      | 6.000000  | 1.700000 | 57.85000 | 0.510000 | 6.720000 | 5.000000  |         |         |       |        |
| 5    |      | -3.100000 | 3.500000 | 64.33000 | 0.680000 | 12.85000 | 1.000000  |         |         |       |        |
| 6    |      | 8.300000  | 7.100000 | 73.83000 | 0.730000 | 2.880000 | 5.000000  |         |         |       |        |
| 7    |      | 0.000000  | 11.20000 | 53.64000 | 0.390000 | 1.430000 | 4.000000  |         |         |       |        |
| 8    |      | 6.500000  | 5.400000 | 75.58000 | 0.920000 | 9.120000 | 2.000000  |         |         |       |        |
| 9    |      | 3.600000  | 18.20000 | 75.80000 | 0.910000 | 7.540000 | 4.000000  |         |         |       |        |
| 10   |      | 0.400000  | 7.500000 | 72.14000 | 0.720000 | 3.000000 | 1.000000  |         |         |       |        |
| 11   |      | 6.900000  | 8.300000 | 58.82000 | 0.860000 | 7.580000 | 5.000000  |         |         |       |        |
| 12   |      | 3.100000  | 7.500000 | 77.53000 | 0.910000 | 2.550000 | 3.000000  |         |         |       |        |
| 13   |      | 8.500000  | 15.00000 | 79.99000 | 0.770000 | 9.080000 | 7.000000  |         |         |       |        |
| 14   |      | 6.900000  | 3.900000 | 79.15000 | 0.570000 | 1.590000 | 6.000000  |         |         |       |        |
| 15   |      | 16.00000  | 2.200000 | 58.38000 | 0.710000 | 3.670000 | 7.000000  |         |         |       |        |
| 16   |      | 5.900000  | 7.800000 | 13.24000 | 0.900000 | 0.780000 | 5.000000  |         |         |       |        |
| 17   |      | 13.70000  | 7.700000 | 8.490000 | 0.630000 | 3.680000 | 8.000000  |         |         |       |        |
| 18   |      | 4.900000  | 11.90000 | 46.71000 | 1.750000 | 0.900000 | 5.000000  |         |         |       |        |
| 19   |      | 14.20000  | 13.20000 | 26.85000 | 1.030000 | 2.080000 | 5.000000  |         |         |       |        |
| 20   |      | 2.800000  | 9.000000 | 62.57000 | 0.750000 | 3.060000 | 1.000000  |         |         |       |        |
| 21   |      | -1.000000 | 5.400000 | 61.87000 | 0.810000 | 31.79000 | 1.000000  |         |         |       |        |
| 22   |      | 1.600000  | 5.400000 | 67.72000 | 1.160000 | 5.790000 | 1.000000  |         |         |       |        |
| 23   |      |           |          |          |          |          |           |         |         |       |        |

Series: EMPL\_IND97 Modified: 6/25/07 17:33

Path = c:\projects\search\papers\_public\regional profile of enp\_tsiapa DB = none WF = panel2

# Επιλογή ομαδοποιημένων διαστρωματικών δεδομένων ή δεδομένων πάνελ

EViews

File Edit Object View Proc Quick Options Window Help

Πάνελ δεδομένα

  

Group: GROUP01 Workfile: UNTITLED::Untitled\

| View                           | Proc           | Object   | Print     | Name      | Freeze   | Default  | Sort     | Transpose   | Edit+/- | Smpl+/- | Title | Sample |
|--------------------------------|----------------|----------|-----------|-----------|----------|----------|----------|-------------|---------|---------|-------|--------|
| Cell can not be edited         |                |          |           |           |          |          |          |             |         |         |       |        |
| obs                            | REGION         | YEAR     | PRODUCTCH | INVEST    | INVEST1  | LABOURCH | DEPRECH  | INVESTINCCH | C       |         |       |        |
| (0341) Vlaanderen - 05         | (0341) Vlaa... | 2005.000 | 1.017550  | 5085.000  | 115021.0 | 1.029696 | 0.928627 | 1.914241    | ^       |         |       |        |
| (0341) Vlaanderen - 06         | (0341) Vlaa... | 2006.000 | 0.961240  | 9477.885  | 119413.9 | 0.981798 | 0.992865 | 1.694256    |         |         |       |        |
| (0341) Vlaanderen - 07         | (0341) Vlaa... | 2007.000 | 1.103772  | 14053.42  | 123989.4 | 1.040676 | 1.154448 | 1.531870    |         |         |       |        |
| (0341) Vlaanderen - 08         | (0341) Vlaa... | 2008.000 | 1.096765  | 10154.49  | 120090.5 | 0.973533 | 1.066949 | 0.885315    |         |         |       |        |
| (0341) Vlaanderen - 09         | (0341) Vlaa... | 2009.000 | 1.098192  | 18595.24  | 128531.2 | 1.024319 | 1.016460 | 2.123234    |         |         |       |        |
| (0341) Vlaanderen - 10         | (0341) Vlaa... | 2010.000 | 1.121171  | 17383.12  | 127319.1 | 0.995405 | 1.159486 | 0.556124    |         |         |       |        |
| (0341) Vlaanderen - 11         | (0341) Vlaa... | 2011.000 | 1.022740  | 23370.95  | 133306.9 | 0.993741 | 1.056324 | 1.803522    |         |         |       |        |
| (0341) Vlaanderen - 12         | (0341) Vlaa... | 2012.000 | 1.036555  | 19072.88  | 129008.9 | 1.004572 | 1.062372 | 0.597898    |         |         |       |        |
| (0343) Wallonie - 05           | (0343) Wall... | 2005.000 | 0.985555  | 7166.000  | 117102.0 | 0.985254 | 1.006624 | 1.685379    |         |         |       |        |
| (0343) Wallonie - 06           | (0343) Wall... | 2006.000 | 0.919329  | 9878.846  | 119814.8 | 1.004726 | 1.041352 | 1.319657    |         |         |       |        |
| (0343) Wallonie - 07           | (0343) Wall... | 2007.000 | 1.164301  | 16479.85  | 126415.8 | 0.998503 | 1.046393 | 1.358765    |         |         |       |        |
| (0343) Wallonie - 08           | (0343) Wall... | 2008.000 | 1.032843  | 13254.39  | 123190.4 | 0.971797 | 1.102678 | 1.286917    |         |         |       |        |
| (0343) Wallonie - 09           | (0343) Wall... | 2009.000 | 1.094595  | -505.1020 | 109430.9 | 0.990279 | 0.991685 | -0.040587   |         |         |       |        |
| (0343) Wallonie - 10           | (0343) Wall... | 2010.000 | 1.130470  | -599.2579 | 109336.7 | 0.982922 | 1.147115 | 0.686883    |         |         |       |        |
| (0343) Wallonie - 11           | (0343) Wall... | 2011.000 | 1.105725  | 3227.567  | 113163.6 | 1.015986 | 1.013364 | -6.077271   |         |         |       |        |
| (0343) Wallonie - 12           | (0343) Wall... | 2012.000 | 0.958714  | -18580.26 | 91355.73 | 0.995382 | 1.021056 | -5.726259   |         |         |       |        |
| (0740) Cyprus - 05             | (0740) Cyprus  | 2005.000 | 1.062469  | -5289.000 | 104647.0 | 0.910540 | 0.904690 | 0.770930    |         |         |       |        |
| (0740) Cyprus - 06             | (0740) Cyprus  | 2006.000 | 1.092920  | -6602.687 | 103333.3 | 0.930605 | 0.895652 | 1.057365    |         |         |       |        |
| (0740) Cyprus - 07             | (0740) Cyprus  | 2007.000 | 1.052751  | -3363.636 | 106572.3 | 1.040325 | 1.039455 | 0.584578    |         |         |       |        |
| (0740) Cyprus - 08             | (0740) Cyprus  | 2008.000 | 1.023938  | -3538.256 | 106397.7 | 0.926124 | 0.844580 | 0.791615    |         |         |       |        |
| (0740) Cyprus - 09             | (0740) Cyprus  | 2009.000 | 0.985186  | 3411.335  | 113347.3 | 1.196173 | 0.786895 | -1.091537   |         |         |       |        |
| (0740) Cyprus - 10             | (0740) Cyprus  | 2010.000 | 1.029886  | -1469.754 | 108466.2 | 0.893009 | 0.859150 | -0.303857   |         |         |       |        |
| (0740) Cyprus - 11             | (0740) Cyprus  | 2011.000 | 1.043471  | -748.5323 | 109187.5 | 1.025719 | 0.792037 | 0.489824    |         |         |       |        |
| (0740) Cyprus - 12             | (0740) Cyprus  | 2012.000 | 1.083764  | -51.43422 | 109884.6 | 0.953340 | 1.617228 | 0.088267    |         |         |       |        |
| (0745) Czech Republic - 05     | (0745) Czec... | 2005.000 | 1.152076  | 2264.000  | 112200.0 | 0.961772 | 1.170677 | -60.13727   |         |         |       |        |
| (0745) Czech Republic - 06     | (0745) Czec... | 2006.000 | 1.066624  | 6057.986  | 115994.0 | 0.990095 | 1.099392 | 1.977686    |         |         |       |        |
| (0745) Czech Republic - 07     | (0745) Czec... | 2007.000 | 1.058492  | 6425.287  | 116361.3 | 0.955759 | 1.184931 | 0.677929    |         |         |       |        |
| (0745) Czech Republic - 08     | (0745) Czec... | 2008.000 | 1.108378  | 8331.096  | 118267.1 | 0.948512 | 1.228188 | 1.548561    |         |         |       |        |
| (0745) Czech Republic - 09     | (0745) Czec... | 2009.000 | 1.098729  | 1375.965  | 111311.9 | 0.939229 | 0.934559 | 0.410365    |         |         |       |        |
| (0745) Czech Republic - 10     | (0745) Czec... | 2010.000 | 1.106836  | 2446.449  | 112382.4 | 0.970983 | 1.082189 | 0.863144    |         |         |       |        |
| (0745) Czech Republic - 11     | (0745) Czec... | 2011.000 | 1.089002  | 22243.06  | 132179.0 | 0.994554 | 1.131604 | 4.046037    |         |         |       |        |
| (0745) Czech Republic - 12     | (0745) Czec... | 2012.000 | 1.012024  | 28696.54  | 138632.5 | 1.010802 | 1.080359 | 1.266622    |         |         |       |        |
| (0370) Denmark - 05            | (0370) Den...  | 2005.000 | 1.147281  | 50540.00  | 160476.0 | 1.010469 | 1.068229 | 0.605199    |         |         |       |        |
| (0370) Denmark - 06            | (0370) Den...  | 2006.000 | 1.088233  | 50354.39  | 160290.4 | 0.987239 | 1.003730 | 0.765742    |         |         |       |        |
| (0370) Denmark - 07            | (0370) Den...  | 2007.000 | 1.118876  | 65681.82  | 175617.8 | 1.064400 | 1.143726 | 10.47553    |         |         |       |        |
| (0370) Denmark - 08            | (0370) Den...  | 2008.000 | 0.983342  | 65300.48  | 175236.5 | 1.030739 | 1.089328 | -0.049300   |         |         |       |        |
| (0370) Denmark - 09            | (0370) Den...  | 2009.000 | 1.110669  | 19864.63  | 129800.6 | 1.009776 | 0.952698 | 0.345390    |         |         |       |        |
| (0370) Denmark - 10            | (0370) Den...  | 2010.000 | 1.124006  | 9856.327  | 119792.3 | 0.945062 | 0.997871 | -2.533420   |         |         |       |        |
| (0370) Denmark - 11            | (0370) Den...  | 2011.000 | 1.050044  | 17287.36  | 127223.3 | 0.996945 | 1.062708 | 0.512833    |         |         |       |        |
| (0370) Denmark - 12            | (0370) Den...  | 2012.000 | 1.018415  | 15310.18  | 125246.2 | 1.006331 | 0.989238 | 0.448788    |         |         |       |        |
| (0010) Schleswig-Holstein - 05 | (0010) Schl... | 2005.000 | 1.029422  | -1710.000 | 108226.0 | 0.995761 | 1.048326 | -0.854550   | v       |         |       |        |
| (0010) Schleswig-Holstein - 06 | (0010) Schl... | 2006.000 | 0.984788  | 388.3688  | 113322.3 | 0.988004 | 0.988004 | 0.988004    |         |         |       |        |
| (0010) Schleswig-Holstein - 07 | (0010) Schl... | 2007.000 | 0.984788  | 388.3688  | 113322.3 | 0.988004 | 0.988004 | 0.988004    |         |         |       |        |

Επιλογή ομαδοποιημένων διαστρωματικών δεδομένων ή δεδομένων πάνελ

Επιλογή ομαδοποιημένων διαστρωματικών δεδομένων (ΟΔΔ) ή δεδομένων πάνελ

- Δεν υπάρχει απόλυτη απάντηση ορθής και εσφαλμένης πρακτικής
- Η χρήση ΟΔΔ μπορεί να είναι πολύπλοκη στην περίπτωση πολλών διαστρωματικών σειρών
- Η χρήση ΟΔΔ διευκολύνει την ανάλυση μεταβλητών μεταξύ διαστρωματικών δεδομένων και μεταβλητών (πχ συσχέτιση ανεργίας στη Γαλλία με ΑΕΠ της ΜΒ)
- Η χρήση της μεθοδολογίας panel περιλαμβάνει περισσότερες τεχνικές (πχ two stage least square, GMM)
- Η χρήση ΟΔΔ είναι ωφέλιμη σε περιπτώσεις αξιολόγησης επιπτώσεων μιας πολιτικής ή ενός συγκεκριμένου συμβάντος

## Μοντέλα με δεδομένα πάνελ

- Ισορροπημένο (balanced): βάση με ίδιο αριθμό χρονολογικών παρατηρήσεων
- Μη ισορροπημένο (unbalanced): διαφορετικοί αριθμοί χρονολογικών παρατηρήσεων για κάποια από τα διαστρωματικά δεδομένα
- Η ενοποίηση των δεδομένων δημιουργεί διαφορές μεταξύ των διαφορετικών διαστρωματικών ή χρονολογικών παρατηρήσεων που μπορούν να αποτυπωθούν με τη βοήθεια ψευδομεταβλητών



## Παράδειγμα ομαδοποιημένων διαστρωματικών δεδομένων

- Μελέτη επιπτώσεων της εγκατάστασης ενός αποτεφρωτήρα απορριμμάτων στις τιμές των κατοικιών μιας περιοχής

$$rprice = \gamma_0 + \gamma_1 nearinc + u$$

- $rprice$ : τιμή κατοικίας (πραγματικές τιμές)
- $nearinc$ : ψευδομεταβλητή (dummy variable) τιμή 1 κοντά στον αποτεφρωτήρα (<3 μιλίων) και 0 σε διαφορετική περίπτωση
- 321 παρατηρήσεις

## Παράδειγμα ομαδοποιημένων διαστρωματικών δεδομένων

- Εκτίμηση οικονομετρικού μοντέλου για το 1981

$$\widehat{rprice} = 101.307,5 - 30.688,27nearinc$$

- Εκτίμηση οικονομετρικού μοντέλου για το 1978

$$\widehat{rprice} = 82.517,23 - 18.824,37nearinc$$

- Εκτιμήτρια της διαφοράς των διαφορών:  $\widehat{\delta}_1 = -30.688,27 - (-18.824,37) =$   
 $= - 11.863,9$

## Παράδειγμα ομαδοποιημένων διαστρωματικών δεδομένων

- Εκτίμηση οικονομετρικού μοντέλου με ΟΔΔ

$$rprice = \beta_0 + \delta_0 y81 + \beta_1 nearinc + \delta_1 y81 nearinc + u$$

$$\log(\widehat{price}) = 11,29 + 0,457 y81 - 0,340 nearinc - 0,063 y81 nearinc$$

## Μοντέλα με δεδομένα πάνελ

$$Y_{it} = a + \beta X_{it} + u_{it}$$

- $i=1,2,\dots,N$  διαστρωματικές μονάδες
  - $t=1,2,\dots,T$  χρονικές περιόδους
  - $a$  είναι ίδιο για όλες τις μονάδες και για όλους τους χρόνους
1. Μέθοδος της κοινής σταθεράς (κοινή σταθερά  $a$  για όλες τις διαστρωματικές μονάδες), ομοιογένεια της βάσης δεδομένων
  2. Μέθοδος των σταθερών επιδράσεων (διαφορετική σταθερά  $a$  για κάθε διαστρωματική μονάδα), αποτυπώνει τις ιδιαιτερότητες κάθε μονάδας που είναι σταθερές στο χρόνο (fixed effects)
  3. Μοντέλο τυχαίων επιδράσεων (α τυχαία παράμετρος  $\alpha_i = a + v_i$ ) η κάθε διαστρωματική μονάδα διαφέρει στα κατάλοιπά της (random effects)

## Παράδειγμα ομαδοποιημένων διαστρωματικών δεδομένων

- Εκτίμηση οικονομετρικού μοντέλου με ΟΔΔ

$$growth_{it} = \beta_0 + \beta_1 SPEC_{it} + \beta_2 SPECH_{it} + \beta_3 RD_{it} + u_{it}$$

- 13 περιφέρειες Ελλάδος, περίοδος 2001-2016
- SPEC: βαθμός απόλυτης εξειδίκευσης με τον δείκτη Theil
- SPECH: μεταβολή απόλυτης εξειδίκευσης
- RD: δαπάνες σε έρευνα και τεχνολογία

## Παράδειγμα ομαδοποιημένων διαστρωματικών δεδομένων

Pool: UNTITLED Workfile: POOL::Untitled\

View Proc Object Print Name Freeze Estimate Define PoolGenr Sheet

Dependent Variable: GROWTH?  
Method: Pooled Least Squares  
Date: 05/10/19 Time: 08:27  
Sample: 2001 2016  
Included observations: 16  
Cross-sections included: 13  
Total pool (balanced) observations: 208

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 4.501731    | 1.383294   | 3.254355    | 0.0013 |
| THEIL?    | -7.072000   | 2.663351   | -2.655302   | 0.0085 |
| THEILCH?  | 25.20175    | 10.02434   | 2.514056    | 0.0127 |
| RDEXPEND? | -0.023333   | 0.006282   | -3.714265   | 0.0003 |

  

|                    |           |                       |           |
|--------------------|-----------|-----------------------|-----------|
| R-squared          | 0.108376  | Mean dependent var    | -0.227688 |
| Adjusted R-squared | 0.095264  | S.D. dependent var    | 4.789374  |
| S.E. of regression | 4.555539  | Akaike info criterion | 5.889608  |
| Sum squared resid  | 4233.599  | Schwarz criterion     | 5.953792  |
| Log likelihood     | -608.5192 | Hannan-Quinn criter.  | 5.915561  |
| F-statistic        | 8.265321  | Durbin-Watson stat    | 0.807927  |
| Prob(F-statistic)  | 0.000032  |                       |           |

# Παράδειγμα ομαδοποιημένων διαστρωματικών δεδομένων

Pool: UNTITLED Workfile: POOL::Untitled\

View Proc Object Print Name Freeze Estimate Define PoolGenr Sheet

Dependent Variable: GROWTH?  
 Method: Pooled Least Squares  
 Date: 05/10/19 Time: 09:04  
 Sample: 2001 2016  
 Included observations: 16  
 Cross-sections included: 13  
 Total pool (balanced) observations: 208

| Variable                       | Coefficient | Std. Error            | t-Statistic | Prob.  |
|--------------------------------|-------------|-----------------------|-------------|--------|
| C                              | -0.326028   | 0.656524              | -0.496597   | 0.6201 |
| THEIL?                         | 0.029316    | 1.219733              | 0.024035    | 0.9809 |
| THEILCH?                       | 53.58145    | 5.982589              | 8.956231    | 0.0000 |
| RDEXPEND?                      | 0.001191    | 0.003073              | 0.387706    | 0.6987 |
| <b>Fixed Effects (Period)</b>  |             |                       |             |        |
| 2001--C                        | 3.576098    |                       |             |        |
| 2002--C                        | 4.074363    |                       |             |        |
| 2003--C                        | 6.813989    |                       |             |        |
| 2004--C                        | 3.502210    |                       |             |        |
| 2005--C                        | -0.527072   |                       |             |        |
| 2006--C                        | 5.238257    |                       |             |        |
| 2007--C                        | 1.782118    |                       |             |        |
| 2008--C                        | -2.988010   |                       |             |        |
| 2009--C                        | -3.432264   |                       |             |        |
| 2010--C                        | -5.930842   |                       |             |        |
| 2011--C                        | -9.247665   |                       |             |        |
| 2012--C                        | -5.518994   |                       |             |        |
| 2013--C                        | -2.279335   |                       |             |        |
| 2014--C                        | 0.834621    |                       |             |        |
| 2015--C                        | 2.183121    |                       |             |        |
| 2016--C                        | 1.919405    |                       |             |        |
| <b>Effects Specification</b>   |             |                       |             |        |
| Period fixed (dummy variables) |             |                       |             |        |
| R-squared                      | 0.843096    | Mean dependent var    | -0.227688   |        |
| Adjusted R-squared             | 0.828152    | S.D. dependent var    | 4.789374    |        |
| S.E. of regression             | 1.985412    | Akaike info criterion | 4.296431    |        |
| Sum squared resid              | 745.0115    | Schwarz criterion     | 4.601302    |        |
| Log likelihood                 | -427.8288   | Hannan-Quinn criter.  | 4.419705    |        |
| F-statistic                    | 56.41973    | Durbin-Watson stat    | 2.102572    |        |
| Prob(F-statistic)              | 0.000000    |                       |             |        |

Pool: UNTITLED Workfile: POOL::Untitled\

View Proc Object Print Name Freeze Estimate Define PoolGenr Sheet

Dependent Variable: GROWTH?  
 Method: Pooled EGLS (Period random effects)  
 Date: 05/10/19 Time: 09:12  
 Sample: 2001 2016  
 Included observations: 16  
 Cross-sections included: 13  
 Total pool (balanced) observations: 208  
 Swamy and Arora estimator of component variances

| Variable                       | Coefficient | Std. Error         | t-Statistic | Prob.  |
|--------------------------------|-------------|--------------------|-------------|--------|
| C                              | -0.182561   | 1.108706           | -0.164661   | 0.8694 |
| THEIL?                         | -0.183526   | 1.218027           | -0.150675   | 0.8804 |
| THEILCH?                       | 52.41347    | 5.922569           | 8.849785    | 0.0000 |
| RDEXPEND?                      | 0.000471    | 0.003063           | 0.153844    | 0.8779 |
| <b>Random Effects (Period)</b> |             |                    |             |        |
| 2001--C                        | 3.474585    |                    |             |        |
| 2002--C                        | 3.925031    |                    |             |        |
| 2003--C                        | 6.633991    |                    |             |        |
| 2004--C                        | 3.397935    |                    |             |        |
| 2005--C                        | -0.502171   |                    |             |        |
| 2006--C                        | 5.080219    |                    |             |        |
| 2007--C                        | 1.747734    |                    |             |        |
| 2008--C                        | -2.871763   |                    |             |        |
| 2009--C                        | -3.380041   |                    |             |        |
| 2010--C                        | -5.762656   |                    |             |        |
| 2011--C                        | -9.002487   |                    |             |        |
| 2012--C                        | -5.394232   |                    |             |        |
| 2013--C                        | -2.218194   |                    |             |        |
| 2014--C                        | 0.860486    |                    |             |        |
| 2015--C                        | 2.139595    |                    |             |        |
| 2016--C                        | 1.871968    |                    |             |        |
| <b>Effects Specification</b>   |             |                    |             |        |
|                                |             | S.D.               | Rho         |        |
| Period random                  |             | 3.578149           | 0.7646      |        |
| Idiosyncratic random           |             | 1.985412           | 0.2354      |        |
| <b>Weighted Statistics</b>     |             |                    |             |        |
| R-squared                      | 0.278572    | Mean dependent var | -0.034632   |        |
| Adjusted R-squared             | 0.267962    | S.D. dependent var | 2.366647    |        |
| S.E. of regression             | 2.024884    | Sum squared resid  | 836.4318    |        |
| F-statistic                    | 26.25745    | Durbin-Watson stat | 1.929262    |        |
| Prob(F-statistic)              | 0.000000    |                    |             |        |

Pool: UNTITLED Workfile: POOL::Untitled\

View Proc Object Print Name Freeze Estimate Define PoolGener Sheet

Correlated Random Effects - Hausman Test  
Pool: Untitled  
Test period random effects

| Test Summary  | Chi-Sq. Statistic | Chi-Sq. d.f. | Prob.  |
|---------------|-------------------|--------------|--------|
| Period random | 11.192178         | 3            | 0.0107 |

Period random effects test comparisons:

| Variable  | Fixed     | Random    | Var(Diff.) | Prob.  |
|-----------|-----------|-----------|------------|--------|
| THEIL?    | 0.029316  | -0.183526 | 0.004160   | 0.0010 |
| THEILCH?  | 53.581449 | 52.413466 | 0.714546   | 0.1671 |
| RDEXPEND? | 0.001191  | 0.000471  | 0.000000   | 0.0026 |

Period random effects test equation:  
Dependent Variable: GROWTH?  
Method: Panel Least Squares  
Date: 05/10/19 Time: 09:07  
Sample: 2001 2016  
Included observations: 16  
Cross-sections included: 13  
Total pool (balanced) observations: 208

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | -0.326028   | 0.656524   | -0.496597   | 0.6201 |
| THEIL?    | 0.029316    | 1.219733   | 0.024035    | 0.9809 |
| THEILCH?  | 53.58145    | 5.982589   | 8.956231    | 0.0000 |
| RDEXPEND? | 0.001191    | 0.003073   | 0.387706    | 0.6987 |

Effects Specification

Period fixed (dummy variables)

|                    |           |                       |           |
|--------------------|-----------|-----------------------|-----------|
| R-squared          | 0.843096  | Mean dependent var    | -0.227688 |
| Adjusted R-squared | 0.828152  | S.D. dependent var    | 4.789374  |
| S.E. of regression | 1.985412  | Akaike info criterion | 4.296431  |
| Sum squared resid  | 745.0115  | Schwarz criterion     | 4.601302  |
| Log likelihood     | -427.8288 | Hannan-Quinn criter.  | 4.419705  |
| F-statistic        | 56.41973  | Durbin-Watson stat    | 2.102572  |
| Prob(F-statistic)  | 0.000000  |                       |           |

- Hausman test
- $H_0$ : τυχαίες επιδράσεις συνεπείς και αποτελεσματικές (random effects)
- $H_1$ : τυχαίες επιδράσεις μη αποτελεσματικές, (άρα ακολουθούμε fixed effects)



- GLS (περιπτώσεις ετεροσκεδαστικότητας και αυτοσυσχέτισης όπου OLS όχι BLUE)

Pool: UNTITLED Workfile: POOL::Untitled\

View Proc Object Print Name Freeze Estimate Define PoolGenr Sheet

Dependent Variable: GROWTH?  
 Method: Pooled EGLS (Cross-section SUR)  
 Date: 05/10/19 Time: 09:23  
 Sample: 2001 2016  
 Included observations: 16  
 Cross-sections included: 13  
 Total pool (balanced) observations: 208  
 Linear estimation after one-step weighting matrix

| Variable  | Coefficient | Std. Error | t-Statistic | Prob.  |
|-----------|-------------|------------|-------------|--------|
| C         | 3.616280    | 0.680762   | 5.312104    | 0.0000 |
| THEIL?    | -5.757626   | 0.997000   | -5.774953   | 0.0000 |
| THEILCH?  | 26.39166    | 2.851238   | 9.256211    | 0.0000 |
| RDEXPEND? | -0.020400   | 0.002599   | -7.850297   | 0.0000 |

Weighted Statistics

|                    |          |                    |           |
|--------------------|----------|--------------------|-----------|
| R-squared          | 0.461529 | Mean dependent var | -0.130051 |
| Adjusted R-squared | 0.453611 | S.D. dependent var | 1.353511  |
| S.E. of regression | 1.005042 | Sum squared resid  | 206.0621  |
| F-statistic        | 58.28360 | Durbin-Watson stat | 1.972577  |
| Prob(F-statistic)  | 0.000000 |                    |           |

Unweighted Statistics

|                   |          |                    |           |
|-------------------|----------|--------------------|-----------|
| R-squared         | 0.106277 | Mean dependent var | -0.227688 |
| Sum squared resid | 4243.564 | Durbin-Watson stat | 0.807315  |

## Παράδειγμα δεδομένων πάνελ

Equation: EQ01 Workfile: UNTITLED::Untitled\

View Proc Object Print Name Freeze Estimate Forecast Stats Resids

Dependent Variable: GROWTH  
Method: Panel Least Squares  
Date: 05/10/19 Time: 10:10  
Sample: 2001 2016  
Periods included: 16  
Cross-sections included: 13  
Total panel (balanced) observations: 208

| Variable | Coefficient | Std. Error | t-Statistic | Prob.  |
|----------|-------------|------------|-------------|--------|
| C        | 4.501731    | 1.383294   | 3.254355    | 0.0013 |
| THEIL    | -7.072000   | 2.663351   | -2.655302   | 0.0085 |
| THEILCH  | 25.20175    | 10.02434   | 2.514056    | 0.0127 |
| RDEXPEND | -0.023333   | 0.006282   | -3.714265   | 0.0003 |

  

|                    |           |                       |           |
|--------------------|-----------|-----------------------|-----------|
| R-squared          | 0.108376  | Mean dependent var    | -0.227688 |
| Adjusted R-squared | 0.095264  | S.D. dependent var    | 4.789374  |
| S.E. of regression | 4.555539  | Akaike info criterion | 5.889608  |
| Sum squared resid  | 4233.599  | Schwarz criterion     | 5.953792  |
| Log likelihood     | -608.5192 | Hannan-Quinn criter.  | 5.915561  |
| F-statistic        | 8.265321  | Durbin-Watson stat    | 0.807927  |
| Prob(F-statistic)  | 0.000032  |                       |           |

Equation: EQ01 Workfile: UNTITLED::Untitled\

View Proc Object Print Name Freeze Estimate Forecast Stats Resids

Dependent Variable: GROWTH  
Method: Panel Least Squares  
Date: 05/10/19 Time: 10:17  
Sample: 2001 2016  
Periods included: 16  
Cross-sections included: 13  
Total panel (balanced) observations: 208

| Variable | Coefficient | Std. Error | t-Statistic | Prob.  |
|----------|-------------|------------|-------------|--------|
| C        | -0.326028   | 0.656524   | -0.496597   | 0.6201 |
| THEIL    | 0.029316    | 1.219733   | 0.024035    | 0.9809 |
| THEILCH  | 53.58145    | 5.982589   | 8.956231    | 0.0000 |
| RDEXPEND | 0.001191    | 0.003073   | 0.387706    | 0.6987 |

#### Effects Specification

Period fixed (dummy variables)

|                    |           |                       |           |
|--------------------|-----------|-----------------------|-----------|
| R-squared          | 0.843096  | Mean dependent var    | -0.227688 |
| Adjusted R-squared | 0.828152  | S.D. dependent var    | 4.789374  |
| S.E. of regression | 1.985412  | Akaike info criterion | 4.296431  |
| Sum squared resid  | 745.0115  | Schwarz criterion     | 4.601302  |
| Log likelihood     | -427.8288 | Hannan-Quinn criter.  | 4.419705  |
| F-statistic        | 56.41973  | Durbin-Watson stat    | 2.102572  |
| Prob(F-statistic)  | 0.000000  |                       |           |

Equation: EQ01 Workfile: UNTITLED::Untitled\

View Proc Object Print Name Freeze Estimate Forecast Stats Resids

Dependent Variable: GROWTH

Method: Panel EGLS (Cross-section SUR)

Date: 05/10/19 Time: 10:20

Sample: 2001 2016

Periods included: 16

Cross-sections included: 13

Total panel (balanced) observations: 208

Linear estimation after one-step weighting matrix

| Variable | Coefficient | Std. Error | t-Statistic | Prob.  |
|----------|-------------|------------|-------------|--------|
| C        | 3.616280    | 0.680762   | 5.312104    | 0.0000 |
| THEIL    | -5.757626   | 0.997000   | -5.774953   | 0.0000 |
| THEILCH  | 26.39166    | 2.851238   | 9.256211    | 0.0000 |
| RDEXPEND | -0.020400   | 0.002599   | -7.850297   | 0.0000 |

#### Weighted Statistics

|                    |          |                    |           |
|--------------------|----------|--------------------|-----------|
| R-squared          | 0.461529 | Mean dependent var | -0.006989 |
| Adjusted R-squared | 0.453611 | S.D. dependent var | 1.359757  |
| S.E. of regression | 1.005042 | Sum squared resid  | 206.0621  |
| F-statistic        | 58.28360 | Durbin-Watson stat | 1.972577  |
| Prob(F-statistic)  | 0.000000 |                    |           |

#### Unweighted Statistics

|                   |          |                    |           |
|-------------------|----------|--------------------|-----------|
| R-squared         | 0.106277 | Mean dependent var | -0.227688 |
| Sum squared resid | 4243.564 | Durbin-Watson stat | 0.807315  |