

## Advanced Econometrics: Nonlinear models for panel data

Course title – Intitulé du cours	Advanced Econometrics : Nonlinear models for panel data
Level / Semester – Niveau /semestre	Deeqa/S2
School – Composante	Ecole d'Economie de Toulouse
Teacher – Enseignant responsable	Koen Jochmans
Other teacher(s) – Autre(s) enseignant(s)	
Lecture Hours – Volume Horaire CM	
TA Hours – Volume horaire TD	
TP Hours – Volume horaire TP	
Course Language – Langue du cours	English
TA and/or TP Language – Langue des TD et/ou TP	English

### Teaching staff contacts:

- email(s) address(es),
- office(s) number(s),
- office(s) hours/day(s) of the week when students can drop by
- preferred means of interaction (after the classes, by email, prior appointment,...)

Email: [koen.jochmans@tse-fr.eu](mailto:koen.jochmans@tse-fr.eu)

Office hour: Send an email to arrange an appointment

Office: T 528

**Course Objectives: newly acquired knowledge once the course completed should be well identified**

In more detail :

- ideas, theories or methods that will be illustrated in class;
- methods that will be used and that students are expected to be proficient in;
- skills that will be developed during the course (type of problems to be resolved, ability to provide written and oral comments on an empirical analysis,...).

It is preferable to specifically list simple objectives with verbs, so that it is easy to evaluate whether these objectives are achieved at the end of the course or to identify the areas for improvement (for instance : for implementation goals - test hypotheses and draw correct inferences using test statistic; for conceptual goals - characterize first-degree, second-degree and third-degree price discrimination;...).

This course will present the literature on the estimation of nonlinear models for panel data. The focus will be on fixed-effect approaches. We will go through several paradigms: ad-hoc solutions to estimation from short panels, bias-corrected inference under double asymptotics, and set identification in discrete choice models. Attention will also be given to estimation of (moments of) the distribution of the fixed effects.

The goal is to present a comprehensive overview of the literature, from its origins to the state of the art. Students will learn the potential and limitations of fixed-effect methods and will be pointed to the current research frontier.

**Prerequisites :**

- skills and competences needed/previously acquired
- or the title(s) of the compulsory course(s) which should have been taken before

An introduction to econometrics at the graduate level.

**Practical information about the sessions:**

- please specify if laptops or tablets are accepted or not in the class,
- expectation on students' participation,
- how will be treated students that arrive to class late.....

Active participation of the students is expected, and timely arrival is appreciated. Readings will be assigned before class. Laptops are permitted.

**Grading system :**

- final exam or midterm exams
- Teaching Assistant grading
- weights of the weighted average main cours-TA (consistent with the voted examination "arrêté d'examen"),
- semester calendar,
- how to handle late homework...

To pass the course, a student should

- attend classes
- read the required material before class (see Readings). Instructions will be sent via Moodle beforehand on required readings each week.
- participate in class discussion
- organize a collective discussion at least once
- write a short essay/referee report/research project on a paper chosen from the list below or any proposal that you might have.

### **Bibliography/references :**

- list of assigned readings and other course materials : books (chapters), internet links,...

Lecture slides will be provided.

Readings consist of a list of papers. An indicative list is as follows.

- Abowd, J. M., F. Kramarz, and D. N. Margolis (1999). High wage workers and high wage firms. *Econometrica* 67, 251–333.
- Alvarez, J. and M. Arellano (2003). The time series and cross-section asymptotics of dynamic panel data estimators. *Econometrica* 71, 1121–1159.
- Arellano, M. (2003). Discrete choices with panel data. *Investigaciones Económicas* 27, 423–458.
- Arellano, M. and S. Bonhomme (2009). Robust priors in nonlinear panel data models. *Econometrica* 77, 489–536.
- Arellano, M. and J. Hahn (2006). A likelihood-based approximate solution to the incidental parameter problem in dynamic nonlinear models with multiple effects. Unpublished manuscript.
- Arellano, M. and B. E. Honoré (2001). Panel data models: Some recent developments. In J. J. Heckman and E. Leamer (Eds.), *Handbook of Econometrics, Volume V*, Chapter 53, pp. 3229–3329. Elsevier.
- Bonhomme, S. (2012). Functional differencing. *Econometrica* 80, 1337–1385.
- Browning, M., M. Eyrnæs, and J. Alvarez (2010). Modeling income processes with lots of heterogeneity. *Review of Economic Studies* 77, 1353–1381.
- Carro, J. M. (2007). Estimating dynamic panel data discrete choice models with fixed effects. *Journal of Econometrics* 140, 503–528.
- Carro, J. M. and A. Traferri (2014). State dependence and heterogeneity in health using a bias-corrected fixed-effects estimator. *Journal of Applied Econometrics* 29, 181–207.
- Chamberlain, G. (1980). Analysis of covariance with qualitative data. *Review of Economic Studies* 47, 225–238.
- Chamberlain, G. (1984). Panel data. In Z. Griliches and M. Intriligator (Eds.), *Handbook of Econometrics, Volume 2 of Handbook of Econometrics*, Chapter 22, pp. 1247–1315. Elsevier.
- Chamberlain, G. (1985). Heterogeneity, omitted variable bias, and duration dependence. In J. J. Heckman and B. Singer (Eds.), *Longitudinal Analysis of Labor Market Data*, Chapter 1, pp. 3–38. Cambridge University Press.

- Chamberlain, G. (2010). Binary response models for panel data: Identification and information. *Econometrica* 78, 159–168.
- Cox, D. R. and N. Reid (1987). Parameter orthogonality and approximate conditional inference (with discussion). *Journal of the Royal Statistical Society, Series B* 49, 1–39.
- Cox, D. R. and N. Reid (1993). A note on the calculation of adjusted profile likelihood. *Journal of the Royal Statistical Society, Series B* 55, 467–471.
- Dhaene, G. and K. Jochmans (2015). Split-panel jackknife estimation of fixed-effect models. *Review of Economic Studies* 82, 991–1030.
- Dhaene, G. and K. Jochmans (2016). Likelihood inference in an autoregression with fixed effects. *Econometric Theory* 32, 1178–1215.
- Fernández-Val, I. (2009). Fixed effects estimation of structural parameters and marginal effects in panel probit models. *Journal of Econometrics* 150, 71–85.
- Fernández-Val, I. and J. Lee (2013). Panel data models with nonadditive unobserved heterogeneity: Estimation and inference. *Quantitative Economics* 4, 453–481.
- Fernández-Val, I. and F. Vella (2011). Bias corrections for two-step fixed effects panel data estimators. *Journal of Econometrics* 163, 144–162.
- Fernández-Val, I. and M. Weidner (2016). Individual and time effects in nonlinear panel data models with large N, T. *Journal of Econometrics* 192, 291–312.
- Gonçalves, S. and M. Kaffo (2014). Bootstrap inference for linear dynamic panel data models with fixed effects. Forthcoming in *Journal of Econometrics*.
- Hahn, J. and G. Kuersteiner (2002). Asymptotically unbiased inference for a dynamic panel model with fixed effects when both n and T are large. *Econometrica* 70, 1639–1657.
- Hahn, J. and G. Kuersteiner (2010). Stationarity and mixing properties of the dynamic tobit model. *Economics Letters* 107, 105–111.
- Hahn, J. and G. Kuersteiner (2011). Bias reduction for dynamic nonlinear panel models with fixed effects. *Econometric Theory* 27, 1152–1191.
- Hahn, J. and W. K. Newey (2004). Jackknife and analytical bias reduction for nonlinear panel models. *Econometrica* 72, 1295–1319.
- Hall, B. H. (1978). A general framework for the time series-cross section estimation. *Annales de l'INSEE* 30/31, 177–202.
- Hausman, J. A., B. H. Hall, and Z. Griliches (1984). Econometric models for count data with an application to the patents-R&D relationship. *Econometrica* 52, 909–938.
- Heckman, J. J. (1981a). Heterogeneity and state dependence. In S. Rosen (Ed.), *Studies in Labor Markets*, Chapter 3, pp. 91–139. University of Chicago Press.
- Heckman, J. J. (1981b). The incidental parameters problem and the problem of initial conditions in estimating a discrete time-discrete data stochastic process. In C. F. Manski and D. L. McFadden (Eds.), *Structural Analysis of Discrete Data with Econometric Applications*, Chapter 4, pp. 179–195. MIT Press.
- Heckman, J. J. (1981c). Statistical models for discrete panel data. In C. F. Manski and D. L. McFadden (Eds.), *Structural Analysis of Discrete Data with Econometric Applications*. MIT Press.
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- Honoré, B. E. and E. Tamer (2006). Bounds on parameters in panel dynamic discrete choice models. *Econometrica* 74, 611–629.

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- Hospido, L. (2012). Modelling heterogeneity and dynamics in the volatility of individual wages. *Journal of Applied Econometrics* 27, 386–414.
- Kline, P., R. Saggio, and M. Sølvssten (2020). Leave-out estimation of variance components. *Econometrica* 88, 1859–1898.
- Jochmans, K. (2017). Two-way models for gravity. *Review of Economics and Statistics* 99, 478–485.
- Jochmans, K. and T. Magnac (2017). A note on sufficiency in binary panel models. *Econometrics Journal* 20, 259–269.
- Jochmans, K. and M. Weidner (2019). Fixed-effect regressions on network data. *Econometrica* 87, 1543–1560.
- Jochmans, K. and M. Weidner (2019). Inference on a distribution from noisy draws. Unpublished manuscript.
- Lancaster, T. (2002). Orthogonal parameters and panel data. *Review of Economic Studies* 69, 647–666.
- Li, H., B. Lindsay, and R. Waterman (2003). Efficiency of projected score methods in rectangular array asymptotics. *Journal of the Royal Statistical Society, Series B* 65, 191–208.
- Magnac, T. (2004). Panel binary variables and sufficiency: Generalizing conditional logit. *Econometrica* 72, 1859–1876.
- Mundlak, Y. (1961). Empirical production function free of management bias. *Journal of Farm Economics* 43, 44–56.
- Neyman, J. and E. L. Scott (1948). Consistent estimates based on partially consistent observations. *Econometrica* 16, 1–32.
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica* 49, 1417–1426.
- Sartori, N. (2003). Modified profile likelihood in models with stratum nuisance parameters. *Biometrika* 90, 533–549.
- Shi, X., M. Shun, and W. Song (2018). Estimating semi-parametric panel multinomial choice models using cyclic monotonicity. *Econometrica* 86, 737–761.
- Wooldridge, J. M. (2005). Simple solutions to the initial conditions problem in dynamic, nonlinear panel data models with unobserved heterogeneity. *Journal of Applied Econometrics* 20, 39–54.

**Session planning :**

- presentation of the sessions, connection with the resources

**Distance learning :**

Distance learning can be provided when necessary by implementing, for example:

- Interactive virtual classrooms
- Recorded lectures (videos)
- MCQ tests and other online exercises / assignments
- Remote (online) tutorials (classes)
- Chatrooms