Modeling Health Care Utilization and Costs

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Course Description

This is a PhD course in which we will cover a set of topics in health econometrics that focus on the modeling of healthcare expenditures, costs, and use. The aim of this course is to learn how to conduct nonlinear econometric analyses to better understand the nature of relationships between healthcare expenditures, costs and use and their determinants. The emphasis in this course will be on applying nonlinear econometric models to real-world problems. However, this requires a solid understanding of the theory behind estimation techniques and inference procedures which require rudiments of probability theory and statistics, and knowledge of basic properties of estimators. The goal is to learn enough theory and get enough practice with empirical models to be able to read journal articles and to be able to conduct empirical research. Therefore, you will also be learn how to use Stata to estimate numerous nonlinear models and use the output to interpret results.

Prerequisites

You need to have taken at least one post-graduate course in Econometrics and have working familiarity with Stata.

Schedule

Lecture: Monday–Thursday 9:00am–11:30am

Practicum and presentations: Monday–Thursday 1:00pm–3:30pm

Assignments

Practicum: Students will be given a dataset and questions. They will use Stata to estimate models to answer the questions.

Presentations: Students will present either a paper from the reading list or work from their own research.

Final assessment: After the course, students will submit a brief report on a nonlinear econometric analysis of healthcare expenditure or use data. I will provide some Stata datasets to facilitate the analysis although students may choose to analyze some other dataset of their choice.

Course Topics and Readings

I plan to provide only a quick overview of linear models with emphasis on issues of specification that are not typically emphasized in first courses in econometrics. Because maximum likelihood will be the method of estimation of many of the types of models we will discuss in this course, I will spend some time going through some of the basic mathematics in the context of simple examples. It seems unlikely that I will be able to cover all of the remaining topics in depth so I may cover some topics only briefly, others not at all, and more generally adjust as needed as we go along. A list of topics with readings is given below. Some readings are from books (denoted **b**) and others are articles (denoted **a**). In addition,

I have used asterisks (*****) to denote key references.

1. Review of Linear Econometric Models

i. Estimation

ii. Marginal, incremental, and treatment effects

iii. Consequences of misspecification

Reading

b*. Deb, P., Norton, E. C., and Manning, W. G. (2017). *Health Econometrics Using Stata*. Stata Press

b. Greene, W. H. (2017). *Econometric Analysis*. Pearson Education

b. Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press

b*. Wooldridge, J. M. (2015b). *Introductory Econometrics: A Modern Approach*. Cengage Learning

2. Maximum Likelihood Estimation

i. Estimation

ii. Quasi-maximum likelihood interpretation

Reading

b. Cameron, A. C. and Trivedi, P. K. (2010). *Microeconometrics Using Stata, Revised Edition*. Stata Press

b*. Greene, W. H. (2017). *Econometric Analysis*. Pearson Education

b. Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press

3. Generalized Linear Models

i. Estimation

ii. Marginal and incremental effects

iii. Choice of link function and distribution family

Reading

b*. Deb, P., Norton, E. C., and Manning, W. G. (2017). *Health Econometrics Using Stata*. Stata Press

b. Hardin, J. W. and Hilbe, J. M. (2007). *Generalized Linear Models and Extensions*. Stata press

b. McCullagh, P. and Nelder, J. A. (1989). *Generalized Linear Models, Second Edition*. CRC Press

a*. Blough, D. K., Madden, C. W., and Hornbrook, M. C. (1999). Modeling risk using generalized linear models. *Journal of Health Economics*, 18(2):153–171

a. Boes, S. and Gerfin, M. (2016). Does Full Insurance Increase the Demand for Health Care? *Health Economics*, 25(11):1483–1496

a. Hill, S. C. and Miller, G. E. (2010). Health expenditure estimation and functional form: Applications of the generalized gamma and extended estimating equations models. *Health Economics*, 19(5):608–627

a. Lo Sasso, A. T., Shah, M., and Frogner, B. K. (2010). Health Savings Accounts and Health Care Spending. *Health Services Research*, 45(4):1041–1060

a. McGuire, T. G., Alegria, M., Cook, B. L., Wells, K. B., and Zaslavsky, A. M. (2006). Implementing the Institute of Medicine Definition of Disparities: An Application to Mental Health Care. *Health Services Research*, 41(5):1979–2005

a. Mihaylova, B., Briggs, A., O'Hagan, A., and Thompson, S. G. (2011). Review of statistical methods for analysing healthcare resources and costs. *Health Economics*, 20(8):897–916

4. Two-part models

i. Estimation

ii. Marginal and incremental effects

Reading

b*. Deb, P., Norton, E. C., and Manning, W. G. (2017). *Health Econometrics Using Stata*. Stata Press

b. Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data*. MIT Press

a. Au, N. (2012). The Health Care Cost Implications of Overweight and Obesity during Childhood. *Health Services Research*, 47(2):655–676

a. Bauhoff, S., Hotchkiss, D. R., and Smith, O. (2011). The impact of medical insurance for the poor in Georgia: A regression discontinuity approach. *Health Economics*, 20(11):1362–1378

a. Belotti, F., Deb, P., Manning, W. G., and Norton, E. C. (2015). Twopm: Two-part models. *Stata Journal*, 15(1):3–20

a*. Drukker, D. M. (2017). Two-part models are robust to endogenous selection. *Economics Letters*, 152:71–72

a. Kim, B. and Ruhm, C. J. (2012). Inheritances, health and death. *Health Economics*, 21(2):127–144

a. Lê Cook, B., McGuire, T. G., Lock, K., and Zaslavsky, A. M. (2010). Comparing Methods of Racial and Ethnic Disparities Measurement across Different Settings of Mental Health Care. *Health Services Research*, 45(3):825–847

a. Mihaylova, B., Briggs, A., O'Hagan, A., and Thompson, S. G. (2011). Review of statistical methods for analysing healthcare resources and costs. *Health Economics*, 20(8):897–916

5. Count Outcomes

i. Poisson regression

ii. Marginal and incremental effects

iii. Negative binomial models

iv. Hurdle and zero-inflated count models

v. Model comparisons

Reading

b. Cameron, A. C. and Trivedi, P. K. (2010). *Microeconometrics Using Stata, Revised Edition*. Stata Press

b*. Cameron, A. C. and Trivedi, P. K. (2013). *Regression Analysis of Count Data*. Cambridge University Press

b*. Deb, P., Norton, E. C., and Manning, W. G. (2017). *Health Econometrics Using Stata*. Stata Press

b. Greene, W. H. (2017). *Econometric Analysis*. Pearson Education

a. Deb, P. and Trivedi, P. K. (1997). Demand for Medical Care by the Elderly in the United States: A Finite Mixture Approach. *Journal of Applied Econometrics,*, (12):313–336

a*. Gerdtham, U.-G. (1997). Equity in Health Care Utilization: Further Tests Based on Hurdle Models and Swedish Micro Data. *Health Economics*, 6(3):303–319

a. Lahiri, K. and Xing, G. (2004). An econometric analysis of veterans' health care utilization using two-part models. *Empirical Economics*, 29(2):431–449

a. Schokkaert, E., Van Ourti, T., De Graeve, D., Lecluyse, A., and Van de Voorde, C. (2010). Supplemental health insurance and equality of access in Belgium. *Health Economics*, 19(4):377–395

a. Schreyögg, J. and Grabka, M. M. (2010). Copayments for ambulatory care in Germany: A natural experiment using a difference-in-difference approach. *The European Journal of Health Economics*, 11(3):331–341

a. Solé-Auró, A., Guillén, M., and Crimmins, E. M. (2012). Health care usage among immigrants and native-born elderly populations in eleven European countries: Results from SHARE. *The European Journal of Health Economics*, 13(6):741–754

6. Models for heterogeneous effects

i. Introduction

ii. Quantile regression

iii. Finite-mixture models

Reading

b. Cameron, A. C. and Trivedi, P. K. (2010). *Microeconometrics Using Stata, Revised Edition*. Stata Press

b*. Deb, P., Norton, E. C., and Manning, W. G. (2017). *Health Econometrics Using Stata*. Stata Press

b. McLachlan, G. and Peel, D. (2004). *Finite Mixture Models*. John Wiley & Sons

a. Bago d'Uva, T., Jones, A. M., and van Doorslaer, E. (2009). Measurement of horizontal inequity in health care utilisation using European panel data. *Journal of Health Economics*, 28(2):280–289

a. Chen, J., Vargas-Bustamante, A., Mortensen, K., and Thomas, S. B. (2014). Using Quantile Regression to Examine Health Care Expenditures during the Great Recession. *Health Services Research*, 49(2):705–730

a. Conway, K. S. and Deb, P. (2005). Is prenatal care really ineffective? Or, is the 'devil' in the distribution? *Journal of Health Economics*, 24(3):489–513

a. Cook, B. L. and Manning, W. G. (2009). Measuring Racial/Ethnic Disparities across the Distribution of Health Care Expenditures. *Health Services Research*, 44(5p1):1603–1621

a. Deb, P., Gallo, W. T., Ayyagari, P., Fletcher, J. M., and Sindelar, J. L. (2011). The effect of job loss on overweight and drinking. *Journal of health economics*, 30(2):317–327

a. Deb, P. and Trivedi, P. K. (1997). Demand for Medical Care by the Elderly in the United States: A Finite Mixture Approach. *Journal of Applied Econometrics,*, (12):313–336

a*. Deb, P. and Trivedi, P. K. (2002). The structure of demand for health care: Latent class versus two-part models. *Journal of Health Economics*, 21(4):601–625

a. Gerdtham, U.-G. and Trivedi, P. K. (2001). Equity in Swedish health care reconsidered: New results based on the finite mixture model. *Health Economics*, 10(6):565–572

a. Gupta, N. D. and Greve, J. (2011). Overweight and obesity and the utilization of primary care physicians. *Health Economics*, 20(S1):53–67

a. Johar, M. and Katayama, H. (2012). Quantile regression analysis of body mass and wages. *Health Economics*, 21(5):597–611

a*. Koenker, R. and Hallock, K. F. (2001). Quantile Regression. *The Journal of Economic Perspectives*, 15(4):143–156

a. Munkin, M. K. and Trivedi, P. K. (2010). Disentangling incentives effects of insurance coverage from adverse selection in the case of drug expenditure: A finite mixture approach. *Health Economics*, 19(9):1093–1108

a*. Puhani, P. A. and Sonderhof, K. (2010). The effects of a sick pay reform on absence and on health-related outcomes. *Journal of Health Economics*, 29(2):285–302

a. Seymour, J., McNamee, P., Scott, A., and Tinelli, M. (2010). Shedding new light onto the ceiling and floor? A quantile regression approach to compare EQ-5D and SF-6D responses. *Health Economics*, 19(6):683–696

a. Singh, C. H. and Ladusingh, L. (2010). Inpatient length of stay: A finite mixture modeling analysis. *The European Journal of Health Economics*, 11(2):119–126

a. Stifel, D. C. and Averett, S. L. (2009). Childhood overweight in the United States: A quantile regression approach. *Economics & Human Biology*, 7(3):387–397

7. Endogeneity in nonlinear models

i. Review of linear instrumental variables methods

ii. Full information maximum likelihood

iii. Control functions

Reading

b. Cameron, A. C. and Trivedi, P. K. (2010). *Microeconometrics Using Stata, Revised Edition*. Stata Press

b*. Deb, P., Norton, E. C., and Manning, W. G. (2017). *Health Econometrics Using Stata*. Stata Press

b. Wooldridge, J. M. (2014). Quasi-maximum likelihood estimation and testing for nonlinear models with endogenous explanatory variables. *Journal of Econometrics*, 182(1):226–234

a. Blundell, R. and Powell, J. L. (2003). Endogeneity in nonparametric and semiparametric regression models. *Econometric society monographs*, 36:312–357

a. Chen, C.-C. and Cheng, S.-H. (2016). Potentially Inappropriate Medication and Health Care Outcomes: An Instrumental Variable Approach. *Health Services Research*, 51(4):1670–1691

a. Garrido, M. M., Deb, P., Burgess, J. F., and Penrod, J. D. (2012). Choosing Models for Health Care Cost Analyses: Issues of Nonlinearity and Endogeneity. *Health Services Research*, 47(6):2377–2397

a*. Geraci, A., Fabbri, D., and Monfardini, C. (2016). Testing Exogeneity of Multinomial Regressors in Count Data Models: Does Two-stage Residual Inclusion Work? *Journal of Econometric Methods*, Early online

a. Kinge, J. M. and Morris, S. (2017). The Impact of Childhood Obesity on Health and Health Service Use. *Health Services Research*, Early online view:n/a–n/a

a. Newey, W. K. (1987). Efficient estimation of limited dependent variable models with endogenous explanatory variables. *Journal of Econometrics*, 36(3):231–250

a. Shih, Y.-C. T. and Tai-Seale, M. (2012). Physicians' perception of demand-induced supply in the information age: A latent class model analysis. *Health Economics*, 21(3):252–269

a. Trottmann, M., Zweifel, P., and Beck, K. (2012). Supply-side and demand-side cost sharing in deregulated social health insurance: Which is more effective? *Journal of Health Economics*, 31(1):231–242

a*. Vella, F. and Verbeek, M. (1999). Estimating and Interpreting Models with Endogenous Treatment Effects. *Journal of Business & Economic Statistics*, 17(4):473

a*. Wooldridge, J. M. (2015a). Control Function Methods in Applied Econometrics. *Journal of Human Resources*, 50(2):420–445