Warsaw School of Economics
Collegium of Economic Analysis

Linear Models in the Analysis of Heterogeneous Treatment Effects

Tymon Słoczyński

A summary of the
doctoral dissertation

Supervisor:
Prof. dr hab. Marek Góra

Co-supervisor:
Dr Michał Myck

In this dissertation I study the applicability of basic linear models, namely the linear regression model and the Oaxaca–Blinder decomposition, in settings with heterogeneous treatment effects. A large body of recent research in the econometrics of programme evaluation has allowed for general heterogeneity in treatment effects (see, e.g., Blundell and Costa Dias 2009; Imbens and Wooldridge 2009). Quite understandably, researchers have typically considered semiparametric and nonparametric estimators such as inverse probability weighting, methods based on the propensity score, and matching on covariates. Little research has been devoted to understanding what is being identified in the linear regression model in the presence of heterogeneous treatment effects and whether there exist alternative linear models which would allow for treatment effect heterogeneity in a satisfactory way. In this dissertation I attempt to fill this gap in the recent literature.

In Chapters 1 and 2, I provide an introduction to this dissertation as well as describe its background, namely the treatment effects literature and the decomposition literature. Until recently, these two frameworks have been developed independently of each other, even though they are strikingly similar and often ask related questions. Recent research of Barsky et al. (2002), Black et al. (2006, 2008), Melly (2006), Fortin et al. (2011), and Kline (2011) has allowed for some degree of convergence of these disciplines, and this dissertation can be seen as a further step in this process.

Chapters 3–5 contain the main contributions of this dissertation. Chapter 3 provides a new interpretation of the linear regression estimand in the presence of heterogeneous treatment effects. I study the implications of treatment effect heterogeneity for least squares estimation when the effects are inappropriately assumed to be homogeneous. I prove that under a set of benchmark assumptions linear regression provides a consistent estimator of the population average treatment effect on the treated (PATT) times the population proportion of the nontreated individuals plus the population average treatment effect on the nontreated (PATN) times the population proportion of the treated individuals. Consequently, in many empirical applications the linear regression estimates might not be close to any of the standard average treatment effects of interest. This result stands in stark contrast to the previous interpretations in Angrist (1998) and Humphreys (2009), and calls into question some of the recommendations in Angrist and Pischke (2009).

Chapter 4 studies various versions of the Oaxaca–Blinder decomposition, a popular method used in empirical labour economics to study differentials in mean wages. I develop a consistent estimator of the population average treatment effect (PATE) which is based on a nonstandard version of the Oaxaca–Blinder decomposition. I also reinterpret