
THE GERMAN MINIMUM WAGE AND WAGE GROWTH: HETEROGENEOUS TREATMENT EFFECTS USING CAUSAL TREES

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Extended Abstract February 2018

A broad economic literature seeks to understand how public policies change socio-economic outcomes. The standard micro-econometric workhorses are difference-in-differences or regression discontinuity designs. To better understand effect heterogeneities, i.e. differences in policy-induced changes by population subgroups, models are usually estimated by subgroup, or interactions between treatment and subgroup dummies are added to the model. Both approaches raise problems of multiple hypothesis testing: the more subgroups are distinguished the more likely erroneous inferences are to occur.

A powerful approach to evaluate heterogeneous treatment effects for randomized control trials without the need to specify pre-analysis plans which addresses the multiple testing problem is based on regression trees. Regression trees are a popular machine learning algorithm which systematically splits the covariate space into recursively smaller subsets and estimates the value of an individual's outcome Y_i as the mean outcome of those Y_j with similar covariates. The estimation involves a parameter which penalizes model complexity. Since this parameter and the structure of the tree are estimated on independent subsamples, overfitting is avoided. Athey and Imbens (2016)¹ modify such regression trees to have differences in treatment effects rather than mere outcomes as maximand of the tree. Since this approach enables us to distill heterogeneity in a purely data-driven manner, we obviate the multiple testing problem.

We apply causal trees to study heterogeneities in subgroup-specific wage growth rates resulting from a major labor market intervention in Germany, the introduction of a statutory gross minimum wage of EUR 8.50 per hour on January 1st, 2015. We analyze whether there is evidence for effect heterogeneity by gender, level of education, type of work, age, migratory background, place of residence, and combinations of these characteristics.

¹ Athey & Imbens. (2016). Recursive partitioning for heterogeneous causal effects. *Proceedings of the National Academy of Sciences*, 113(27), 7353-7360.