Networks as Control Functions: Nonparametric Identification and Estimation of Partial Effects

Job Market Paper

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Abstract

This paper studies a nonparametric model where a latent variable creates endogeneity by affecting both network formation and an outcome of interest. We generalize the existing network control function approach to nonparametric outcome models, using individuals' link functions to account for the unobserved heterogeneity. Our identification is a form of matching on unobservables: we conceptually match individuals based on their latent link functions. To implement this strategy, we first estimate the distances or dissimilarities between the latent link functions using network data. Second, we apply a functional kernel smoothing over these distances to estimate the structural parameter. Our asymptotic analysis reveals a fundamental trade-off: the robustness gained from this approach comes at the unavoidable cost of a slow convergence rate, driven by the difficulty of matching on latent objects. We characterize this statistical cost by deriving a minimax lower bound.

JEL codes: C14, C31, C54

Key Words: Network data, average partial effects, control function, functional regression, latent homophily.

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