

# Identifiability Criteria for Total Effects in the Presence of Unmeasured Confounders

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## Abstract

In this paper, we assume that cause-effect relationships between variables can be described as a directed acyclic graph and the corresponding linear structural equation model. Then, we consider the identification problem for total effects in the presence of unmeasured confounders. In order to solve the problem, the front door criterion (Pearl, 2000) and the conditional instrumental variable method (Brito and Pearl, 2002) are known as identifiability criteria for total effects. In this paper, we propose new graphical identifiability criteria for total effects based on those for factor models. The results of this paper are useful as the identifiability criteria for total effects and provide a new viewpoint to the identification problem of factor models.

**Key words:** Back door criterion, Path diagram

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Received March 15, 2007; Received in final form September 4, 2007; Accepted September 11, 2007.