

## **SREE 2019**

**Title:** Conditional randomization tests for peer-effects in exogenous link formation experiments.

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### **Background/Context:**

Peer-effects are a phenomenon of growing interest in education (Basse and Feller 2018), and more broadly in the causal inference literature. Much of the recent developments are concerned with estimating or testing peer-effects in scenarios where the peer structure (i.e social network, households, etc...) is fixed and independent of the assignment mechanism. For instance, in the experiment considered by Basse and Feller 2018, peer-effects occur at the household level, and the composition of households is not affected by the intervention. In these cases, the focus is on how an intervention `spills over' to neighboring individuals in the peer structure. In many education settings, however, the focus is on how the composition of the peer structure itself affects individuals: for instance, one may be interested in understanding how college students are affected by their roommates (Sacerdote 2001) or classmates (Duflo et al 2011). In this case, the intervention consists in a manipulation of the peer-structure itself by randomly assigning an individual to peers. This problem – referred to as the exogenous link formation setting in the econometrics literature – is usually tackled from a model-based perspective. By contrast, much of the modern causal inference literature on testing and estimation of peer-effects favors randomization-based approaches, which avoid explicitly modelling the potential outcomes and allow for exact finite sample inference.

We build on and extend recent work by Li et al 2018, which proposes a randomization-based inference approach to estimating the impact of roommate attributes on students' GPAs. While this work does not model the potential outcomes, it still relies on asymptotics for inference. We keep the formalism of Li et al 2018, but combine it with a recent strand of work on conditional randomization tests for testing peer-effects under a fixed peer structure (Aronow 2012, Athey et al 2017, Basse et al 2018).

### **Purpose/Objective/Method:**

In this paper, we extend the work of Basse et al 2018 and propose conditional randomization tests with peer-effects in the exogenous link formation setup. Specifically we construct a nonparametric procedure for testing null hypotheses that involve peer-effects. The method we develop has three important benefits. First, it is randomization-based and therefore makes no modelling assumption on the potential outcomes – this is a desirable feature since interference models are difficult to specify and check. Second, it is exact even in finite samples; it does not

rely on asymptotics for inference. Third, it is very simple to implement: it essentially boils down to running a Fisher randomization test on a carefully selected subset of units.

We consider a variety of exogenous link formation designs used in the education and econometrics literature and give a characterization for the broad class of designs for which our method can be applied. In particular, our method extends the reach of nonparametric inference to common designs that were not considered by Li et al 2018.

### **Setting/Intervention:**

Peking University admits students from two tracks: the exam track and the recommendation track. After enrolling, a student is assigned to a dorm room with three other incoming students, with whom he or she will live for the next four years. Following Li et al 2018, we ask the question of whether the composition of a student's roommates (in terms of the tracks from which they were admitted) has an impact on his or her academic performance. To make the comparison easier, we consider the same subset of administrative data considered by Li et al 2018, focusing on male students who graduated in 2013 from the departments of informatics (104 students from the exam track, 52 from the recommendation track) and the department of physics (49 students from the exam track, 43 from the recommendation track). We compare the substantive results from our tests to those in Li et al 2018.

### **References:**

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