

Introduction: Implementation in Iterated Elimination of Weakly Dominated Strategies

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1. What is the question (of the paper)?

Under incomplete information, mechanism design theories reach outcomes consistent with the social choice function (SCF) by Bayesian equilibrium. There have been literature trying to relax the “common prior assumption”, which requires agents to hold the same belief on probability distribution over each agents’ types. Bergmann and Morris (BM) proposed the “robust virtual implementation” that avoids the common prior assumption using iteratively eliminating strongly dominated strategies (IESDS), but their extension on iteratively eliminating weakly dominated strategies (IEWDS) is challenged. This paper asks why BM’s theorem does not work on IEWDS, and aims to provide a substitute theorem on SCF’s implementability in IEWDS.

2. Why should we care about it?

If theorems are incorrect, then policy makers may make ineffective mechanism which may even lead to undesirable consequences. Furthermore, it is important for mechanism design to be easily applicable on different agents or environments. The more flexible assumptions and conditions we’ve made, the more realistic our theorems will be.

3. What is your (or the author’s) answer?

In BM’s mechanism, there are two conditions for SCF: 1) ex post incentive compatibility and 2) robust measurability. The author argues that the second condition is not required by IEWDS, and adjusts this condition to “weak robust measurability”. He develops a new definition for weak robust virtual implementation accordingly.

4. How did you (or the author) get there?

To show how BM’s mechanism fails to work, the author borrowed a counterexample from Muller(2015), who also proposed a dynamic mechanism with some conditions such that SCF can be implemented. Using the fact that extensive form rationalizability (EFR) and IEWDS have consistent outcome, the author extends Muller’s results to static mechanism and by which revises BM’s result.

An example

假設市長想要重新建設一個落後的區域，並規劃三種不同的開發計畫，以公民投票的方式讓居民選擇最喜歡的一種，假設每一個居民都符合理性(rational)和謹慎(cautious)。居民分成兩種類型(type): 想發展觀光和想發展產業。市長知道每一個居民的類型，而依據 SCF，最符合永續發展的 A 計畫能讓整個區域有比較好的福祉，因此他透過設計投票機制(例如:兩兩一組比較)讓居民以 IEWDS 的決策方式選出 A 計畫。然而，市長引用的是 BM 對 IEWDS 的結論，而在這個情境中，如果居民不知道其他人的類型，IEWDS 將不能應用(也許他的機制得讓居民散布關於自己類型的資訊)，投票的結果也不會選出 A 計畫。

常用符號對照表

EPIC	ex post incentive compatibility
EFR	extensive-form rationalizability
IESDS/IEWDS	iteratively eliminating strictly/weakly dominated strategies
RCSBR	rationality and common strong belief of rationality
RCWAR	rationality and common weak assumption of rationality
SCF	social choice function
θ_i	agent i 's type
Θ_i	a compact subset of the real line
X	a compact set of deterministic outcomes
$\Delta(X)$	the lottery space generated by X .
M	a mechanism
M_i	compact set of messages available to i
g	the outcome function.
S	a message profile