A Network Solution to Robust Implementation: the case of Identical but Unknown Distributions *

Mariann Ollár
University of Edinburgh

Antonio Penta
ICREA, UPF and Barcelona GSE

March 19, 2021

Abstract

We consider mechanism design environments in which agents commonly know that others' types are identically distributed, but without assuming that the actual distribution is common knowledge, nor that it is known to the designer *(common knowledge of identicality, CKI)*. Under these assumptions, we study problems of partial and full implementation, as well as robustness. First, we characterize the transfers which are incentive compatible under the CKI assumption, and provide necessary and sufficient conditions for partial implementation. Second, we characterize the conditions under which full implementation is possible via direct mechanisms, as well as the transfer schemes which achieve full implementation whenever it is possible. We do this by pursuing a *network approach*, which is based on the observation that the full implementation problem in our setting can be conveniently transformed into one of designing a network of strategic externalities, subject to suitable constraints which are dictated by the incentive compatibility requirements entailed by the CKI assumption. This approach enables us to uncover a fairly surprising result: the possibility of full implementation is characterized by the strength of the preference interdependence of the two agents with the least amount of preference interdependence, regardless of the total number of agents, and of their preferences. Finally, we study the robustness properties of the implementing transfers with respect to both misspecifications of agents' preferences and with respect to lower orders beliefs in rationality.

KEYWORDS: Moment Conditions, Robust Full Implementation, Rationalizability, Interdependent Values, Identical but Unknown Distributions, Uniqueness, Strategic Externalities, Spectral Radius, Canonical Transfers, Loading Transfers, Equal-externality Transfers.

JEL: D62, D82, D83

1 Introduction

Many economic models assume that agents believe that the types of others are drawn from the same distribution. This is a natural way to represent situations in which agents regard each other

*Earlier versions of this paper circulated under the title "Implementation via Transfers with Identical but Unknown Distributions". We are grateful to Eddie Dekel, Philippe Jehiel, George Mailath, and Rakesh Vohra for their comments. We also thank seminar audiences at MIT-Harvard, Michigan, Oxford, Carnegie-Mellon, Penn State, Univ. of Edinburgh, Bar-Ilan Univ, Tel-Aviv Univ., Hebrew Uni. of Jerusalem, ICEF (Moscow), and participants to the 2019 Warwick Economic Theory Workshop (Warwick Univ.) and to the Workshop on New Directions in Mechanism Design (Stony Brook, 2019). UPF benefited from the financial support of the Spanish Ministry of Economy and Competitiveness, through the Severo Ochoa Programme for Centres of Excellence in R&D (CEX2019-000915-S). Antonio Penta also acknowledges the financial support of the European Research Council (ERC), ERC Starting Grant #759424.