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REPUTATION IN CONTINUOUS-TIME GAMES

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We study reputation dynamics in continuous-time games in which a large player (e.g., government) faces a population of small players (e.g., households) and the large player's actions are imperfectly observable. The major part of our analysis examines the case in which public signals about the large player's actions are distorted by a Brownian motion and the large player is either a *normal type*, who plays strategically, or a *behavioral type*, who is committed to playing a stationary strategy. We obtain a clean characterization of sequential equilibria using ordinary differential equations and identify general conditions for the sequential equilibrium to be unique and Markovian in the small players' posterior belief. We find that a rich equilibrium dynamics arises when the small players assign positive prior probability to the behavioral type. By contrast, when it is common knowledge that the large player is the normal type, every public equilibrium of the continuous-time game is payoff-equivalent to one in which a *static* Nash equilibrium is played after every history. Finally, we examine variations of the model with Poisson signals and multiple behavioral types.

KEYWORDS: Reputation, repeated games, incomplete information, continuous time.

1. INTRODUCTION

REPUTATION PLAYS AN IMPORTANT ROLE in long-run relationships. Firms can benefit from reputation to fight potential entrants (Kreps and Wilson (1982), Milgrom and Roberts (1982)), to provide high quality to consumers (Klein and Leffler (1981)), or to generate good returns to investors (Diamond (1989)). Reputation can help time-inconsistent governments commit to noninflationary monetary policies (Barro (1986), Cukierman and Meltzer (1986)), low capital taxation (Chari and Kehoe (1993), Celentani and Pesendorfer (1996)), and repayment of sovereign debt (Cole, Dow, and English (1995)). In credence goods markets, strategic concerns to avoid a bad reputation can create perverse incentives that lead to market breakdown (Ely and Valimaki (2003)).

We study reputation dynamics in repeated games between a *large player* (e.g., firm, government) and a population of *small players* (e.g., consumers, households) in which the actions of the large player are *imperfectly observable*. For example, the observed quality of a firm's product may be a noisy outcome of the firm's effort to maintain quality standards; the realized inflation rate may be a noisy signal of the central bank's target monetary growth. Our setting is a

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