Strategic gaming analysis for cement industry: a bilevel approach

E. Allevi* A.J. Conejo† G. Oggioni‡ R. Riccardi§ C. Ruiz¶

Abstract

This paper investigates the equilibria reached by a number of strategic producers in the cement sector through a technological representation of the market. We present a bilevel model for each producer that characterizes its profit maximizing behavior. In the bilevel model, the upper-level problem of each producer is constrained by a lower-level market clearing problem representing cement trading and whose individual objective function corresponds to social welfare. Replacing the lower level problem by its optimality condition renders a Mathematical Program with Equilibrium Constraints (MPEC). Then, all strategic producers are jointly considered. Representing their interaction requires solving jointly the interrelated MPECs of all producers, which results in an Equilibrium Problem with Equilibrium Constraints (EPEC).

A parametric analysis concerning cost and demand fluctuations has been conducted.

*University of Brescia, Department of Economics and Management, IT-25122 Brescia, Italy. E-mail: elisabetta.allevi@unibs.it

†Ohio State University, Department of Electrical and Computer Engineering, Columbus, USA. E-mail: conejonavarro.1@osu.edu

‡University of Brescia, Department of Economics and Management, IT-25122 Brescia, Italy E-mail: giorgia.oggioni@unibs.it.

§University of Brescia, Department of Economics and Management, IT-25122 Brescia, Italy E-mail: rossana.riccardi@unibs.it.

¶Universidad Carlos III de Madrid, Department of Statistics, Madrid, Spain E-mail: caruizm@est-econ.uc3m.es