



Communication in Cournot competition: An experimental study



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ABSTRACT

This study investigates the impact of communication on outcomes in Cournot duopoly and triopoly experiments. Communication is implemented by two different devices, a 'standardized-communication' and a 'free-communication' device. Using both students and managers as subjects, we find that managers behave in a similar way under both communication devices, while students collude slightly better under free than under standardized communication. Second, while under standardized communication managers select lower outputs than students, we observe no difference in subject pools under free communication. Finally, we observe more collusion in duopoly than in triopoly.

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1. Introduction

The classical quantity-setting (Cournot) oligopoly describes a situation between competing firms that strategically decide how much to produce. Its elegance and simplicity has inspired a broad range of theoretical models with applications in industrial organization, public finance, environmental economics, trade theory, etc. It is therefore hardly surprising that the Cournot model has also spawned a constant stream of experimental literature from Hoggatt (1959) and Selten and Sauerermann (1959) to the present. Over the years, many of the design conditions have been altered and their impacts investigated (e.g. cost asymmetry, feedback information, number of firms, unity player assumption, etc.). It is surprising that as yet so little should be known about the impact of non-binding communication on Cournot markets. Investigating the isolated effect of communication seems especially interesting in the light of the result that in the absence of communication

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subjects hardly collude in Cournot oligopolies with three or more firms. Even in duopolies, the average quantities observed are closer to the Cournot–Nash than to the symmetric joint-payoff maximizing outcome (see, for example, the meta-analysis by [Huck, Normann, & Oechssler \(2004\)](#)).

As to the relevant literature, the only Cournot study encompassing communication prior to ours was conducted by [Daughety and Forsythe \(1987a, 1987b\)](#). These authors designed treatments with special regulation via price ceilings, finding that, when firms are able to coordinate by sending messages, they collude much more than when there is no communication.¹ A recent triopoly study by [Normann, Rösch, and Schultz \(2012\)](#), where communication is allowed when firms join buyer groups, reveals that communication has a considerable effect on collusion. The isolated effect of communication has further been investigated in price setting oligopoly with homogeneous goods à la Bertrand ([Fonseca & Normann, 2012](#)), in a price competition game with product differentiation ([Friedman, 1967](#)), and in spatial competition à la Hotelling ([Brown-Kruse, Cronshaw, & Schenk, 1993](#); [Brown-Kruse & Schenk, 2000](#)). In these experiments communication turns out to be a rather effective tool in facilitating collusion.

Why should we expect non-binding communication to induce more collusion? In a Cournot game, communication is considered “cheap talk” (in the sense of [Farrell & Rabin, 1996](#)) since it neither reveals private information nor induces self-commitment. There may, however, be various reasons why people would want to communicate in a repeated Cournot game. [Crawford \(1998\)](#) conjectures that communication plays an important “reassurance” role that facilitates collusion by reducing uncertainty about the others’ actions. In addition, communication can create and reinforce group identity and thus lead to maximization of joint group payoff ([Dawes, Van De Kragt, & Orbell, 1988](#)). Finally, [Brown-Kruse and Schenk \(2000, p. 76\)](#) point out that “with communication only one of the players had to figure out the optimal solution and could try to convince the other player to adopt it. Without communication, the player that ‘gets it’ can attempt to signal a better equilibrium. The problem [...] [is that] the signaler may be incurring losses while [its competitor] is reaping high profits from being a slow learner.” Accordingly, the aim of this paper is to investigate how non-binding communication affects the outcome in a Cournot oligopoly experiment. Since the borderline between collusion and Cournot play is, loosely speaking, between two and three firms, we specifically investigate communication in duopoly and triopoly. In particular, we conducted eight treatments to investigate the impact of two types of communication devices in Cournot duopoly and triopoly.² We compare the results of these treatments with four control treatments without communication, the data for the latter being taken from [Waichman, Requate, and Siang \(2010a\)](#) (triopoly) and [Waichman, Requate, and Siang \(2010b\)](#) (duopoly). In addition, we test for subject-pool effects by recruiting both Malaysian students and managers as participants. It is plausible that managers should be more appropriate than student subjects to represent firms in industrial organization experiments.³ Moreover, notably in Malaysia, communication between firms has been quite common since no comprehensive competition legislation existed until recently.⁴ Our main findings are as follows: First, we find that managers behave in a similar way under both communication devices, while students collude slightly better under free than under standardized communication. Second, while managers select lower output levels than students when standardized communication is implemented, we observe no significant differences between the subject pools under free communication. Third, we observe more collusion in duopoly than in triopoly. Finally, we find that despite the possibility of communication, the Cournot–Nash outcome accurately describes the average output decision in all but one of the triopoly treatments, while in duopoly the average output decisions are more collusive when communication is allowed.

2. Experimental design and procedure

2.1. Underlying model and design

The design is based on the symmetric duopoly and triopoly Cournot treatments by [Huck et al. \(2004\)](#), where each subject represents a single firm producing a homogeneous good. Due to our manager subjects’ relatively high opportunity cost of participating, the experiment lasts exactly 17 rounds.⁵ In each of the rounds, every firm has to take a decision about the quantity to produce. In the treatments with communication, each round consists of two stages (a communication stage and a decision stages). The communication stage is a period of two minutes in which firms can send written messages within their group.⁶ After two minutes, the firms enter the ‘decision stage’. Here they have two minutes to make their output decisions.

¹ [Holt \(1995\)](#) also reports on another experiment by [Binger, Hoffman, Libecap, and Schachat \(1990\)](#). The working paper version is no longer available, and at least the section about communication has not been published elsewhere.

² The $(2 \times 2 \times 2)$ setting refers to the two different communication devices, oligopoly size (duopoly and triopoly), and the subject pool (students and managers).

³ The logic is as follows: Let us reasonably assume that if firms are represented by a single player (unity player assumption, see [Raab & Schipper \(2009\)](#)), they would be best represented by their CEOs. CEOs are selected from the set of managers, and managers are selected (later in life) from the set of students. Hence managers are one step closer to CEOs than students.

⁴ The Malaysian Competition Act 2010 went through parliament as recently as April 2010 and came into force in January 2012 ([Choong & Huckerby, 2012, chap. 3.14](#)).

⁵ This was the case except for the two triopoly control treatments (with students and managers, respectively) which lasted 25 rounds. These treatments were taken from previous work by [Waichman et al. \(2010a\)](#). For comparability, and since no time trend was observed after the early rounds of these treatments, we report the result of the first 17 rounds of the control treatments.

⁶ Each firm is identified by a number (Firm 1, Firm 2, etc. . . .) that was valid for the entire duration of the session.

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