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# The Cournot–Bertrand profit differential: A reversal result in a differentiated duopoly with wage bargaining

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## Abstract

This paper compares Cournot and Bertrand equilibria in a downstream differentiated duopoly in which the input price (wage) paid by each downstream firm is the outcome of a strategic bargain with its upstream supplier (labor union). We show that the standard result that Cournot equilibrium profits exceed those under Bertrand competition – when the differentiated duopoly game is played in imperfect substitutes – is reversible. Whether equilibrium profits are higher under Cournot or Bertrand competition is shown to depend upon the nature of the upstream agents' preferences and on the distribution of bargaining power over the input price. We find that the standard result holds unless unions are both powerful and place considerable weight on the wage argument in their utility function.

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## 1. Introduction

A classic result in oligopoly theory is that firms will set quantities rather than prices when goods are imperfect substitutes. This result was first formalized by Singh and Vives (1984) and has been further refined by Vives (1985), who establishes more general results on the ranking of Cournot and Bertrand outcomes, by Okuguchi (1987) and, in a geometric analysis, by Cheng (1985). The result is a cornerstone of oligopoly theory.

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Recently, the early results have attracted renewed interest. Dastidar (1997) shows that in a homogeneous product market the results are sensitive to the sharing rule and are not necessarily valid under asymmetric costs. In the standard model, costs are both symmetric and exogenous. Qiu (1997) develops a model of differentiated duopoly in which there is a two-stage game. In stage 1, each firm chooses a level of cost-reducing research and development (R&D) prior to the standard product market game played in a second stage. Qiu (1997) shows that the relative efficiency of Cournot and Bertrand competition depends upon R&D productivity, the extent of spillovers, and the degree of product market differentiation. Lambertini (1997) extends the standard analysis to the context of a repeated market game in which the firm's choice of the strategic variable is itself the outcome of a strategic (meta) game. This game is also shown to be characterized by the prisoners' dilemma.

Häckner (2000) has shown that the result concerning the dominance of Cournot over Bertrand profits is sensitive to the duopoly assumption. Häckner (2000) considers an  $n$ -firm setting with vertical product differentiation. Our paper, like that of Häckner (2000), can be thought of as testing the robustness of the standard results with respect to alternative market structures. While Häckner (2000) extends the standard model *horizontally* through increasing the number of firms within the product market, our paper extends the analysis *vertically* by examining the consequences of introducing upstream suppliers to the downstream duopolists.

In particular, we address the issue of whether the standard results on the ranking of Cournot and Bertrand equilibrium outcomes under differentiated duopoly are robust to the inclusion of a decentralized wage-bargaining game played between each firm and a firm-specific labor union. There is symmetry across the two union–firm wage bargains. Hence, in equilibrium, we retain the property of symmetric costs, typically assumed in the standard model. As in Qiu (1997) – though for very different reasons – these costs, however, are no longer exogenous in our model. Instead, in the model we develop here, they are the outcome of a strategic game played between each firm and its labor union. This can be interpreted as a particular example of a more general situation of bargaining between an upstream supplier and a downstream retailer in the context of oligopoly in the retail market. The structure of our model is similar to that of Qiu (1997), with wage bargaining rather than R&D choice in the first stage of the game. In stage 2, we consider both Cournot and Bertrand solutions to the non-cooperative product market game.

Our analysis of the Cournot solution is closely related to the model of Horn and Wolinsky (1988), which analyses the incentives to merge among upstream and downstream firms, and how these incentives depend on the degree of product differentiation. The model of Horn and Wolinsky (1988) builds on the concept of strategic substitutes and complements developed by Bulow et al. (1985). The analysis of wage determination in unionized oligopolies was first developed by Davidson (1988), who focused on a comparison of local and national bargaining and, like Horn and Wolinsky (1988), adopted the standard Cournot–Nash assumption to describe product market competition. A somewhat more generalized approach to wage setting in the context of imperfect competition in both labor and product markets is described by Dowrick (1989). Similarly, Naylor (1998, 1999) considers unionized duopoly in the context of international trade and economic integration, and again assumes Cournot behavior in the product

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