

# Referee Report

Title: Relative profit maximisation and Bertrand equilibrium with convex cost functions

Authors: Atsuhiko Satoh and Yasuhito Tanaka

## Report

This paper is a generalisation of Satoh and Tanaka (2013). The authors consider a Bertrand model in a homogeneous product duopoly with strictly convex costs. Dastidar (1995) had shown that when a firm's objective is to maximise absolute profits then an entire range of prices can be supported as Bertrand equilibria. In the present model, the firms maximise the weighted sum of absolute and relative profits. The authors show that like Dastidar (1995), here also there exists a range of the equilibrium price in duopolistic equilibria. However, this range of equilibrium price is narrower than the range of the equilibrium price in duopolistic equilibria under absolute profit maximization. Also, larger the weight on the relative profit, the narrower is the range of the equilibrium price. As the weight on the relative profit goes up, the maximum price that can be supported as a Bertrand equilibrium comes down.

The result is interesting and worth noting and should be published. I have only very few suggestions for revisions. The authors might think of comparing and contrasting their results with the following papers.

There is a literature on *mixed* Bertrand competition where there are both private firms and public firms. Note that *private firms maximise profit* and *public firms maximise social welfare*. The paper by Ogawa and Kato (2006) deals with price competition in a homogeneous products market. In their model there is one private firm and one public firm (i.e. mixed duopoly). They show *with the help of a specific example* that in a price setting game the range of Bertrand price equilibrium is the same as in Dastidar (1995).

The paper by Dastidar and Sinha (2011) generalises the results of Ogawa and Kato (2006). This paper takes general demand and cost functions and shows that in a duopoly with convex costs, Bertrand competition leads to the same set of prices as Nash equilibria irrespective of whether both firms are private or one of them is a public firm with the objective of social welfare maximization (i.e. mixed duopoly). *When both firms are public the set of equilibrium prices is larger than in the case of a mixed duopoly*. Interestingly,

however, even in this case, it is possible to have the collusive price (joint profit maximizing price) as one of the Bertrand equilibrium prices.

The present paper's interesting contribution is that when both firms put positive weight on relative profits, the range of Bertrand equilibrium prices is *narrower* than in Dastidar (1995). However, the result in Dastidar and Sinha (2011) shows that when both firms are public the set of equilibrium prices is *larger* than in Dastidar (1995). The authors may think of discussing these contrasting results. *The main point is that the equilibrium range shrinks (or expands) with changes in the firms' objective functions.*

### References

1. Dastidar, K. G.(1995), "On the existence of pure strategy Bertrand equilibrium", *Economic Theory* 5, 19-32.
2. Dastidar, K. G. and U.B. Sinha (2011) "Price Competition in a Mixed Duopoly" in *Dimensions of Economic Theory and Policy: Essays for Anjan Mukherji* (Edited by K. G. Dastidar, H. Mukhopadhyay and U. B. Sinha) Oxford University Press, New Delhi
3. Ogawa, A. and K. Kato (2006), "Price competition in a mixed duopoly", *Economics Bulletin*, 12: 1-5.
4. Satoh, A. and Y. Tanaka (2013) "Relative profit maximization and Bertrand equilibrium with quadratic cost functions", *Economics and Business Letters*, 2, pp. 134-139.