Profits and competition under alternative technologies in a unionized duopoly with product differentiation ☆

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ABSTRACT

This paper aims at investigating if the conventional wisdom (i.e. an increase of competition linked to a decrease in the degree of product differentiation always reduces firms' profits) can be reversed in a unionized duopoly model. We show that a decrease in the degree of product differentiation may affect wages, hence profits, differently, depending on both the firms' production technology and the mode of competition in the product market. Specifically, under constant returns to labour, the "reversal result" can apply under both Cournot and Bertrand competition, but it is more likely when firms compete in quantities. By contrast, under decreasing returns, profits can increase with competition but only if firms compete in prices.

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1. Introduction

A conventional wisdom in industrial economics suggests that a decrease in the degree of product differentiation always reduces firms' profits by increasing the intensity of product market competition, irrespective of the fact that firms compete *à la* Cournot or *à la* Bertrand (e.g. Shy, 1995, pp. 138–140). The reason behind this result can be understood by referring to the standard differentiated duopoly model, due to Singh and Vives (1984), in which a decrease in the degree of product market differentiation diminishes total demand and induces firms to compete more aggressively under both modes of competition, leading unambiguously to lower profits.

While in the standard Singh and Vives's (1984) model firms' marginal costs are constant and exogenously given, the growing literature on unionized oligopolies (see, e.g., the seminal works by Horn and Wolinsky, 1988 and Dowrick, 1989) relaxes such assumption by admitting that (labour) costs are the outcome of a strategic game played between firms and unions before the former compete in the product market. In such a framework, recent works show that higher competition, measured in terms of the *number of competing firms*, can increase firms' profits.[1] This paper also investigates the possibility of a "reversal result" (i.e. profits increase with competition) in a unionized duopoly model but, following Singh and Vives's (1984) spirit, focalises on *product differentiation/substitutability* as the measure of the degree of competition in the product market.

Moreover, we introduce another important novelty into the analysis: together with the standard case of labour constant returns technology considered by the previous literature, we also analyse diminishing returns to labour, which imply increasing marginal costs. While the latter hypothesis is largely adopted in other strands of oligopoly theory (e.g. White, 1996; De Fraja and Delbono, 1990 in mixed oligopoly models, and Perry and Porter, 1985; Heywood and McGinty, 2007 in relation to the "merger paradox" in oligopolies), the effects that introducing a decreasing returns technology produces in a unionized oligopoly framework have so far not been investigated.[2]

Our main results can be summarised as follows. When wages are exogenously determined, the standard result that profits always decrease when competition increases remains valid irrespectively of the production technology by firms. However, when unions endogenously fix wages, more various results do emerge. In particular, when product differentiation decreases, together with the standard competition effect (that always operates in reducing profits), another effect, that we label *endogenous* or *union wage effect*, (indirectly) affects profits via changes in wages. We show that the patterns of behaviour of both the competition effect and the union wage effect differ according to the regimes of competition and technology, leading to mixed outcomes in relation to the possibility that the standard (negative) relationship between competition and profits is reversed.

In particular, when labour displays constant returns, the conventional result can be actually reversed under both Cournot and Bertrand competition provided that unions sufficiently prefer wages to employment. Moreover, the range of product differentiation values, for which the reversal result applies, is larger when firms compete in quantities than in prices. Instead, under labour decreasing returns, the reversal result is generally more difficult to be obtained, since the competition effect is stronger under both competition regimes. However, we show that (provided that unions are sufficiently wage-oriented) the union wage effect can outweigh the competition effect but only if firms compete *à la* Bertrand. Hence, only under this mode of competition in the product market, the conventional wisdom can actually be reversed.

Various works deal with the relationship between competition and profits in a vertical structure. Naylor (2002a) shows the profits-per-firm raising effects of exogenous entry, which is linked to the fact that entry of a new firm has the effect of increasing the elasticity of the demand of labour, leading unions to bargain for lower wages.[3] Similarly, in a model with cost difference between firms, Mukherjee et al. (2009) point out that entry in the market increases profits of the incumbent firms if the entrant firm is sufficiently cost inefficient as compared to the incumbents (see also Tyagi, 1999; Matsushima, 2006).

Our work differs with respect to those above-mentioned in various aspects. Firstly, as already remarked, they measure competition by the number of firms competing in the product market. Instead, we refer to the degree of product differentiation. Although in both cases the possibility of the reversal result inevitably hinges on a negative relationship between competition and production costs (wages), the underlying mechanisms are different. This implies that final outcomes differ in relation to some important aspects. Most notably, while both Naylor (2002a) and Mukherjee et al. (2009) find that the positive relationship between competition and profits is more likely to occur if competition (i.e. the number of firms) is low, we obtain the opposite: when firms compete *à la* Cournot and labour exhibits constant returns, which is the framework considered by Naylor (2002a) and Mukherjee et al. (2009), the higher the degree of competition (i.e. the degree of product substitutability), the higher the possibility that the reversal result applies. Secondly, while previous literature considered constant returns to scale technology, we derive our outcomes under both labour constant and decreasing returns. This will permit us to compare the results under alternative technologies and, in particular, to highlight as technologies differently interact with diverse competition regimes.[4]

Given the key-role played by wages' behaviour in affecting our results, our work also deals with the literature studying the relationship between oligopoly competition in the final product market and unionized wages. The seminal article by Dowrick (1989) shows that higher competition reduces unionized wage. Considering a move from monopoly to duopoly, Bastos et al. (2010) provide open-shop unions and conclude that the theoretical negative relationship between competition and wages crucially hinges on the assumption that union density is one. More recently, however, Mukherjee (2012) generalises Bastos et al. (2010) with multiple unionized and non-unionized firms, showing that if there are at least two firms initially (at least one of them is unionized), higher product market competition reduces unionized wage, irrespective of the union density. While such works consider linear production technology and competition in terms of number of firms, we generalise the negative relationship between wages and competition under decentralised unionisation to the cases with diminishing returns to scale technology and competition in terms of the degree of product substitutability. Particularly, in our framework, such a negative relationship holds true irrespective of the technology, the competition regime in the product market and the union's preference for wage and employment.[5]

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[2] Exceptions are Fanti and Meccheri (2011, 2012a) that compare profits under alternative competition regimes (Cournot vs. Bertrand competition), and Fanti and Meccheri (2014) that analyzes merger profitability under centralised unionisation.

[3] In Naylor (2002b) the same mechanism is considered to investigate the conditions under which *industry* profits as a whole are increasing with the number of firms in the market. However, as also recognised by Naylor (2002a, p. 2), "[i]t is less surprising that industry profits can increase with the number of firms as such a result is consistent with falling profits-per-firm".

[4] Mukherjee et al. (2008) study the relationship between competition and profits under both Cournot and Bertrand competition. However, they maintain the standard hypothesis of constant returns to scale and concentrate on the case in which a monopolistic final goods producer can decide to licence its technology to another firm (thus increasing competition means moving from monopoly to duopoly). Importantly, Mukherjee et al. (2008) also compare the cases with decentralised (firm-specific unions) and centralised (industry-wide) unionisation. While here we concentrate on the firm-specific unions case, we refer to Fanti and Meccheri (2012b) for a study with centralised unionisation and decreasing returns to labour.

[5] In Fanti and Meccheri (2012b), we show that if labour exhibits decreasing returns and unionisation is *centralised*, the wage always increases with competition (measured in terms of the degree of product differentiation) when firms compete *à la* Cournot. On the other hand, under Bertrand competition, the relationship between the wage chosen by the central union and the degree of competition is "humped". Moreover, in relation to the competition/profits nexus, the results of this paper (with decentralised unionisation) qualitatively hold true even when unionisation is centralised.