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Competition and innovation behaviour

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Abstract

This paper attempts to shed light on the complex relationship between innovation and competition. Traditional measures of product market competition using industry statistics are often challenged and found wanting. Using the Statistics Canada 1999 Survey of Innovation, this paper develops new measures of competition by arguing that firms' perceptions about their competitive environment are important for innovation and are better measures of firm-specific competition. It shows that the relationship can be positive or negative, depending on specific competition perception and specific innovation activity. In addition, it shows that firms tend to bundle process innovation with product innovation, implying that the economic value of process innovation is likely embodied in product innovation.

Keywords: Competition; Innovation; R&D; Acquisition of technology

1. Introduction

Innovation is about turning knowledge into economic activity. It is a process of discovery, learning, and application of new technologies and techniques from many sources. It is an important driver of economic and productivity growth, and ultimately of the improvement in living standards. Many policy makers and researchers believe that competition promotes innovation.[1] "This belief has widespread consequences. It is the driving force behind numerous important policy changes, ranging from the deregulation of numerous sectors in the OECD economies to many of the economic reforms in Eastern Europe" (Nickell, 1996). The objective of this paper is to empirically study the association of innovation behaviour with different types of competition, with a focus on technological innovation.[2]

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[1] Note, however, that competition does not guarantee to achieve the social optimum level of innovation. After reviewing the literature, Martin (2002, Chapter 14) observes that a market system results in an insufficient level of innovation relative to the second-best optimum.

[2] This paper distinguishes technological innovation from organizational innovation. The former is associated mainly with activities linked to offering new or significantly improved products or production processes, while the latter is associated mainly with human resource management and managerial practices.

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After six decades of scrutiny since the publication of Schumpeter's Capitalism, Socialism, and Democracy in 1942, the relationship between competition and innovation is still a subject of intense debate (e.g., Clement, 2003).[3] Grossman and Helpman (1991) and Romer (1990a,b) argue that firms undertake innovation because they seek profitable opportunities that arise from monopoly power. This argument is an addition to Schumpeter's view that monopoly power may be a precondition for innovation (Baldwin and Scott, 1987).[4] As summarized by Kamien and Schwartz (1982), a firm that possesses monopoly power is facing less market uncertainty and can more easily appropriate returns from its R&D investments.[5] In addition, a monopolist is likely able to better finance innovation activities because of supranormal profits from its monopoly power,[6] and it is likely to use its power to search for persistent dominance in its market than a firm without monopoly power.

However, the theoretical argument of a direct effect of market power on innovation is often challenged. Levin et al. (1985) suggest that such an effect tends to be based more on technological or institutional conditions. Scott (1984, 1993) indeed shows that once industry and firm effects, proxies for technology opportunities, are controlled for, the effect of seller concentration on innovation becomes statistically insignificant. In addition, it is often argued that a monopolist has an incentive to suppress subsequent innovation by other firms (e.g., Weinberg, 1992).

On the empirical front, the evidence on the relationship between innovation and competition is also ambiguous. After surveying the literature on testing the Schumpeterian hypothesis on the relationship between monopoly power and R&D spending, Baldwin and Scott (1987, p. 145) conclude: "There is no unambiguous evidence of an important, generally valid, relationship between competition and innovative activity". This is consistent with the conclusion from the literature review by Kamien and Schwartz (1982) and Cohen and Levin (1989).[7]

"A fundamental problem is that the slippery concept of market power cannot be measured directly. Thus, resort must be had to various proxies, such as concentration, market share, profitability, and conditions of entry" (Baldwin and Scott, 1987, p. 89). Most empirical studies that test the Schumpeterian hypothesis focus on the relationship between R&D intensity and seller concentration. However, seller concentration as a competition measure has been challenged and found wanting.

Scherer (1984, Chapter 9) indicates that the effect of the traditional measure of competitive pressure on R&D investment that is traditionally found in the literature is an artifact of insufficient controls for differences among firms and industries in opportunities for R&D. Scott (1984) confirms the result and shows that the effect of seller concentration is only a small percentage of the systematic variance in R&D intensity across firms. Once appropriate controls (firm and industry effects) are added, the effect of seller concentration becomes insignificant.[8] The result is confirmed by Levin et al. (1985) using a different procedure to control for technological opportunity.[9] Thus, alternative measures of competition are needed to better understand the effect of competition on innovation.

This paper contributes to the literature by arguing that both competition and innovation have many dimensions and that different innovation activities are

[3] One key source of evidence to the scrutiny in the 1960s is the work collected in Scherer (1984). For a comprehensive review of the earlier theoretical and empirical work and its evolution, see Baldwin and Scott (1987) and Scott (1993).

[4] Loury (1979) shows that as the number of firms in the industry increases, the equilibrium level of firm investment in R&D declines. However, this result depends on fixed costs being more important than variable costs in the R&D technology. Lee and Wilde (1980) show that if variable costs are more important than fixed costs, then an increase in competition should lead to an increase in the equilibrium level of firm investment in R&D.

[5] For an empirical study of conditions of appropriability of industrial R&D, see Levin et al. (1987).

[6] Internal financing of an innovation project may be desirable because it is easy to protect the secrecy of the project from competitors and it is cheaper than external financing because of asymmetric information.

[7] For more recent empirical evidence, see Blundell et al. (1999) for a positive correlation between product market competition and innovation and Aghion et al. (2002) for an inverted U-shape relationship.

[8] Scott (1993, Chapter 10) shows that the fact that control for firm and industry effects eliminates the effect of the traditional measure of seller concentration is not the result of firms operating in many different industries. It is also not the result of measuring concentration in current sales rather than in the innovative investments of "innovation markets" in pursuit of future sales changes.

[9] For a complete discussion of this literature, see Scott (1993).