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Is Competition Good for Innovation? A Simple Approach to an Unresolved Question

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Abstract

The relation between the intensity of competition and R&D investment has received a lot of attention, both in the theoretical and in the empirical literature. Nevertheless, no consensus on the sign of the effect of competition on innovation has emerged. This survey of the literature identifies sources of confusion in the theoretical debate. My discussion is mainly based on a unified model that simplifies the comparison of different results. This model is also applied to show which factors work in favor of a positive relation between competition and innovation.

Keywords: Competition, investment, cost reduction.

JEL Codes: L13, L20, L22.

Contents

1

Introduction

Many policy issues require an understanding of the relation between competition and innovation. Should competition policy take the effects of mergers on innovative activity into account, and would one expect these effects to be positive or negative? Should entry into monopolistic markets (e.g., in network industries) be supported with a view toward the effects on innovation? Should competitive procurement be encouraged because of potential positive effects on innovation? Does the consideration of effects on innovation provide additional arguments for globalization?

Conceptually, the question whether one should foster competition because of concerns for innovation falls into two parts. First, does more competition lead to more innovation? Second, is more innovation desirable? The second point is often taken for granted. Innovation is regarded as an "engine for economic growth" and growth is regarded as desirable. Clearly, however, innovation has benefits and costs, and it does not take a lot of fantasy to construct simple arguments for why firms may innovate too much.[1] In this monograph, I will focus

[1] For instance, Tirole (1988, Ch. 2) argues that even a monopolist may oversupply rather than undersupply quality relative to a social planner.

on the first question, investigating the relation between competition and innovation, without necessarily implying that more innovation is desirable.

The analysis of the question has a long history. On the one hand, there is the Schumpeterian tradition emphasizing that monopoly rents are necessary to give incentives for innovation. On the other hand, there is the view that competition puts the necessary pressure on firms (and, in particular, on managers) to exert innovative effort, which is summarized most succinctly in the famous statement that "The best of all monopoly profits is a quiet life" (Hicks, 1935). The search for a better understanding of the topic has generated a cottage industry of a considerable size. Over several decades, there has been a constant flow of theoretical papers on the topic, both from a partial equilibrium (industrial organization) and from a general equilibrium (growth theory) perspective, and there is no sign that the flow of papers is abating. This interest is reflected in the empirical literature: The question has been dubbed the "second-most tested hypothesis in industrial organization" (Aghion and Tirole, 1994).

Of course, the continuing flow of research reflects a state of affairs that is highly unattractive from a policy point of view, namely that neither the theoretical nor the empirical research on the subject is very conclusive. Depending on the particular notion of competition, the underlying oligopoly model or the type of innovation, one can arrive at positive, negative, inverted-U-shaped, or even U-shaped relations between competition and innovation. This would be no problem if it were easy to say which economic fundamentals drive the different predictions. Unfortunately, in many cases seemingly innocuous modeling details can have a substantial effect on the predictions. The usual solution would be to search enlightenment through empirical analysis. However, it would take a rather selective view of the empirical literature to arrive at a clear conclusion. One can find empirical support for just about any relation between competition and innovation, including the possibility that there is no significant relation at all.

It is therefore not surprising that even distinguished scholars come to quite different conclusions about what we have learnt. In spite of a qualifying footnote, Aghion et al. (2005, 2009) are quite definite in their

assessment, at least as far as the theoretical industrial organization literature is concerned.

> "Theories of industrial organization typically predict that innovation should decline with competition".[2]

Vives (2008, p. 419), one of the leading IO theorists, takes the opposite view:

> "Does competition foster innovation? The answer is a qualified yes".

One might therefore want to side with Gilbert (2006, p. 162) who formulates the state of affairs as follows:

> "Economic theory supports neither the view that market power generally threatens innovation by lowering the return to innovative efforts nor the Schumpeterian view that concentrated markets generally promote innovation."

His assessment of the empirical literature is similar:

> "...empirical studies have not generated clear conclusions about the relationship between competition and innovation... (Gilbert, 2006, p. 162)".

In this monograph, I will abstain from giving another full-fledged treatment of the existing literature. The number of surveys in the field is so large that it would be hard to come up with anything but a summary and update of existing surveys. Rather, this monograph has a narrower goal. I will try to provide a simple framework that helps to understand two issues:

1. What are the sources of the ambiguous relation between competition and innovation?

[2] Importantly, the growth-theoretic work of Aghion and co-authors themselves comes to different conclusions. This will be discussed in Section 6.3.

2. Which factors (firm characteristics, market characteristics, characteristics of the innovation) are conducive to a positive relation between competition and innovation?

This monograph attempts to make some progress on these two issues. To this end, I will take a subjective look at the existing literature. Section 2 identifies the first source of ambiguity. Roughly speaking, innovation incentives are the difference between the profits of a firm if it invests (ex post profits) and profits if it does not invest (ex ante profits). Any change in parameters that reduces ex post profits without affecting ex ante profits reduces innovation incentives and, conversely, any change in parameters that reduces ex ante profits without affecting ex post profits increases innovation incentives. However, most interesting parameterizations of competition tend to reduce ex post and ex ante profits, so that the net effect is unclear without further qualification.

In the remainder of the monograph, I will therefore consider such parameterizations. In Section 3, I will review a simple framework that I introduced in a more technical companion paper (Schmutzler, 2010). This framework is general enough to contain the simple introductory examples and many familiar models from the literature as special cases. It is a two-stage model with an investment stage preceding product market competition. The product market stage is kept general, encompassing most common oligopoly models. The competition parameter is defined through a set of abstract properties that are fulfilled for most standard parameterizations of competition. The analysis reveals four simple transmission channels by which the intensity of competition affects innovation.[3] It becomes clear that these four individual effects work in different directions. Without specifying the framework further, it is impossible to say which effects dominate. Thus, one can clearly understand the sources of the ambiguity. Thereby, one obtains a useful tool for discussing the intuition for the effects of competition on innovation.

[3] Competition affects equilibrium outputs and margins and the sensitivity of these quantities to marginal costs.

As an illustration, I will then consider several simple examples in Section 4. This serves three purposes. First, the examples help to understand the different possible meanings of competition. Second, we see that even within this small set of simple examples, the effects of competition on innovation are ambiguous. Third, the examples are useful to identify the sources of ambiguities.

In Section 5, I then extend the analysis to deal with asymmetric firms. There are several reasons for doing this. First, even though the framework is static, it is useful for discussing some basic ideas about an interesting aspect of market dynamics. A central question on the long-run behavior of markets is whether initial differences between firms are self-reinforcing. A large literature has dealt with the countervailing effects emerging in this context. Some of these effects can already be sketched in the simple static framework introduced here. This discussion is interesting in its own right, but will also be important in the subsequent analysis of the effects of competition on investment with asymmetric firms. Second, the asymmetric framework is useful to obtain a first idea about the circumstances leading to a positive effect of competition on investment. A robust result is that in environments where competition has a positive effect on laggards (relatively inefficient firms), it will typically also have a positive effect on leaders (relatively efficient firms), whereas the converse statement is not true. This suggests that the analysis must take firm-specific effects into account: The aggregate impact of competition on investment may hide heterogeneous effects on different firms.

Even though the two-stage model is general in some respects, it is oversimplified in others. In Section 6, I therefore treat various extensions of the simple framework that have received some attention in the literature. For instance, I consider the possibility of endogenous entry of firms, and separation of ownership and control. I also provide some thoughts on product innovations, even though the literature is less well developed than the literature on process innovations. These modifications tend to suggest a more positive effect of competition on investment. Finally, I briefly deal with growth-theoretic papers. These papers usually contain simple two-stage oligopoly models as a building block, but to obtain a full understanding of the effects of competition

on investment, the interaction between different markets needs to be considered.

I move toward the empirical literature in Section 7. My treatment of this huge body of research is eclectic. I focus on contributions that I find useful in the context of the theoretical ideas that I am pursuing here. Perhaps unsurprisingly, I will argue that, some recent progress notwithstanding, the empirical literature mirrors the unsatisfactory state of affairs in theory, leaving the average reader at least as confused. Moreover, it is often hard to understand the relation between the theoretical models and the empirical approaches. I will therefore also summarize a few contributions that have dealt with the relation between competition and innovation in laboratory experiments. Experiments have the advantage that they can be directly tailored to test specific models. Section 8 contains some concluding remarks.

In line with the restricted scope of this endeavor, I am omitting many interesting papers on the relation between competition and innovation. This is not only true for the empirical work, but also for theory. The treatment of the growth literature, for instance, is very brief, focussing on one paper that is particularly relevant for the purposes of this survey. Also, I do not even touch the literature on patent races and research tournaments.[4] This literature is characterized by the property that, even when many firms exert effort, only a small number of them (usually one) can benefit from the fruits of the innovation. Exploring the relation of this literature to the "non-tournament" approaches discussed here would be interesting, but is beyond the scope of this monograph.

[4] See for instance, Loury (1979) and Lee and Wilde (1980) for examples of the former and Taylor (1995) for examples of the latter; Fullerton et al. (1999) et al. provides an experimental analysis of research tournaments.

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