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Economics of co-authorship

Bruna Bruno

Department of Economics and Statistics, University of Salerno, Via Ponte don Melillo, 84084 Fisciano (SA), Italy

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ABSTRACT

Starting with the literature on the rising incidence of co-authorship in economics, this paper presents a theoretical model to analyze choices of co-authorship based on the assumption that authors are motivated to optimize the returns to publications. The model analyzes two pay structures, one that is proportional to the number of authors, and one that is not. The heterogeneity of the researchers implies for the policy-maker a trade-off between the objective of maximizing effort and that of selecting better researchers. The trade-off is more relevant when low-quality researchers choose opportunistic behavior in order to collaborate with high-quality researchers.

1. Introduction

The frequency of scientific collaboration in economics has been increasing since the early 1950s, resulting in an increasing trend towards multi-authorship (Hudson, 1996). Some explanations have been proposed and tested in the literature, with varying results. Basically, the growing incidence of co-authorship is ascribed to a technological change in the production function, which fosters increasing opportunities for specialization. The estimates of the effect of co-authorship are referred alternatively to two different measurements of output: a quantitative measurement (e.g., the number of publications) or a qualitative one (e.g., the impact of each publication). Three limits in the existing analysis of co-authorship can be underlined.

The first limit relies on the focus of the proposed explanations, which are concentrated only on the supply side of the economic research market, while the demand side is often ignored. All of the arguments concern the shape of the production function or the evolution of input prices. Different returns to economic research are often considered a consequence of the structural change in research methods. It seems that the market for economic research is presumed to be a competitive market.

The second limit concerns the measurements that have been used to approximate the research output, which may be either qualitative or quantitative measures. The variable measurement of research output makes it difficult to compare the assumptions and the results of different studies.

Finally, the lack of a theoretical framework could explain both the first and the second limits discussed above. By simultaneously considering the demand and the supply side of the research market, the conflicting effects of technological change and the reward system can be evaluated. In the same way, the irrelevance of co-authorship on research measurement, whether quantitative or qualitative, can be derived from the prevailing market pay structure. A more comprehensive analysis should assess the causal relationships that must be tested and must define an approach to the measurement problem of the research output.

Hence, this paper attempts to develop a theoretical model of author–agent behavior that, while allowing for a quantitative or qualitative approach to the production function, takes into account the effects of different pay structures. The following

E-mail address: brbruna@unisa.it.

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section reviews the main hypotheses about the rising incidence of co-authorship in economic research, and Section 3 discusses some specific empirical results. The problems arising with the output measurement and the reward system are briefly summarized in Section 4. The model of author–agent behavior and its implications are described, respectively, in Sections 5 and 6. Concluding remarks are found in Section 7.

2. Determinants of co-authorship: a literature review

The literature reports empirical evidence that increased specialization may explain the rising incidence of co-authorship (McDowell and Melvin, 1983). Additional arguments have been tested over time. Barnett et al. (1988) analyze four different explanations for the rising incidence of co-authorship, finding, in regard to finance researchers, empirical support for the first three hypotheses. The *division of labor* hypothesis, tested by McDowell and Melvin, is based on the increasing specialization deriving from the growing stock of knowledge in economics. The gain from collaborative work might result from harnessing skill complementarities (Hudson, 1996) or from the fact that "it may be cheaper for an individual to acquire new capacity (human capital) to produce through formal collaboration with someone who already has the requisite human capital than to acquire the needed knowledge de novo, personally" (Laband and Tollison, 2000). From this perspective, co-authorship fosters higher quality by exploiting complementarities. Nevertheless, empirical analyses of the input relationship between co-authors have shown the existence of a substitutability relationship between co-authors (Medoff, 2007). Aside from the benefits of co-authorship, it is necessary to take into account also the costs associated with scientific collaboration. Hudson (1996) underlines that collaborative work involves compromises and less risky approaches to economic problems. Surely, multi-authored papers involve some costs of coordination and communication, varying with the intensity of specialization of the researchers involved. Combinations of researchers with different specializations favor the division of labor and reduce coordination costs. Researchers with similar skills probably face higher coordination costs.

The hypothesis of a rising *opportunity cost of time* derives from the pressure of the "Publish or Perish" mechanism. The time once devoted to informal review of colleagues' drafts has become more costly, and, by offering a co-authorship, a researcher can incentivize the level of effort required for an accurate review of his paper. Also, from this perspective, collaboration guarantees more adequate quality standards. The *diversification hypothesis* derives from the uncertainty embedded in the editorial review process. Through co-authorship, more papers can be submitted, reducing the variance of the random elements of the review process. In this hypothesis, researchers choosing whether to produce a solo-authored paper or two bi-authored papers will prefer the second option because it reduces the variance of the random elements of the review process, which may lead to rejection for even good-quality papers. Then, according to the risk diversification hypothesis, a minimum standard of quality is pursued by authors choosing co-authorship.

The fourth hypothesis, which concerns the relationship between *co-authorship and quality*, encompasses all the previous ones. The relationship between quality and co-authorship can derive from the increasing need for specialization, the rising opportunity cost of time and risk diversification, as discussed earlier. In addition, it could also be the result of a sort of synergy in which multiple contributors can develop results that none would have developed on his or her own. Synergy differs from complementarities because it can also exist between individuals with similar skills (Hudson, 1996). The quality hypothesis has been tested by using different measurements, such as citation frequency and conferment of awards. Laband (1987) and Chung et al. (2009), as well as Johnson (1997), report that the average quality (measured by citation frequency) is higher for co-authored papers. For Laband and Tollison (2000) the evidence that co-authored papers are more likely to be accepted for publication than solo-authored papers supports the hypothesis that co-authorship gains occur in the form of higher-quality manuscripts. Presser's (1980) results for social psychology, showing that collaboration is associated with fewer rejections, are often cited as support for the quality hypothesis. In contrast, Barnett et al. (1988) do not find support for the quality hypothesis, and Hollis (2001) reports differentiated results: by using the journal citation index as a proxy for the quality of the articles, he finds that quality is positively correlated with the number of authors for a given author; on the other hand, total output per period per individual, measured as the sum of published pages weighted by quality indexes and discounted by the number of authors, is lower when more co-authorship occurs. For the author, this evidence supports the conclusion that, though collaboration is privately rational, it is not socially desirable if we care about the sum of quality research produced.

A fifth hypothesis is added in this paper. The *demand-side hypothesis* suggests that co-authorship is enhanced by the academic pressure for publications, for the purpose of obtaining higher salaries and quicker career advancement, which results in

> "…an oversupply of research tied to personal and bureaucratic imperatives such as promotion and tenure…" (Laband and Tollison, 2000, p. 166).

If researchers are evaluated on the basis of the number of publications/citations and if papers with k authors are not counted as $1/k$ papers, the benefit from co-authorship is straightforward. Researchers choosing whether to work on a solo-authored paper or on two bi-authored papers, exerting the same effort, will prefer the second option because it doubles the probability of an upward move.

Taken as a whole, two explanations remain on the table. According to the quality hypothesis, researchers collaborate to obtain a synergy effect or risk diversification, to exploit skill complementarities or to obtain informal review. The demand side hypothesis stresses that the incentive for co-authorship is provided by the research organization, which rewards the number of publications or their quality in the same way, regardless of the number of authors. The critical difference between

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