

Does interdisciplinary research lead to higher scientific impact? A research group based analysis

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Introduction

A variety of science policy instruments aim to foster Interdisciplinary Research (IDR) since it is perceived as more successful in achieving scientific and technological breakthroughs. However, there is little evidence showing that interdisciplinarity systematically leads to achievement, although there are plenty of historical studies suggesting that interdisciplinary research environments play a key role in scientific breakthroughs (e.g. Hollingsworth, 2006).

Some recent studies have obtained conflicting results on this issue, looking at the impact in terms of citations, and using as units of analysis the paper (Adams et al, 2007; Lariviere and Gingras, 2010) or the journal (Lewitt and Thelwall, 2008). In this study we investigate the relation between interdisciplinarity and scientific impact, bringing in two methodological contributions. First, we use the research group as unit of analysis (c.f. Rinia et al, 2001); second we use both established and novel measures of diversity as indicators of interdisciplinarity (Porter et al, 2007; Rafols and Meyer, 2010).

Method

The analysis is based on the publications generated from 1990 to 2003 by 62 research groups of the Spanish Council for Scientific Research (CSIC) that were funded by the Spanish Food Technology Program.

Two sets of data were used. The first set refers to research projects and the second to the publications produced by groups involved in these projects. Data about projects include the number of researchers taking part in each project and affiliation of the principal researcher. Publications were retrieved from Science Citation Index (SCI). All the information in the database for each publication was downloaded, including all the references. The publications were linked to research projects matching author names with names of researchers in each project (Yegros-Yegros, 2010). Publications and references were classified into disciplines according to ISI Subject Categories.

Impact of publications is measured by number of received citations normalized by field and publication year. Degree of interdisciplinarity is measured through indicators of disciplinary diversity (Rafols and Meyer, 2010).

Results

We find that different measures of diversity show different influence on citations. For instance, Figure 1 presents the influence of Shannon diversity or entropy on the scientific impact of research groups. Diversity was calculated over the whole set of references of each research group, i.e. $-\sum_i p_i \ln p_i$, (where p_i is the proportion of references in discipline i). Preliminary regression results corroborate an inverted u shape dependence of impact on diversity at the group level (c.f. Larivière and Gingras, 2010). Further analyses explore in detail the different influence on impact of the various aspects of diversity, namely the variety or number of disciplinary categories, the balance or evenness of the category distribution and the distance or disparity between categories.

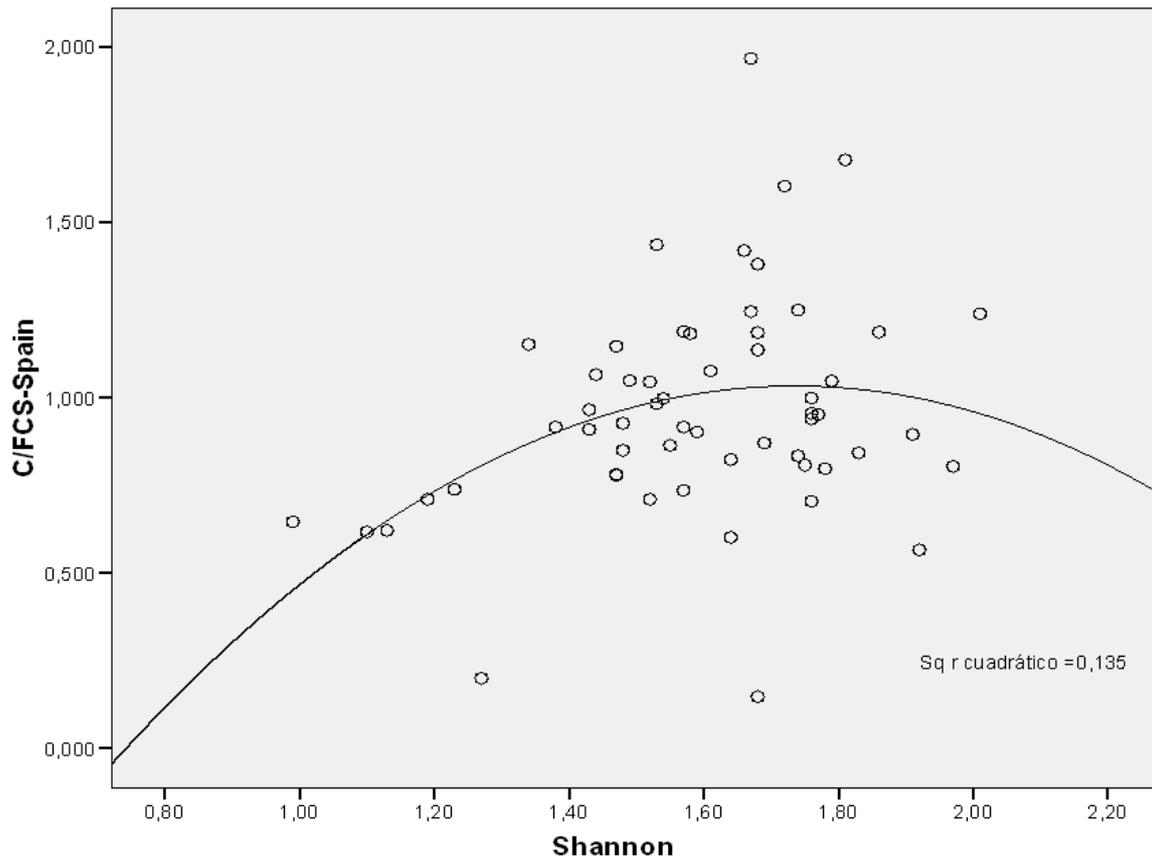


Figure 1. Average impact per paper vs Shannon diversity of disciplines in references, per group

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