Citation Flows in the Zones of Influence of Scientific Collaborations

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Domestic citation to papers from the same country and the greater citation impact of documents involving international collaboration are two phenomena that have been extensively studied and contrasted. Here, however, we show that it is not so much a national bias, but that papers have a greater impact on their immediate environments, an impact that is diluted as that environment grows. For this reason, the greatest biases are observed in countries with a limited production. Papers that involve international collaboration have a greater impact in general, on the one hand, because they have multiple "immediate environments," and on the other because of their greater quality or prestige. In short, one can say that science knows no frontiers. Certainly there is a greater impact on the authors' immediate environment, but this does not necessarily have to coincide with their national environments, which fade in importance as the collaborative environment expands.

Introduction

Some workers have analyzed the degree of collaboration using the coauthorship of publications (Carpintero & Peiró, 1983; Alcaín & Gálvez, 1998). There is indeed some correlation between the coauthorship index and the impact of papers, so that scientific communities gain in visibility as their networks grow and bring together a greater number of associates (Moya et al., 2008). In general, high levels of collaboration lead to high levels of impact, greater quality of the papers published, and greater productivity of the authors in their particular scientific fields (Lewinson & Cunningham, 1991; Narin, Stevens, & Whitlow, 1991; Glänzel, 2001; Glänzel, 2002; Leimu & Koricheva, 2005; Katz & Hicks, 1997; Persson, Glanzel, & Danell, 2004; Hsu & Huang, 2010; Aksnes, 2003; Moya-Anegón et al., 2008; Chinchilla, Vargas, Hassan, González, & Moya, 2010)

The potential benefits of scientific collaboration may depend on the discipline. The effect of collaboration on scientific impact appears to be more positive in the "hard" sciences such as physics and astronomy, than in the "soft" sciences such as sociology or social sciences (Stack, 2002; Bandyopadhyay, 2001; Moed, Bruin, Nederhof, & Tijssen, 1991; Bridgstock, 1991), with citation behaviour sometimes differing considerably from one field to another (Lancho, Guerrero, & Moya, 2010a, 2010b).

The benefits will also depend on the different types of collaboration (Leimu & Koricheva, 2005; Katz & Hicks, 1997): (a) domestic in-house collaboration (all authors from the same institution); (b) domestic institutional collaboration (all authors from the same country but from more than one institution); and (c) international collaboration (authors from more than one country; (Leimu & Koricheva). Although institutional collaboration is more important than domestic in-house collaboration, international collaboration is even more so in the sense that it increases the citation rates far above those of domestic national collaboration (Narin et al., 1991; Katz & Hicks; Goldfinch, Dale, & De Roue, 2003; Sooryamoorthy, 2009).

Gómez, Fernandez, and Sebastian (1999) consider that international collaboration increases the visibility of research papers since they are published in journals of greater impact than those of national collaborations. Narin and Whitlow (1990) find evidence that papers with a multiple international authorship have double the citation frequency of those without such collaboration. Schmoch and Schubert (2008) suggest that international papers are more highly cited because their potential community is larger. In other words, international papers may be more highly cited simply because

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