

Network of scientific collaboration of Cuban researchers working in Europe: Perspective for the home country

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This study analyses the potential value of the network of scientific collaboration of Cuban researchers in Europe focussing on their institutional links with worldwide collaborators between 1995 and 2014.

Countries investing in science to boost their economic growth are also engaging and supporting the international collaboration in science [1]. This exchange of knowledge generates borderless flows of researchers as actors of complex and global networks of scientific collaboration. The dilemma for developing countries is how to benefit from this global network of international collaboration without losing their best and brighter researchers. Premises for the right balance rest on strengthening the national capacity in science and optimising transnational knowledge practices of the mobile researchers to contribute to the national output in science from abroad and to build long lasting relationships for returning home [2].

Our research aimed to find the features of those premises in the case of Cuba. First, we investigated the Cuban scientific capacity [3]. Second, we focused on the performance of a sample of 107 Cuban researchers in Europe and their potential to bridge their network of collaboration from Europe with Cuban science [4]. Selecting the sample of researchers in this geographical region responds to the mobility trends during the period of study between 1995 and 2014 and the prospect of strengthening the scientific collaboration between Cuba and Europe. Another advantage of this region is the free movement of their researchers and the availability of flexible and inclusive funding in the European Research Area.

Sample of Cuban researchers in Europe (CRiE)

We estimated by triangulation of three different sources that Cuban researchers in Europe might be between 600 to 1200 from the beginning to the end of the period of study. The ability to publish in scientific journals was the distinctive attribute to choose the sample. By publishing, scientists consider the knowledge as a public good, making possible a favourable environment for sharing information among collaborators. Figure 1 shows the experimental design followed in the process of finding the sample of the active Cuban researchers in Europe (CRiE). The initial list of researchers was created using the chain-referral sampling methodology, searching sources of professional network such as LinkedIn. The original number of candidates were 150 Cuban professionals in Europe. A further screening using the bibliographic database Scopus reduced the number to 135 Cuban researchers with at least one

record, of which 107 were included in the study as CRiE according to their publication pattern.

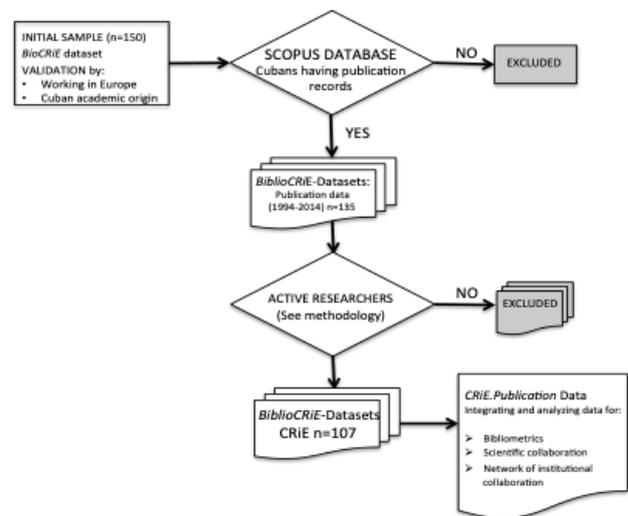


Figure 1: Experimental design. Source [4]

Network of scientific collaboration of CRiE

The search in Scopus was carried out by using the Author search engine, limiting the number of documents to articles and fixing the period between 1995 and 2014. Publication records of each researcher with all available information was downloaded and codified anonymously creating 107 datasets (BiblioCRiEs). Another working dataset (Publication Data) integrating the bibliometric information was created in order to explore the institutional collaboration. By choosing institutions rather than countries we were able to assess the institutional actors (nodes) in the CRiE network of collaboration. Each publication with n collaborations generates n binary links of CRiE institutions (type I) with n collaborating institutions (type II). A third column (weight) counting the frequency of those binary ties between type I and type II institutions was also recorded (More explanation in [4], page 271, paragraph 3). The three columns of the binary relational matrix were then transformed in a symmetrical matrix using an ad hoc programme [5] and then processed through UCINET and NetDraw software for k -core analysis of centrality and the visualization of the institutional network of collaboration created by CRiE [6].

Institutions and links in CRiE network		
Sector	Institutions Nr(%)	Collaborations Nr(%)
Academia	14(40)	185(73.7)
Public Health	5(14.3)	8(3.2)
Industry	9(25.7)	39(15.5)
CITMA	7(20)	19(7.6)
Cuba/CRiE- Network	35/991	251/6842

Table 1: Cuban institutions in the network of CRiE

Profile of CRiE and analysis of the network of scientific collaboration

CRiE have been publishing from 115 European institutions of which 80 were universities, 28 national or regional institutes of research and 7 institutions from the industry. CRiE accrued 2,385 scientific articles of which 1,863 were with European affiliation generating 1,348 collaborative articles between 1995 and 2014. The whole network of CRiE collaboration comprises 991 different institutions (nodes) from 56 countries: 698 from Europe, 118 from North America, 96 from Latin America and 79 from the rest of the world. European institutions sharing Latin roots are highly represented among institutions of the region in which Spain shares 24% of collaborative institutions, followed by Italy (15%) and France (14%).

The 1348 collaborative articles generated 3140 binary collaboration (ties) accruing 6842 frequencies of links. Fifty-six CRiE collaborated with Cuba producing 203 articles (203/1348, 15%) and 251 collaborative links (251/6842, 3.6%) with 35 Cuban institutions (Table 1). The majority of collaboration with Cuba took place during the first five years after moving to Europe.

k -core analysis of centrality showed two Cuban universities sharing the central position ($k = 6$) with another 24 institutions worldwide of which, 18 belong to academia. These Cuban institutions were the University of Havana and the Central University of Villa Clara. Another two and five Cuban institutions were in k -cores 4 and 3 respectively. The rest were in the periphery among 679 institutions (Figure 2).

Summary

Building the network of international collaboration of CRiE by choosing the institutions as nodes, provides key information about where the Cuban actors of the network have been more successful. The network analysis of centrality informs which institutions are better connected and therefore benefited from the international collaboration in this particular network.

From Cuba's perspective it shows the positioning and the degree of penetration of Cuban institutions in the network of their mobile researchers, pointing where the country can build further cooperation and partnership. Cuban universities are the main actors in the Cuba-CRiE collaboration. More importantly,

this network of CRiE publishing with Cuban institu-

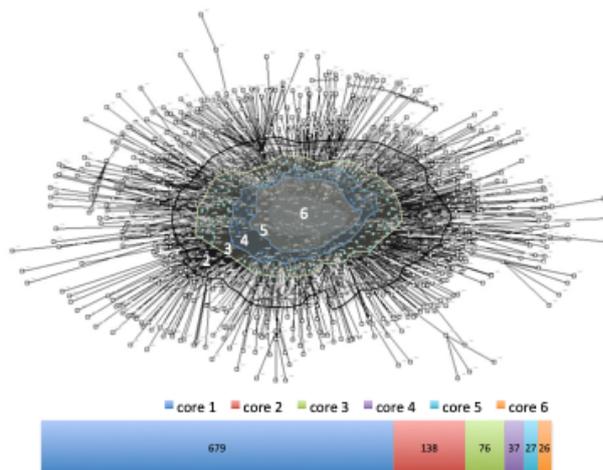


Figure 2: CRiE network of institutional collaboration. The horizontal bar shows number of institutions per core based on k -core analysis of centrality. Source [4]

tions helps to increase the visibility of Cuban scientific capacity, through international meetings and more diversified journals not always used by Cuban counterparts. This study shows that Cuban researchers naturally collaborate with the home country. There is scope for improvement addressing a long-term connection, and lessons to learn from the experiences of both sides: CRiE and the researchers from Cuban institutions. Monitoring the dynamic of the network can be a valuable tool to optimise the relationship between mobile researchers abroad and the national system of science and innovation, including their temporary or definitive return to work in Cuban institutions.

Notes

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