A quantitative analysis of the academic economic literature regarding the Brazilian Development Bank (BNDES)[☆]

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Abstract

This article presents a systematization and quantitative evaluation of the economic literature regarding the Brazilian Development Bank – BNDES – produced since its foundation, in 1952, until 2013. We identified, catalogued, read and analyzed approximately 1000 studies, in order to understand what were the major themes and questions raised in this literature, what types of methodologies were employed and how these changed over time, as well as indicators of authorship, collaboration and institutional affiliation. Using this database, a quantitative analysis was carried out using the following indicators: (i) production, which evaluates both the quantity and characteristics of these publications, (ii) impact, which measures the repercussion of this production and (iii) relational, which evaluates citation, co-citation and co-authorship networks. The results showed a growing trend in the number of publications, especially in the last two decades. Additionally, this analysis revealed that the distribution of these publications was significantly concentrated in terms of the most cited documents, the most prolific authors and the institutions which sponsored these publications. Furthermore, a network analysis showed a reduced density in the citation and co-authorship networks, as well as isolated debates on certain themes.

Resumo

Este artigo apresenta uma sistematização e avaliação quantitativa da literatura econômica sobre o Banco Nacional de Desenvolvimento Econômico e Social - BNDES - produzido desde a sua fundação, em 1952, até 2013. Identificamos, catalogamos, lemos e analisamos cerca de mil estudos, a fim de compreender os principais temas e questões levantadas nessa literatura. Destacamos os diferentes tipos de metodologias e como estas questões mudaram ao longo do tempo, bem como indicadores de autoria, colaboração e filiação institucional. A partir desse banco de dados construído, uma análise quantitativa foi realizada utilizando os seguintes indicadores: (i) de produção, que avalia tanto a quantidade e as características dessas publicações, (ii) impacto, que mede a repercussão dessa produção e (iii) relacional, que avalia redes de co-autoria e co-citação. Os resultados mostraram uma tendência crescente do número de publicações, especialmente nas duas últimas décadas. Além disso, essa análise revelou que a distribuição dessas publicações foi concentrada de forma significativa em termos dos documentos mais citados, os autores mais produtivos e as instituições que patrocinaram essas publicações. Além disso, uma análise de rede mostrou uma densidade reduzida nas redes de citação e de co-autoria, bem como debates isolados em determinados temas.
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1. Introduction

The BNDES is the largest development bank in Latin America and one of the biggest in the world. Its importance, measured by the amount of credit disbursements in relation to GDP in Brazil, grew significantly over the last decade. This recent increase is associated with a growing academic interest on the role of the bank and its activities. In fact, the role played by BNDES in the Brazilian economic development has been a recurrent theme in the literature – various debates were carried out when finance for industrial growth was particularly high during the 1970s in Brazil, as well as in the context of privatization of state owned enterprises carried in the 1990s.

We identified almost 1000 documents, including books, articles, theses, dissertations and selected working papers which were directly or indirectly related to BNDES. Our aim was to understand what were the major themes and questions raised in this literature, what types of methodologies were employed and how these changed over time as the bank grew and its mission changed. Issues of authorship, collaboration and institutional affiliation were also investigated. In order to achieve this objective, we employed bibliometric tools to explore this database and constructed new indicators.[1] We also performed network analysis by mapping the economic literature produced on the BNDES since its creation, in the 1950s, up until the time of this writing (2013).

The BNDES was originally founded to provide long-term financing for investments in order to support various economic development policy goals and this is still its primary role in the Brazilian economy. As a consequence, the history of the bank coincides with the different stages of economic development in Brazil and, as such, the bank's own operations raise important and interesting questions to economists and other researchers. Research in this area has proven to be fruitful given the range of theoretical approaches regarding the role of development banks. However, despite extensive economic literature on the BNDES, no systematic survey, filtering and evaluation had been carried out of this literature. Many questions remained unanswered as to the extent of this literature, the most relevant topics, the most prolific authors, the publications which have had the greatest citation impact and the trend of production, amongst others.

This article aims to address these questions and, in doing so, to provide an overview of the existing academic literature regarding the BNDES over the last 60 years. Three specific contributions stand out: the first is a survey of publications analysing the BNDES, including bibliographic information and the references cited by them. This information was systemized into a database which consists of 919 documents and 923 authors whose research is related to the bank. The second contribution is the use of bibliometric analysis, which allows us to create a profile of the whole economic literature on the BNDES by incorporating the original use of networks to evaluate citation,

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[1] Bibliometric analysis is an important tool as it allows researchers to profile areas of knowledge, map relationships among authors and develop indicators on the production and impact of academic literature (Okubo, 1997; Van Leeuwen et al., 2003). When combined with network analysis, bibliometric methods allow for a better evaluation of the relevant literature on a topic or specific subject (Pilkington and Meredith, 2009).

co-citation and co-authorship links amongst these documents. The article's third and final contribution lies in the use of an internal database which was constructed to consider the entirety of the relevant documents on the BNDES, thereby increasing the reliability of the bibliometric analysis.[2]

The article is divided into five sections, including this introduction. Section 2 provides a description of bibliometric analysis while Section 3 gives an explanation of the methodology used to compile the database and discusses the indicators which were chosen for analysis. In Section 4, the results are presented and discussed and finally, Section 5 concludes the paper.

2. Bibliometric indicators

The term bibliometrics has been defined as the application of mathematical and statistical methods to measure the quantity and performance of publications such as books, articles and other types of media (Pritchard, 1969). Literature on these methodologies has essentially identified three types of bibliometric indicator: (1) quantitative/production; (2) performance/impact; (3) structural/relational (Moed et al., 1995; Rousseau, 1998; Gauthier, 1998; Van Leeuwen et al., 2003; Lundberg, 2006; Durieux and Gevenois, 2010). Although a variety of terminology has been used within the literature, these terms are essentially related to the same concepts.

Quantitative indicators are used to measure production by counting the number of publications per author, document type, research institution or country. When these indicators are available for a long enough period of time, we can make conjectures about trends in publication (Durieux and Gevenois, 2010).

Unlike the quantitative indicators, performance indicators aim to measure the quality and impact of a publication, author or institution (Durieux and Gevenois, 2010). For example, bibliometric analysis widely uses the number of citations received by an author, article or institution as an indicator of its performance or impact. Garfield (1955) considered citation indexes to be an important source of information for researchers and argues that, in the case of a relevant article, the citation index provides a measure of how influential this article has been to fellow researchers.

Martin and Irvine (1983) draw a distinction among the concepts of the "quality", "importance" and "impact" of a publication. They argue that these concepts cannot be directly measured, i.e. the number of citations a publication receives does not directly reflect its quality or importance, but rather serves as a partial indicator of its impact. Other factors which can affect the number of citations a publication receives include the location of the author, her prestige within the scientific community, the language the document was published and the availability of the journal it appears in.

Finally, structural or relational indicators measure the connections among publications, authors or fields of research (Durieux and Gevenois, 2010). These indicators are widely used in the literature, especially in the bibliometric analysis of co-authorship and co-citation. Co-citation analysis typically presents a network in which authors' most frequently cited documents are connected through co-citation links. Relational indicators are used to map knowledge structures and networks among authors, documents, institutions and countries. This allows us to identify partnerships among institutions or authors and to show the connections among topics or research areas, or even identify emerging topics in a field (Lima et al., 2010; Okubo, 1997; Gauthier, 1998).

Co-citation analysis is one of the quantitative methods widely used to create networks, identifying specific structural frameworks in the field of research. These frameworks can be evaluated by author co-citation analysis (ACA) or document co-citation analysis (DCA) (White and Griffith, 1981).

Small (1973) defines co-citation analysis as the frequency two documents are cited in the literature together by a subsequent document. He goes on to argue that when publications are frequently co-cited they are, invariably, cited even more frequently individually. As such, they tend to represent the concepts, methods or key experiments in a field of knowledge. Thus, co-citation patterns can be used to map the relationships among these key concepts.

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[2] In Brazil, bibiometric analysis was initially used in the field of Economics by Azzoni (1998, 2000), whose objective was to perform an impact analysis on the research of authors, academic institutions and economics journals. This was done by measuring the frequency with which the work was cited by articles published in major Brazilian journals. In order to ascertain more fully the international impact of Brazilian publications, Issler and Ferreira (2004) evaluated researchers and Economics departments in Brazil by the number of citations they received in international journals. On the other hand, Faria et al. (2007) studied the determinants of international citations of Brazilian economists in articles published in major Brazilian economics journals. However, it was only with the work of Faria (2010) that issues related to the language of publication and co-authorship were explored. Despite this literature, we found no studies that use bibliometric analysis as employed in this paper.

White and Griffith (1981) suggest mapping an area of knowledge by using the authors as the unit of analysis and the co-citations of pairs of authors as variables which measure the relationship between them. That is, the more frequently two authors are cited together, the greater the relationship between them.

In this article, we use quantitative production indicators to create a profile of the economic literature on the BNDES. We then use impact indicators and citation, co-citation and co-authorship networks to evaluate the literature relevant to the scientific community.

3. Methodology

3.1. Database

This article is based on a database constructed in order to systematize the economic literature published on the BNDES since its founding, in the 1950s. This involved three distinct phases through which publications were identified, registered and classified.

First, extensive work was carried out to identify academic literature on the subject by searching for key words/themes related to the BNDES's mission of providing long-term financing for investment.[3] In addition to the references available on digital platforms (such as *JSTOR*, *Scielo*, *Web of Knowledge*, *Science Direct* and *Google Scholar)* we consulted the main Brazilian archives and libraries as well as the international literature on the BNDES. This included academic journals, theses, dissertations, books and book chapters and working papers, amongst others.[4] This initial search protocol indicated a vast amount of academic material on the topic. However, a significant portion of the literature found using these keywords was not, in fact, related to the BNDES. Thus, in order to identify potentially relevant publications (those which indeed evaluated the role of the bank) we performed a first reading of the documents, selecting only those that fit the purpose of this research and which merited a second, more detailed reading.

In the second phase, we registered the selected documents along with bibliographic information and details of the references they cited. The bibliographic references in the documents served two purposes for our research; firstly, they allowed us to identify new literature to be included in the database, and secondly, they allowed us to isolate the most frequently cited academic literature on the BNDES.[5]

Finally, we classified the documents according to both the chronological period which they referred to and by the themes they addressed. Based on changes in the way the bank has operated throughout its history, we defined five sub-periods, namely, 1952–1964, 1964–1980, 1980–1990, 1990–2002 and 2002–2013,[6] and themes were defined according to the areas the BNDES operates.[7] The documents were then classified according to the degree to which the BNDES was referred to in the text. For this, we adopted the following criterion, represented by a binary variable called "Degree of reference to the BNDES": 1 = the object of the study is specifically the bank, or the BNDES plays an important role in the document; 0 = the object of study is not the BNDES nor is the bank mentioned significantly in the document.[8]

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[3] These themes include: long-term financing, BNDE(S), long-term investment, development bank, capital goods financing, infrastructure financing, privatization and development financing. Publications of "Prêmio BNDES" were only considered when dealing on the BNDES.

[4] The category "others" was created to include working papers, special studies and some research reports.

[5] It should be stressed that not all of the references in the selected articles were included in the database, but only those that met the same criteria of the key words associated with the mission of BNDES, as used in the identification phase. Thus, the references included in the database for each publication constitute qualified references to the research objective and, as a consequence, are also an entry in the database itself. Citations analyzed in the database were restricted to papers referring to the BNDES.

[6] Some documents are not related to a specific period, for example, those which deal with the theoretical role of development banks. These works were grouped into an item entitled "timeless".

[7] The themes associated with BNDES financing programmes are: Agribusiness, Trade, Tourism and Services, Urban and Social Development, Sports and Culture, Exports and International Positioning, Industry, Infrastructure, Innovation, Environment and Capital Markets. Additionally, three themes were created ("Privatization", "Theory of Development Banks" and "Others"). Note that a single publication can address more than one topic and cover more than one period.

[8] For example, a publication that evaluates the role of the BNDES in the creation of jobs was rated as 1. A publication describing the sources of financing in Brazil which includes only tables or figures on BNDES disbursements without critical evaluation were classified as 0. Additionally, publications restricted to a brief description of the history of BNDES were also rated 0.

In summary, this process resulted in a unique and targeted database of economic literature on the BNDES. It constitutes a collection of publications which were identified and qualified by consulting a wide range of archives using various search tools and the references included in these documents. Thus, information about citations was obtained from the documents that make up the database. The most frequently cited publications, which will be evaluated later in this article, are therefore those which had the greatest impact on the other studies evaluating the BNDES. The completed database consists of 919 academic works published between 1952 and June 2013.[9] Therefore, all indicators regarding quantity, such as the number of citations and the number of published documents, among others, refer to this period.

3.2. Method of analysis

The information in the database was used to construct production and performance indicators as well as citation, co-citation and co-authorship networks. The data were separated into "characteristic variables", which enable us to characterize the production, and "classification variables", which comprises the period of analysis, the themes studied and the degree to which the BNDES was referred to in the text. The database was analyzed using one-dimensional statistics (e.g., number of publications), two-dimensional statistics (the relationship between two variables, such as the number of publications by document type), multidimensional statistics or the relationship among multiple variables (e.g., the number of publications by document type per year) and finally, statistics that detect patterns of the frequency distribution of quantitative variables.

As a significant portion of the documents in the database came from the BNDES's own publications, such as books, *Revista do BNDES*, *BNDES Setorial* and *Working Papers*, it became important to analyze these documents separately. This was done by filtering the documents by institution, thereby making it possible to calculate the indicators separately for publications that were sponsored by the BNDES and those which were not. Non-parametric methods were employed to test for differences of means because the distribution of publications and authors were found to be non-normal which, in turn, violates one of the main assumptions of almost all these types of statistical tests. Tests for independent samples such as the Mann–Whitney and Kruskal–Wallis tests as well as tests for paired samples, like the Wilcoxon test, were used.[10] A multivariate factor analysis technique was also applied to identify common features among the most cited papers in the database.[11]

The statistics presented in the tables and graphs that follow, in addition to the differences of means tests, were obtained using the data editor IBM SPSS Statistics 20. Citation, co-citation and co-authorship networks were elaborated using UCINET 6.0 and NetDraw (Borgatti et al., 2002) softwares.

4. Results of the bibliometric analysis

4.1. Production indicators

Fig. 1 shows the evolution of the literature, which allows us to observe trends over the period of analysis. As previously mentioned, studies published by the BNDES itself and those published by other institutions have been treated separately. A growing trend can be observed in the total number of publications on the BNDES, with a

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[9] Of these works, 888 (equivalent to 96.6%) were read, evaluated and classified according to the methodology set out, whilst the remainder of the database consists of edited collections (3.4%). These collections (books) were considered relevant within the database as they were found in the bibliographic references of many documents, i.e., in these cases, the citation referred to the whole collection and not the specific article. However, since the articles that make up these collections were separately evaluated and classified, it was considered unnecessary to classify the collection itself, thus avoiding double counting.

[10] The Mann–Whitney test is an alternative to the t-test for independent samples which compares the central tendency of two samples in order to detect differences between two corresponding populations. The Kruskal–Wallis test is a generalization of the Mann–Whitney test for more than two groups. From random samples of K populations, one can test the hypothesis of a location parameter common to all populations. Finally, the Wilcoxon test is applied to analyze differences between two conditions in the same group of subjects, that is, an alternative to the *t*-test for paired samples and tests whether the populations differ in location (Pestana and Gageiro, 2005).

[11] Factor analysis is a set of statistical techniques that can reduce the original number of variables by extracting independent factors, so that these factors can explain, briefly, the original variables. Factor analysis assumes the existence of a smaller number of unobservable variables which are correlated to the data, indicating what is common to the original variables (Pestana and Gageiro, 2005).
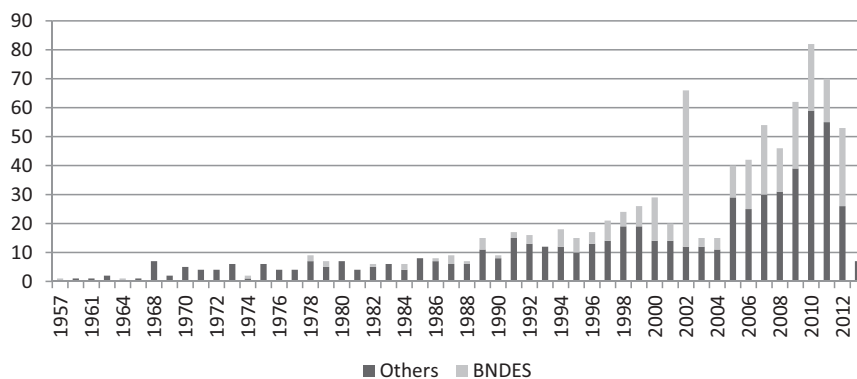
Fig. 1. Evolution of publications of the economic literature on the BNDES for the period 1957–2013 and sponsoring institution.
Source: Elaborated by the authors using the database of publications on the BNDES.

Table 1
Documents from the economic literature on the BNDES, by type and sponsoring institution.

	Articles	Book chapters	Books	Masters dissertations	Doctoral theses	Discussion texts	Others	TOTAL
Others	260	88	88	84	42	26	35	623
BNDES	137	106	35	–	–	11	7	296
Total	397	194	123	84	42	37	42	919

Source: Elaborated by the authors using the database of publications on the BNDES.

considerable change in the 1990s and another after 2000. Until 1969, only 16 publications were listed in the database. Publications on the BNDES were still relatively low in the 1970s and 1980s, with an average of 6.35 publications per year. In the 1990s, however, there was a significant increase in publication, with a mean of 17.5 publications per year. This trend becomes more pronounced after 2000, with an annual average of 42.9 references. Publication was particularly concentrated in 2010, with 82 publications recorded in the database for that specific year. The rate of growth of publications on the BNDES (13.5% a year over the last five years) was higher than that of scientific papers in Brazil in general which, according to data provided by SCImago Journal & Country Rank (2013), was around 9.7% annually over the same period. This growth in the literature on the BNDES suggests an increased interest from researchers on topics related to the bank and follows the growth of BNDES lending in recent years.[12] However, this growth was also found to be the result of a generalized increase in the scientific literature in Brazil.

It can also be seen in Fig. 1 that, until the end of the 1980s, the BNDES was responsible for very little of the literature that emerged about the bank. Until the late 1980s, the BNDES sponsored, on average, only 0.7 publications annually, while publications sponsored by other institutions averaged 4.4 per year. However, since 1990, the institution has increased its share in the total number of publications, being responsible for a significant and growing portion of the economic literature on the bank. During the 1990s, the average number of publications sponsored by the BNDES was 4.0 per year, increasing to 16.9 from the year 2000. On the other hand, publications sponsored by other institutions increased from 13.5 in the 1990s to 26.0 after the year 2000. This was due to the reissue of the "*Revista do BNDES*", in 1994, and increased support for the publication of books, particularly commemorative ones. The peak of publications sponsored by the BNDES, for example, occurred in 2002, which marked the fiftieth anniversary of the bank and generated a large number of publications, especially chapters of books.

Table 1 shows the distribution of this production by document type. It can be observed that BNDES was responsible for almost one third (32.2%) of all publications. Looking at the composition of the literature, 43.2% were articles, 21.1% book chapters, 13.4% books and 4.6% fall into the "other" category. This shows the clear predominance of articles compared to other types of documents. With regard to sponsoring institution, there was a concentration of books and

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[12] The correlation calculated between BNDES disbursements as a proportion of GDP and the number of publications on the BNDES was 0.78.

Table 2
Journals in which the articles on the BNDES were published.

Journal	Number of papers	Percentage	Percentage of papers citing papers already published in the journal
Revista do BNDES	108	27.2%	23.1%
BNDES Setorial	17	4.3%	23.5%
Revista de Economia Política	14	3.5%	0.0%
Economia e Sociedade	14	3.5%	35.7%
Análise Econômica	13	3.3%	7.6%
The Quarterly Review of Economics and Finance	13	3.3%	0.0%
Ensaios FEE	13	3.3%	0.0%
Latin American Perspectives	8	2.0%	0.0%
Estudos Econômicos	8	2.0%	0.0%
Desarrollo Económico	7	1.8%	0.0%
Pesquisa e Planejamento Econômico	7	1.8%	14.2%
World Development	7	1.8%	28.5%
Latin American Research Review	7	1.8%	0.0%
Journal of Interamerican Studies and World Affairs	6	1.5%	0.0%
Energy Policy	6	1.5%	0.0%
Others	149	37.5%	–
Total	397	100%	–

Source: Elaborated by the authors using the database of publications on the BNDES.

book chapters published by the BNDES, while theses and dissertations were mainly developed by the post-graduate centres of UNICAMP and UFRJ.

Analysing specifically the category of articles, we can identify the journals in which articles on the BNDES were published (Table 2). In an attempt to consider the possible bias of a journal editor towards publishing papers which cite their own journal, we present, in the fourth column of Table 2, the percentage of papers that cited at least one paper from the same journal in which it was published. According to this information it is possible to observe that articles were published in 102 different academic journals during the period, with an average of 3.9 per journal. However, this was not evenly distributed: 57.8% of journals published only one article, whilst the "*Revista do BNDES*" published 108 – this last journal can be seen as the main vehicle for publications concerning the bank. The other journals that published a significant number of articles on the bank are "*Revista de Economia Política*", "*Economia e Sociedade*", "*Análise Econômica*," "*The Quarterly Review of Economics and Finance*" and "*Ensaios FEE*". Journals edited by the BNDES cite their own papers to a greater extent than most of the other journals, with the exception of "*Economia e Sociedade*" and "*World Development*".

Analysing trends in authorship, we identified that among a total of 923 authors responsible for producing the economic literature on the BNDES, 30.8% were affiliated with the BNDES at the time of publication, while 69.2% were researchers from other institutions. These 923 authors produced the database's 919 documents, which represents an average of 0.99 publications per author. The greater number of authors relative to publications reflects the fact that co-authoring was more prevalent than authors being responsible for more than one publication. When we consider that each individual co-author of the document received full credit for the work, the average number of texts published per author increases to 1.6, with values ranging from 1 to 32 publications per author. In addition, 76.1% of authors published only one document on the BNDES during the entire period of investigation while 97.5% of authors published up to five texts during the same period. This asymmetry in the distribution of authors, which is often found in bibliometric analysis, seems to reflect the fact that few authors devote themselves to one specific subject and that many authors contribute marginally to the overall number of publications. The number of documents published per author also varies significantly when we look at institutional affiliation, with BNDES affiliated authors publishing a greater number of papers, on average.[13]

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[13] We conducted the Mann–Whitney nonparametric test for independent samples, which allowed the rejection, at a 1% significance level, that the distributions of the number of documents per author were equal (in central tendency). Therefore, it was noted that the figures for publications per author were different when affiliations were considered, as authors affiliated to the BNDES were more prolific.

Table 3
Main themes and periods that were studied in publications on the BNDES.

Themes	Period					
	1952–1964	1964–1980	1980–1990	1990–2002	2002–2013	Total
Industry	33.0%	34.1%	26.0%	17.6%	16.8%	23.3%
Infrastructure	24.3%	18.2%	15.8%	14.2%	15.3%	16.8%
Privatisations	4.9%	5.5%	17.4%	19.3%	3.0%	10.0%
Social and Urban Development, Sports and Culture	8.2%	6.9%	6.1%	8.9%	13.6%	9.4%
Capital Markets	4.1%	8.6%	7.3%	8.2%	12.4%	8.8%
Exports and International Positioning	5.3%	6.5%	6.5%	9.7%	9.9%	8.2%
Theory – Development Banks	7.8%	7.9%	6.9%	5.5%	7.2%	6.9%
Others	9.5%	6.5%	5.2%	6.3%	6.1%	6.6%
Innovation	0.8%	3.4%	4.8%	5.9%	8.6%	5.4%
Agribusiness	1.2%	1.7%	2.8%	2.5%	3.2%	2.4%
Environment	0.4%	0.3%	0.8%	1.0%	2.3%	1.1%
Trade, Services and Tourism	0.0%	0.0%	0.0%	0.4%	0.9%	0.4%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: Elaborated by the authors using the database of publications on the BNDES.

With regards to "classification variables", Table 3 presents the themes organized by period. The themes "Infrastructure" and "Industry" are particularly well represented throughout all periods, but the negative trend suggests they are losing participation to other emerging themes. "Industry" showed a sharper decline from the 1980s, while the theme "Infrastructure" only reduced its percentage share between the first two periods. In other words, "Infrastructure" was found to be the most recurrent topic of research across all periods. In studies that analyzed the 2002–2013 period, the themes "Social and Urban Development", "Sports and Culture", "Capital Markets" and "Innovation" increased their participation share. In line with the growth of the bank's lending to the agribusiness sector, research that dealt with this issue showed a relative increase in recent periods. The importance of the theme "Privatization" in papers dealing with the periods 1980–1990 and 1990–2002 should also be highlighted.[14]

Continuing to look at the statistics regarding the classification of the literature, the degree to which the BNDES was referred to is also relevant. As previously mentioned, a binary variable was created to enable texts to be classified according to this reference. We found that in half of the documents selected for the database, either the object of the study was the BNDES or the bank played an important role in it. The other half of the documents neither had the BNDES as the central object of study nor did they refer to the bank in a significant manner.

4.2. Performance indicators

The number of citations a text or author received within our database was used to indicate its performance, i.e., the visibility of the text or author or the impact it exerted on the academic community and, more specifically, on those interested in the economic literature regarding the BNDES. In this sense, the most frequently cited publications serve as a reference for other researchers investigating a particular area. Of the total of 919 publications, 59.1% were not cited at all, which is a very common result in applied social sciences[15] (Faria, 2008; Pendlebury, 1991; Hamilton, 1991). On the other hand, the highest number of citations a publication received in our database was 41.

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[14] Since a document can address more than one topic and/or period, the results in Table 3 should be evaluated with caution. For instance, there could be a case where a document has assessed all periods and has focused on the process of privatization in the 1990s. When being classified, this document would be allocated for all periods and also, for its particular theme, privatization. Therefore, as they are independent classifications, at the intersection of these two pieces of information (Table 3), a discussion on the theme of privatization was considered to have taken place for all periods, since it was not possible to isolate the specific period for which a particular theme was discussed in each text. Due to this limitation, the results in Table 3 simply show the issues which were most important in each sub-period.

[15] Although they use different databases, thus hampering their comparison, the percentage of non-cited documents published on the BNDES is close to the percentage found by Pendlebury (1991), who evaluated all papers published in journals that comprised the ISI in 1984 and the citations which they accumulated until 1988. According to this author, 48% of the papers published in the social sciences were not cited.
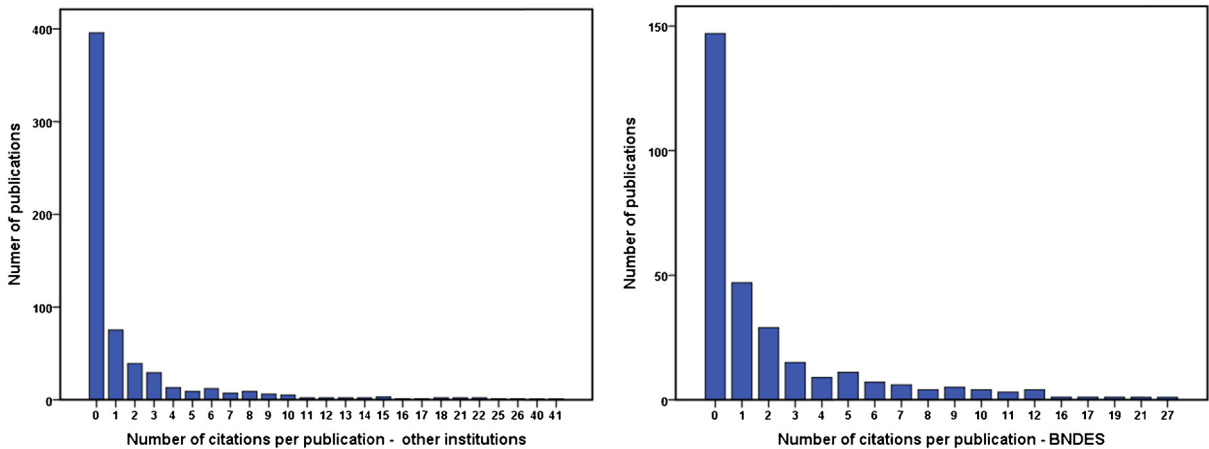
Fig. 2. Frequency distribution of publications from the economic literature on the BNDES by number of citations.
Source: Elaborated by the authors using the database of publications on the BNDES.

Fig. 2 shows the frequency distribution of the publications according to the number of citations they received, separated by the sponsoring institution. The asymmetry in the distribution shows, in one hand, a concentration of documents which received a below average number of citations and, on the other, a concentration of citations on a few documents. This asymmetry was even more apparent in documents not sponsored by the BNDES. Among documents published by the bank, 49.7% received no citations, while for documents published by other institutions this percentage reached 63.6%.[16]

Analysing the most frequently cited publications further, Table 4 presents the seventeen most cited documents along with their respective authors and year of publication.

The seminal books "Quinze anos de política econômica", written by Carlos Lessa, and "A industrialização e o desenvolvimento econômico do Brasil", written by Werner Baer, were the most cited documents in our database, with 41 and 40 citations respectively.[17] Some of the most frequently cited publications deal with the Brazilian economy in a comprehensive manner, but feature the BNDES in a significant manner, such as those written by Werner Baer, Celso Lafer, Antonio Barros de Castro and Maria da Conceição Tavares. However, as we considered citations made in publications which also referenced the bank, the citations that these documents received can be expected to be due their analysis of the BNDES and not solely for the fact that they addressed the Brazilian economy in general.

Figs. 3 and 4 show the behaviour of citations a publication received over time for the four most cited and for all papers, respectively. Concerning the first of these two figures, the aforementioned books of Lessa and Baer are still cited after many years. In turn, although the documents written by BNDES and Monteiro Filha are more recent, they already exhibit a relatively complete cycle of quotations twenty years after their publication.

According to Fig. 4, it can be observed that the trajectory of citations for all documents follows the approximate behaviour of a lifecycle. The peak of citations occurred, on average, two years after a document was published. Considering how citations accumulate over time, documents received approximately half of their total citations within the first five years of publication. In this sense, as the literature on the BNDES has grown significantly in the last decade, it is possible that many of the documents that make up the database have not yet completed this cycle. This fact is very likely an explanation to the low average number of citations.

Besides the number of citations per document, another important indicator is the number of citations per author – given that the most cited authors have become references in their respective areas, we can identify the key authors in the economic literature regarding BNDES. Where documents had more than one author, we adopted the criterion whereby all authors received full credit for the publication.

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[16] Mann–Whitney test for independent samples allowed us to reject the hypothesis that the number of citations per documents were equal (in central tendency) for BNDES publications and other institutions. Therefore, it can be stated that documents published by BNDES were cited more (on average) than documents published by other institutions.

[17] The book "*BNDES, 40 anos*" received citations both of the articles that make up the collection and the book as a whole.

Table 4
The seventeen main works according to the number of citations they received.

Title	Year[a]	Author	Affiliated to the BNDES[b]	Number of citations
Quinze anos de política econômica	1975	Lessa, C.	No	41
A industrialização e o desenvolvimento econômico do Brasil	1966	Baer, W.	No	40
BNDES, 40 anos: um agente de mudanças	1992	Bndes	Yes	27
A aplicação de fundos compulsórios pelo BNDES na formação da estrutura setorial da indústria: 1952 a 1989	1994	Monteiro filha, D. C.	No	26
The Brazilian economy: growth and development	2001	Baer, W.	No	25
The Development of the Brazilian steel industry	1969	Baer, W.	No	22
Privatização de recursos públicos: os empréstimos do sistema BNDES ao setor privado nacional com correção monetária parcial	1989	Najberg, S.	No	22
The changing role of the State in the Brazilian economy	1973	Baer, W., Kerstenetzky, I., Villela, A. V.	No	21
BNDES: 50 anos de desenvolvimento	2002	Bndes	Yes	21
Da substituição de importações ao capitalismo financeiro: ensaios sobre economia brasileira	1972	Tavares, M. C.	No	21
Fontes de recursos do BNDES	1995	Prochnik, M.	Yes	19
O BNDE e a industrialização brasileira: 1952–1961	1981	Viana, A. L. D.	No	18
JK e o Programa de Metas, 1956–1961: processo de planejamento e sistema político no Brasil	2002	Lafer, C.	No	18
A atuação do sistema BNDES como instituição financeira de fomento no período 1952–1996	1998	Curralero, C. R. B.	No	17
O papel da poupança compulsória no financiamento do desenvolvimento: desafios para o BNDES	1994	Bonelli, R., Pinheiro, A. C.	Yes	17
A economia política das políticas públicas: as privatizações e a reforma do Estado	1997	Velasco júnior, L.	Yes	16
A economia brasileira em marcha forçada	1985	Castro, A. B., Souza, F. E. P.	No	16
Others				1302
Total (919 documents)				1689

Source: Elaborated by the authors using the database of publications on the BNDES.
  [a] Considering the year of publication of the edition which was incorporated in the database.
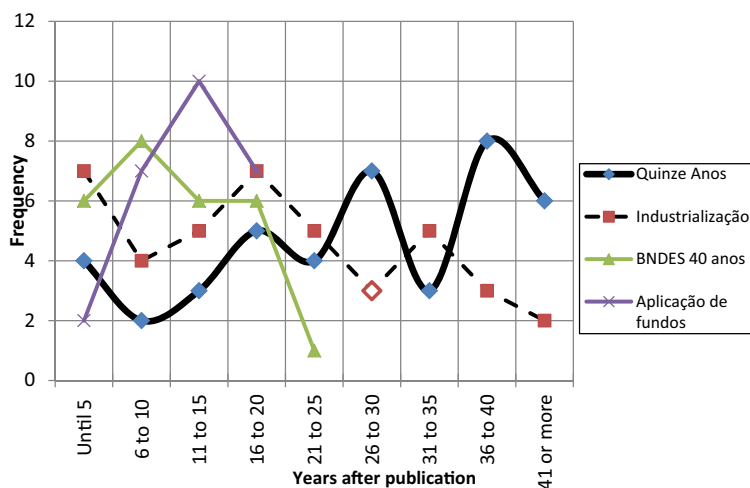 [b] Considering the affiliation of the author at the time of publication.

Fig. 3. Evolution in the number of citations received by the four most cited documents from the economic literature on the BNDES.
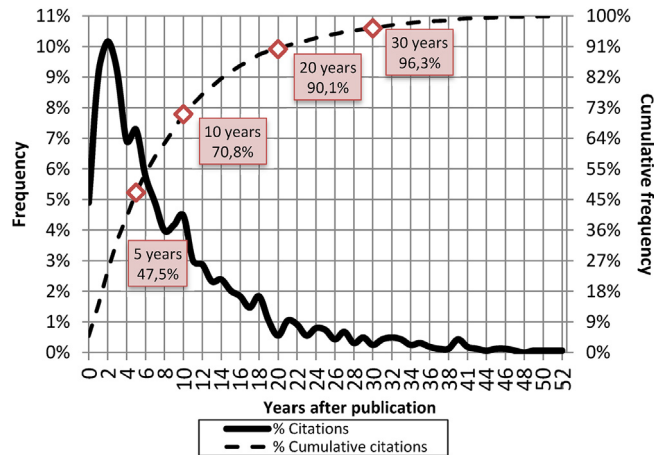
Fig. 4. Evolution in the number of citations received by all documents from the economic literature on the BNDES.
Source: Elaborated by the authors using the database of publications on the BNDES.

Statistical analysis shows that, on average, authors received 2.6 citations. However, a high standard deviation of 8.7 indicated a high dispersion. Considering the frequency distribution of authors according to the number of citations they received, the results were asymmetric, with 59.2% of the authors receiving zero citations. These results are consistent with what has been found in bibliometric analysis, namely, that citation distribution is generally asymmetric and characterized by few authors receiving a high number of citations and a great majority of authors receiving very few.[18]

The number of citations varied considerably according to the institutional affiliation of the author. BNDES – affiliated authors, on average, received more than twice as many citations as authors affiliated with other institutions.[19] This can be explained by the fact that some documents written by authors affiliated to the bank constitute important technical reports or describe the history of the bank and were therefore widely cited. However, using the number of citations per author as an impact indicator may introduce some bias which should be minimized. Some authors, for instance, may have received a high number of citations because they are responsible for several publications on the topic, but when analyzed individually, these publications may have had a low impact on the scientific field. On the other hand, although some authors have published few papers, may have produced material which is highly valuable for the academic community.

In this context, an important indicator that can mitigate this bias is the number of citations that a particular author has received in relation to his/her total number of publications, i.e., the average number of citations per publication of a particular author, representing the average impact of his/her work. However, another problem related to the number of citations per author is self-citation.[20] Table 5 presents the number of citations per publication, as well as the number of self-citations for the most cited authors in the database.

Carlos Lessa stood out as the author with the greatest number of average citations. Despite having only three works listed in the database, the author was cited 52 times, i.e., 17.3 citations per publication. Other authors who stand out include Anibal V. Villela, Marta Prochnik, Dulce Monteiro Filha, Licínio Velasco Jr., Ana Claudia Além and Werner Baer. On the issue of self-citation, it can be seen that the two authors with the most citations in the database also stood out as the authors who most cited their own work.

In Table 6 we break down the "classification variables" from Table 3 (thematic classification by period) by the number of citations each theme received in each period. This can be understood as an indicator of the impact of the theme. As expected, those themes which were most commonly studied were also, in general, the most cited ones. As indicated by the previous analysis, "Infrastructure" and "Industry" received a high percentage share of citations in all

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[18] See Faria (2008).

[19] The Mann–Whitney test for independent samples rejected the null hypothesis that the number of citations per author with a BNDES affiliation was equal to that of those without a BNDES affiliation at the 1% significance level. Hence, it is possible to conclude that the number of citations per author was different between institutions, i.e., authors with a BNDES affiliation were the most cited.

[20] Self-citation happens when an author mentions in his or her study one of his or her own previously published articles.

Table 5
Most cited authors and average citations per publication.

Authors	Citations	Publications	Citations/publications	Self-citation	Self-citation/citation
Baer, W.	135	18	7.5	30	22.2%
Pinheiro, A. C.	118	22	5.3	33	28.0%
Bndes	70	14	5.0	1	1.4%
Giambiagi, F.	70	15	4.6	10	14.3%
Monteiro filha, D. C.	68	7	9.7	6	8.8%
Torres filho, E. T.	65	22	2.9	11	16.9%
Lessa, C.	52	3	17.3	0	0.0%
Além, A. C.	38	5	7.6	3	7.9%
Puga, F. P.	36	32	1.1	4	11.1%
Najberg, S.	35	5	7.0	1	2.9%
Velasco júnior, L.	34	4	8.5	3	8.8%
Villela, A. V.	32	3	10.6	1	3.1%
Suzigan, W.	31	7	4.4	0	0.0%
Tavares, M. C.	31	7	4.4	0	0.0%
Prochnik, M.	30	3	10.0	1	3.3%

Source: Elaborated by the authors using the database of publications on the BNDES.

Table 6
Percentage of themes with the highest impact (most cited) by period.

Theme/period	1952–1964	1964–1980	1980–1990	1990–2002	2002–2013
Industry	38.5%	34.1%	26.5%	15.4%	18.8%
Infrastructure	31.5%	26.7%	19.5%	17.8%	15.6%
Capital Markets	7.5%	12.5%	15.0%	8.0%	10.3%
Privatization	2.6%	6.3%	22.1%	26.4%	2.6%
Exports and International Positioning	4.2%	5.2%	5.6%	12.7%	14.2%
Others	4.8%	6.5%	7.1%	9.9%	14.4%
Theory of Development Banks	5.6%	4.1%	1.8%	3.0%	7.3%
Social and Urban Development, Sports and Culture	4.8%	3.1%	0.9%	2.6%	8.7%
Innovation	0.6%	1.4%	1.3%	3.5%	6.9%
Agribusiness	0.0%	0.1%	0.1%	0.5%	0.4%
Environment	0.0%	0.0%	0.0%	0.4%	0.6%
Trade, Services and Tourism	0.0%	0.0%	0.0%	0.0%	0.2%

Source: Elaborated by the authors using the database of publications on the BNDES.

periods of analysis, but showed a trend of decreasing share relatively to the total amount of publication. "Privatization" was another issue that showed a high level of impact in the literature, i.e., publications on this topic often received more than one quote, especially in the periods spanning 1980–2002. The theme "Theory of development banks", which proved to be particularly relevant during the first two periods, saw a resurgence of interest in the most recent period, namely, 2002–2013. In studies that analyzed this period there was a relatively greater impact of those associated with "Social and Urban Development", "Sports and Culture" and "Innovation". In addition, research that addressed the issue "Agribusiness" had little impact in any of the periods. Although the number of studies on the theme "Environment" has grown, citations over the period of analysis did not match this growth, which suggests that citations take time to occur.

The degree to which the BNDES was referred to in the texts was another important issue when classifying the publications by the number of citations they received. We found that, in general, the most cited papers were also those which had the BNDES as the main object of study. Amongst the documents which had 10 or more citations, 67.4% were publications in which the BNDES appeared significantly in the document, whereas among the documents without any citations, only 40.4% had the BNDES as the focus of study. Papers with a high degree of reference to the BNDES (whose binary classification variable was given a value equal to 1) received an average of 2.1 citations. For publications with a low level of reference to the BNDES (the binary classification variable assumed 0), the average
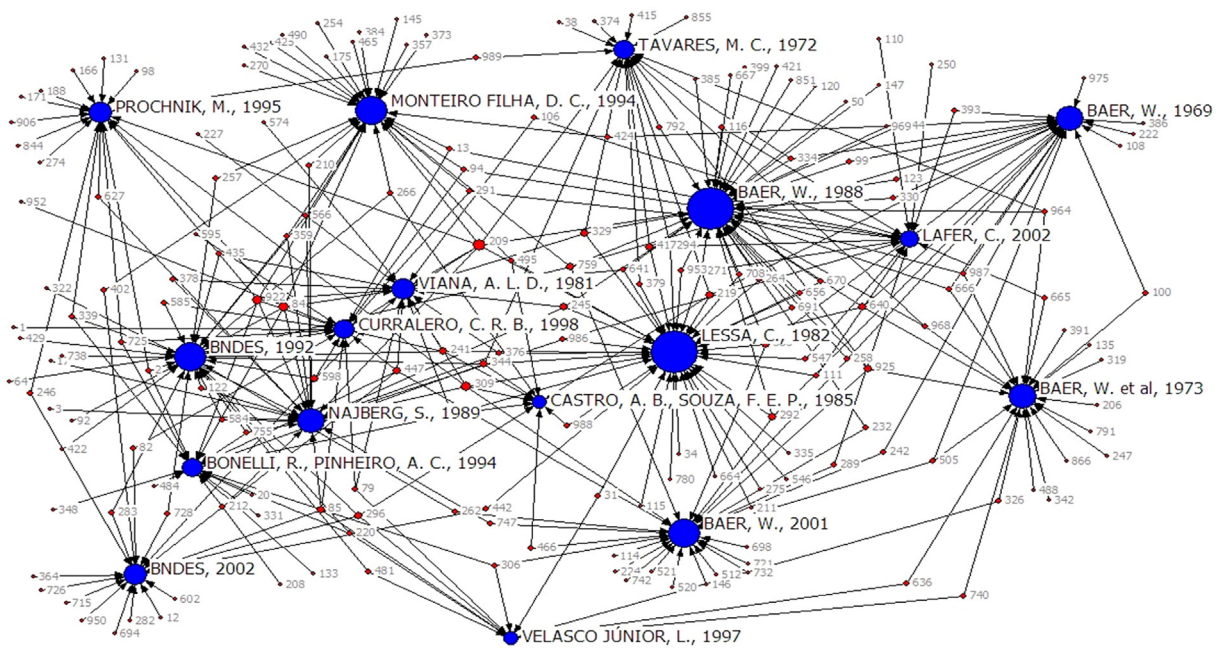
Fig. 5. Citation networks of the seventeen most frequently cited publications in the database. Note: Each number in the network, which the reader will find along the lines of the network constellations, represents a code for each of the documents in our database.
Source: Elaborated by the authors using the database of publications on the BNDES.

was 1.7 citations[21]. Therefore, publications that had the BNDES as the main object of study can be said to have had a higher level of impact than those which did not refer significantly to the BNDES.

4.3. Network analysis

Another way to visualize the structure of citations within our database is by analysing the links connecting different documents. To conduct this analysis, we made use of the centrality degree, which considers the number of interactions amongst authors, to construct citation, co-citation, authorial and institutional partnership networks. Fig. 5 presents the citation network for the most cited documents listed in Table 4, where the size of the node reflects the frequency with which the document was cited. According to this indicator, the value of density within the network was 0.1061, indicating that only 10.61% of all possible connections had been made within the network, i.e., a rather sparse and low-density network.

The high degree of centrality around the publications of Baer (1988), Baer (2001), BNDES (1992), Curralero (1998), Lessa (1982), Najberg (1989) and Viana (1981) suggests the high level of impact these documents have had on economic literature on the BNDES. In fact, with the exception of Baer (2001), all of these publications had the BNDES as the main focus of their study, i.e., they analyzed the operations of the bank in a significant way.

One could say that these publications form a core network of citations. Some of these publications also display a high degree of centrality, characterizing several networks of local influence. In other words, although the document was widely cited, its network of citations was only weakly connected to other most cited documents. This was the case, for example, for Baer et al. (1973), Prochnik (1995), Monteiro Filha (1994) and BNDES (2002), which had several connections through citations from other publications that were only marginally connected to the main network.

Fig. 6 presents the co-citation network of the seventeen most cited documents in the database. As is typical in this type of analysis, this network shows that the most cited documents are connected by co-citation links, as indicated by the thickness of the line between them. It can be observed that the study of Viana (1981) and Najberg (1989) formed the

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[21] In order to verify the statistical difference between the averages and medians of groups 1 and 2, we also applied the Mann–Whitney test. Results showed that the null of hypothesis of equality (between means and medians) could be rejected at 1% significance level.
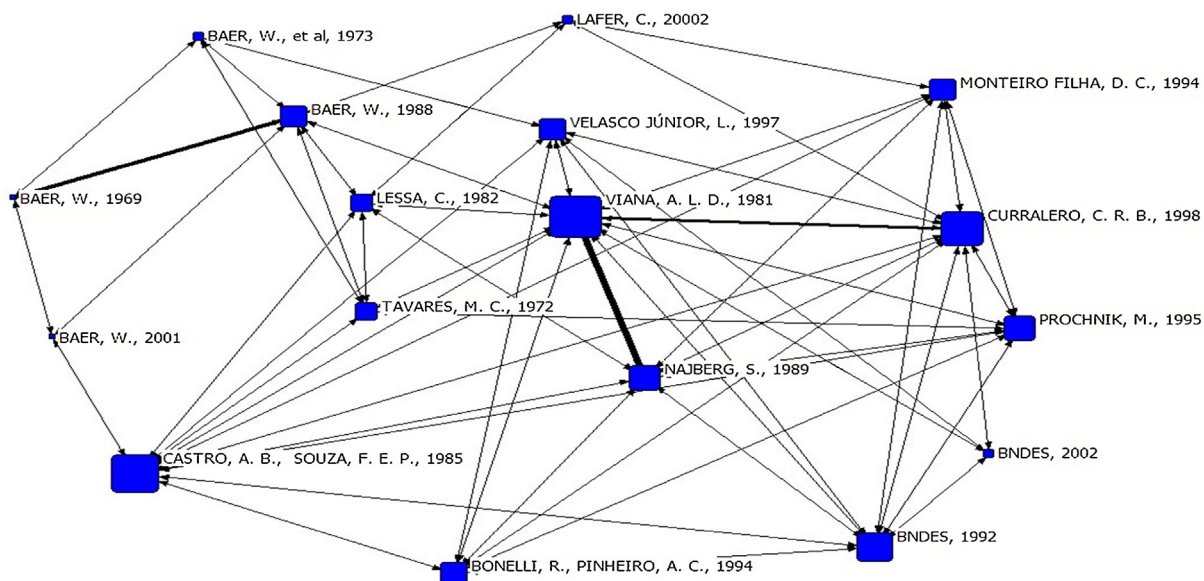
Fig. 6. Co-citation networks of the seventeen most cited publications.
Source: Elaborated by the authors using the database of publications on the BNDES.

pair of documents with the highest number of co-citations, followed by Viana (1981) and Curralero (1998) – these three documents were dissertations in which the performance of the BNDES was indeed analyzed in details. The influence of the work of Baer (1969) and Baer (1988) is also noteworthy, showing a high number of co-citations and, along with the three abovementioned documents, form the main or most influential publications within the network. In addition to these main publications, the following works were co-cited, if to a lesser extent: Castro (1985), Lessa (1982), Monteiro Filha (1994), Prochnik (1995) and Velasco Jr. (1997). According to this bibliometric indicator, it can be argued that these documents are some of the main references for researchers investigating the role of the BNDES.

The relationship among the most cited publications from the database was also analyzed by means of the multivariate factor analysis technique, which grouped publications according to the number of citations and co-citations. Results showed that eight eigenvalues were greater than one, meaning that eight factors can be used to explain the citations and co-citations relationship in our database. These eigenvalues explained 54% of the total variance of the original variables. Table 7 presents the factor loadings corresponding to each of the eight factors, which measure the correlation coefficients between each factor and each of the 17 studies included in the analysis.

In general, the factor analysis corroborates the results of the citations and co-citations networks (as suggested by Figs. 4 and 5, respectively). Indeed, factors 1, 2 and 4 were found to be positively correlated with documents that explicitly focused on the BNDES. Factor 1 comprises publications characterized by discussion and presentation of statistics with regards to the main sources of finance for the BNDES. The work of Prochnik (1995), which showed a 59% correlation with Factor 1, describes the bank's history of funding in its different stages according to the predominant source of resources. Bonelli and Pinheiro (1994), in turn, performed an analysis for a shorter period, highlighting the importance of compulsory savings as the main source of funding for the bank.

Factor 2 consists of three widely cited master's dissertations that evaluated the performance of the BNDES, particularly in the financing to Brazilian industrialization in its different periods – as previously mentioned, Viana (1981), Najberg (1989) and Curralero (1998) form the set with the most co-cited works. Factor 4 added the doctoral thesis of Monteiro Filha (1994) and the book "BNDES 40 anos" (1992). The first study evaluated the role of the BNDES as a government apparatus as well as acting as a financial agent and the second, in turn, summarizes the sources of the bank's funds and its activities until 1992, when the BNDES turned 40. Factor 3 was relatively more correlated with documents whose authors were classical references as to the Brazilian economy, which were cited together, as were the documents in Factors 5, 6 and 8. As previously mentioned, these works dealt more comprehensively with the Brazilian economy, but also dealt with the role of the BNDES. Factor 5, for example, brought together three documents which discussed Brazilian industrialization and the role of the government. Factor 8 was related to documents published in the

Table 7
Factor analysis applied to the citation network of the most cited publications.

Publications	Factor							
	1	2	3	4	5	6	7	8
Viana, A. L. D. (1981)	0.06	0.81	0.21	−0.03	0.01	−0.03	0.08	0.00
Curralero, C. R. B. (1998)	0.05	0.65	−0.18	0.11	−0.21	0.18	−0.32	−0.01
Prochnik, M. (1997)	0.59	0.21	−0.22	−0.11	0.17	−0.31	0.17	−0.14
Najberg, S. (1989)	0.16	0.51	0.09	0.28	0.05	−0.17	0.23	−0.08
Baer, W. (1988)	−0.56	0.12	0.02	−0.32	0.32	−0.20	0.11	−0.01
Bonelli, R.; Pinheiro, A. C. (1994)	0.68	0.15	0.06	−0.03	0.18	0.13	0.11	0.12
Lafer (2002)	−0.03	0.00	0.04	0.06	0.13	−0.03	−0.84	−0.05
Lessa, C. (1982)	−0.17	0.14	0.70	−0.29	0.12	−0.20	−0.21	−0.15
Baer, W.; Kerstenetzky, I.; Villela, A. V. (1973)	−0.25	−0.12	−0.29	−0.17	0.35	0.56	0.14	−0.18
Baer, W. (2001)	−0.01	−0.02	0.01	−0.15	0.07	−0.04	0.05	0.82
Monteiro filha, D. C. (1994)	−0.06	0.09	−0.08	0.80	0.13	−0.15	−0.11	−0.14
BNDES (2002)	−0.06	0.06	−0.07	−0.09	−0.87	0.02	0.14	−0.08
Tavares, M. C. (1972)	−0.16	0.04	0.16	−0.31	0.31	−0.05	0.21	−0.40
BNDES (1992)	0.24	−0.02	0.27	0.49	−0.13	0.19	0.34	−0.01
Baer, W. (1969)	−0.50	−0.03	−0.10	0.03	0.29	0.00	0.21	0.44
Velasco júnior, L. (1997)	0.12	0.08	0.06	−0.06	−0.10	0.79	0.00	0.01
Castro, A. B.; Souza, F. E. P. (1985)	0.09	0.05	0.77	0.13	0.02	0.13	0.12	0.08

Source: Elaborated by the authors using the database of publications on the BNDES.

English language by Werner Baer. Consequently, the documents in question are classical references on the Brazilian economy that are cited in the international literature.

In general, it was noted that most of the factors were correlated with few publications, corroborating the result of local networks presented earlier. Therefore, they are works that impacted on the literature in terms of citations, but had little co-citation connections with the other documents cited.

The analysis of co-authorship shows the partnerships and cooperation networks that have been established among researchers investigating a particular topic. These authors may be affiliated with the same institution or may belong to different institutions or even work in different countries.

Initial results found that 65.1% of the publications in the database were written by only one author, which is a fairly common result in social sciences. This percentage was even higher for documents whose authors were not affiliated with the BNDES (75.2%). However, where at least one author was affiliated with the BNDES, only 44.1% of the publications were not co-authored.

In order to construct the co-authorship network we used the centrality degree method again, finding a density value of 0.21%. This result emphasizes that co-authoring of documents published on the BNDES is reduced.

Fig. 7 shows the three main co-authoring networks identified in the database. The size of the node (circumference) reflects the frequency with which the author appears in co-authored publications. The thickness of the line connecting two authors indicates the frequency these researchers worked together and the red colour represents authors affiliated with the BNDES. Data shows that these authors were prominent in establishing collaborative co-authoring. The first group includes two key researchers, namely, Fernando Pimentel Puga and Ernani Teixeira Torres Filho, who have established a wide network of co-authorship. The two smaller networks each had one central author. Fabio Giambiagi was the central author of the second network, which is also connected to the main network. The third network, featuring João Antônio de Negri as the central author, was characterized by being relatively more local than the others.

In the case of co-authorship, the authors' institutional affiliation was used as a measure of inter-institutional cooperation. Internal and external collaboration were defined as co-authorship of researchers from the same and different institutions, respectively. Among co-authored publications, 60.4% of the documents were produced in networks of internal collaboration, while 39.6% resulted from external collaboration. When analysing authors affiliated with the BNDES separately, we found that external collaboration networks were even more restricted, constituting only 22.2% of co-authored documents.

Fig. 8 shows the network of inter-institutional cooperation in the development of co-authored publications – the node size (size of the circumference) indicates the frequency the institution has been involved in co-authored publications
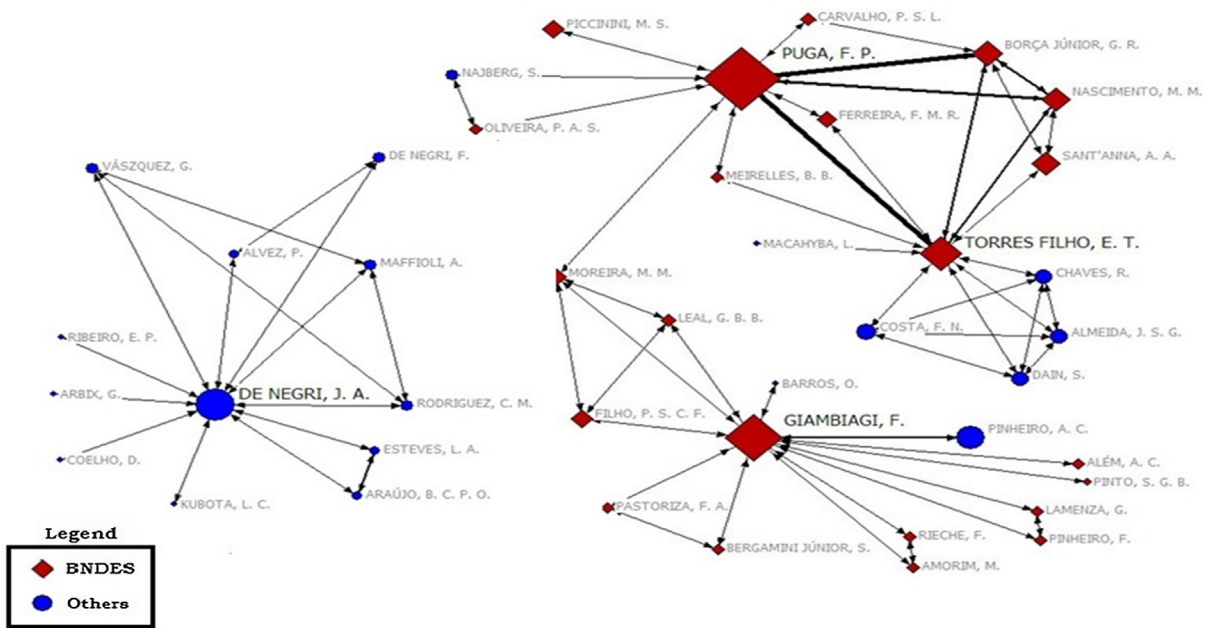
Fig. 7. Three principal co-authorship networks identified in the database.
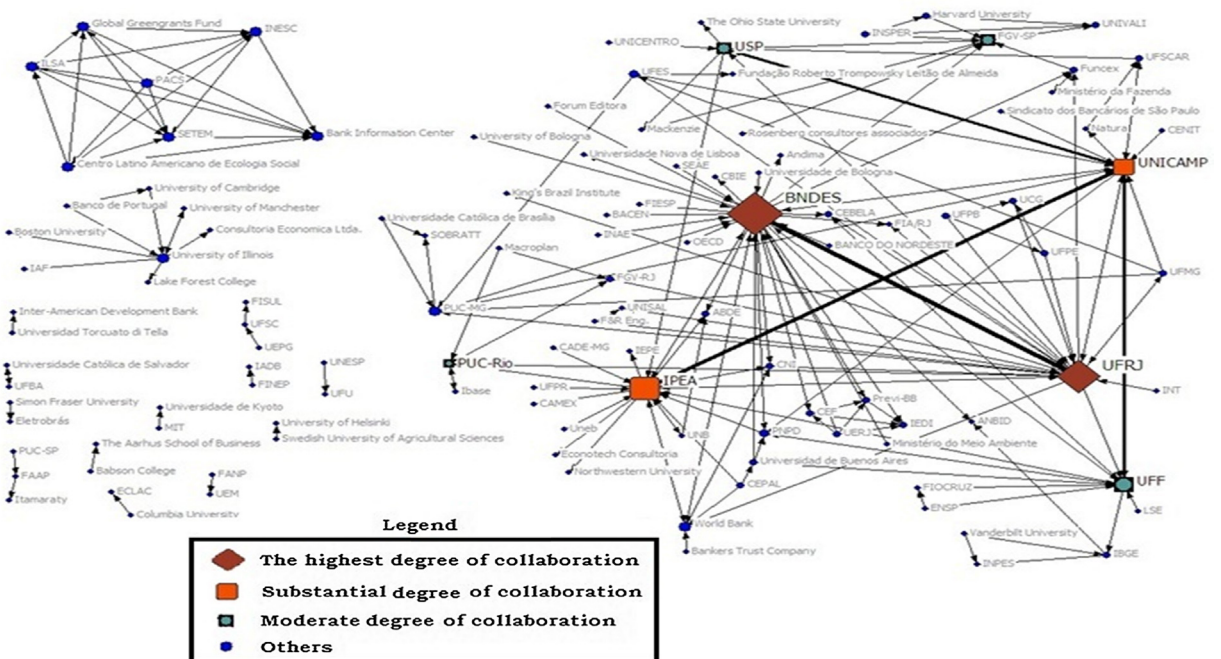Source: Elaborated by the authors using the database of publications on the BNDES.

Fig. 8. Cooperation networks among institutions.
Source: Elaborated by the authors using the database of publications on the BNDES.

and the thickness of the link between two institutions denotes the frequency of co-authorship between two different institutions. The value of network density was 0.0053, indicating that only 0.53% of all possible connections had been established. This result suggests a network with reduced relations among institutions.

It is possible to observe that the collaboration network was formed from a core network connecting the most important national institutions (in terms of collaboration in co-authoring publications), amongst them the own BNDES, as well as UFRJ, IPEA, UNICAMP, UFF, USP, FGV-SP and PUC-RJ. In addition to this main network, there was evidence of some smaller local networks, the most noteworthy are two formed by international institutions. In the case of the local network around the University of Illinois, the other institutions have not established co-authoring partnerships with each other. This is in contrast to the local network that includes the Instituto de Estudos Socioeconômicos (INESC), in which no one institution holds a central position. In fact, this refers to a study developed by INESC which was co-authored by other institutions.

With regard to the main network, it can be observed that the BNDES was the institution with the highest number of co-authored papers and consequently, showed the highest level of collaboration. However, internal collaboration was predominant in this network. Concerning inter-institutional collaboration, in turn, UFRJ stood out as the BNDES's main co-authorship partner. Other relevant collaborations occurred between UNICAMP and the following institutions: IPEA, UFRJ, UFF and USP.

5. Final considerations

The bibliometric indicators presented in the this paper allow us to outline an original and detailed profile of all of the economic literature produced on the role of the BNDES, in addition to tracing the trajectory of these publications. A growing trend of academic publications on the BNDES was found, especially in the last two decades, with higher growth rates than those for scientific papers in Brazil. This reflects not only the growth of economics publications in general throughout this period, but also the increased attention which has been paid to the role played by the BNDES, especially with the growth of its lending. Additionally, analysis of the database revealed that publications on the subject were highly concentrated, both in terms of the institutions which were responsible for the publications and the most prolific authors.

The results also show that the publication of academic texts on the bank has been concentrated in journal articles and book chapters. Moreover, a significant number of theses and dissertations have been developed on the topic since the foundation of the bank, indicating that the Brazilian post-graduate programmes, especially those at UNICAMP and UFRJ, have been paying special attention to the topic.

The BNDES's concern with generating data and research on its operations is reflected in the bibliometric analysis. In general, the BNDES has been the institution responsible for the largest number of publications on the bank – according to the evidence provided by our study, just over a quarter of authors who have published on the topic were affiliated to the BNDES. Therefore, the bank's focus on generating information and bibliographical output has produced a degree of endogeny in the literature.

Regarding the classification of the publications, "Industry" and "Infrastructure" were the most popular themes in the literature, as they were the most cited and, in many publications, analyzed together. The most studied periods were the last two decades. However, as expected, the studies that evaluated the early periods of the BNDES received the highest number of citations. In addition, it can be seen that the most frequently cited documents were also those which assessed the role of the BNDES in greater depth.

It was also possible to identify a group of key authors who published the most and who received the higher number of citations. Statistical analysis shows that citations were concentrated on a relatively small number of publications and authors. As a result, we can infer that despite the extensive database of publications and authors that have explored the topic, only a relatively small number of publications have exerted an impact in terms of citations in the literature. Moreover, analysis of citation and co-citation networks of these core texts indicates a significant number of local networks, i.e., despite the publication being relatively more cited, its network did not link to the other documents which form the core network. The reduced density of the citation network was also observed in both the co-authorship networks and in the institutional partnerships among authors. The low density of the citation networks and low levels of citation and co-citation suggest that the dialogue/debate among authors has been limited.

On the topic of cooperation, authors affiliated with the BNDES published relatively more co-authored studies and co-operated more with each other. On the other hand, the collaboration networks among authors affiliated with the

BNDES and authors from other institutions were relatively smaller than those for the other authors in the database. Network analysis for the authors' institutional affiliations showed that the main cooperation network was among researchers from the UFRJ and the BNDES.

The results presented in this paper are relevant as they provide an overview of all the literature ever produced regarding the operations of the BNDES, from its inception to the present day. In this sense, the original contribution of this paper to the literature lies not only in surveying and organizing of an ample literature on the institution, but also in the analysis of its main characteristics and peculiarities. As the BNDES is an institution which cannot be separated from the history and economic development of Brazil, this paper takes an important step deepening the economic debate about the bank's existence and operations and, as such, serve as an important tool for future studies addressing this institution.

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