

PERSPECTIVES

Invited article

Translated version

DOI: <http://dx.doi.org/10.1590/S0034-759020180507>

SOCIAL INEQUALITY, RESEARCH RESPONSIBILITY, AND RESPONSIVENESS

INTRODUCTION

Inequality is one of the classic problems of the social sciences. It is recurrently associated with the phenomenon of social stratification because it manifests itself as a hierarchical and unequal arrangement of positions based on socially defined features, such as power, property, and prestige (Eisenstadt, 1995) or as a “structure of regularized inequalities” (Almeida, 1984, p. 175). Although concerns over the economic basis of income and class inequality predominate, attention on the subject has been intensified by its association with other dimensions, such as gender, race, and ethnicity (Dodd, Lamont, & Savage, 2017).

Research indicates that Brazil is one of the most unequal countries in the world. Studies support the historical resilience of inequality (Medeiros, Souza, & Castro, 2015), an absence of significant oscillations of income concentration among the wealthiest population (Souza, 2016), and recent growth in inequality (Morgan, 2017), although official data indicate a reduction in the income concentration in recent years (IBGE, 2018). The 2017 report of the Institute of Applied Economic Research (IPEA) suggests an uncertain scenario up to 2035 concerning the possibility of reducing inequality, which is largely explained by the fiscal imbalance and the recent political crisis (Guellati, Monteiro, & Oliveira Junior, 2017).

The fact is that social inequality is one of the most relevant problems in Brazilian society. It results from the institutional arrangement of the society and, once naturalized and reproduced, reverberates in the reduction of social solidarity and democratic coexistence (Queiroz, 2018; Reis, 2000; Souza, 2004, 2015; Souza, 2016).

In this essay we address the issue of social inequality by focusing on selected aspects of the organizational and institutional scope of the scientific field of research in Business Administration. We begin with a brief consideration of two ways of addressing the relationship between social inequality and research in Business Administration: denial and confrontation. Regarding the second way as better than the first, we approach the discussion on the societal impact of research with two scientific delimitations: the responsible and the responsive. The first refers to the social engagement of research, i.e., to the bonds of commitment to problems or social causes manifested in the practices of the social insertion of graduate programs, and in their preferences for certain research phenomena. The second emphasizes institutional integrity, positioning the debate in the structure of rules and the moral commitment of the academic community.

In conclusion, we argue that responsible engagement legitimizes while responsiveness transforms. The argument is that the approach of research to social problems, especially the more

EDSON RONALDO GUARIDO FILHO^{1,2}
edson.guarido@gmail.com
ORCID: 0000-0001-7905-1596

¹Universidade Positivo, Programa de Mestrado e Doutorado em Administração, Curitiba, PR, Brazil

²Universidade Federal do Paraná, Programa de Mestrado e Doutorado em Gestão da Informação, Curitiba, PR, Brazil

pervasive and pernicious ones, such as social inequality, requires the complicity of mechanisms (see Amis, Munir, Lawrence, Hirsch, & McGahan, 2018) at the organizational and institutional levels of the scientific field of Business Administration. This implies, on the one hand, the need to consider the articulation between research intentions and intervention spaces on social reality and, on the other hand, the need to consider formal induction and moral commitment in the infusion of values that bring scientific practice closer to the transformation of society.

SOCIAL INEQUALITY AND RESEARCH IN BUSINESS ADMINISTRATION

Although the relationship between social inequality and the research field of Business Administration may be addressed from different positions, here they are treated as opposites, despite the possibility of intermediate manifestations. We shall refer to denial and confrontation.

Scientific denial encompasses behaviors that involve either rejection of data or evidence, refutation of research strategies, or negligence of the scope of scientific practices with regard to their problem-solving abilities (Specter, 2009). We may imagine the substitution of scientific skepticism by ideological defense or the suppression of evidence by fallacious rhetoric (Hansson, 2017; Specter, 2009) or political proselytism disguised as scientificity.

With regard to the position of denial, the premise is that research in Business Administration should not embrace social inequality. While denial is considered difficult to apprehend or inherently complex, it expresses a skeptical position and non-approval of initiatives that would otherwise be considered naïve, reckless, undue, or irrelevant. There would be three types of denial:

- Object-related: Inequality would not be the focus of studies in the field, which should focus its efforts and resources on the understanding of organizations—their nature, structure, processes, and results. The organization would be the entity to be explained.
- Mechanism-related: Inequality could not be explained from the analysis of management practices or organizational activity, since, in the last instance, it is a distinct problem that should be entrusted to economists, sociologists, or researchers from different areas of knowledge (Amis et al., 2018).
- Constituent-related: Due to the previous ones, inequality would not be the focus of attention of the main constituents of the support and approval of organizational activities, restricted, e.g., to investors, partners, or collaborators and rarely to society at large.

However, denial competes with the position of confrontation. This second view is guided by an understanding that organizations are inherently associated with the reproduction (or solution) of social inequalities, either because they are spaces that produce inequality in their structure and internal processes or because they adopt management practices that replicate existing social problems (Amis et al., 2018; Marens, 2018). Furthermore, it is understood that social inequality requires interdisciplinary treatment, which explains the interest of different stakeholders, including public research funds, government, and segments of civil society. Recent special editions of *Organization Studies* (vol. 39, no. 9, 2018) and *Business & Society* (vol. 57, no. 6, 2018) have addressed the question from this perspective.

In the position of confrontation, the centrality of the problem is taken into account, as well as the potential influence of organizations as an *explanans* of inequality, and the organizational agency as a relevant mechanism for the reduction or reproduction of social problems. The research interest, in turn, is justified not only as an instrumental response to social pressures but also as adherence to the ethical review movement underlying the scientific field (Tsui, 2016), which includes society as a beneficiary.

The position of confrontation, in simple words, means admitting that “Yes, we have something to do with all of this,” that it is necessary to face the problem, and that something can be done about it. Under the terms of this essay, it means opening the door to thinking about research practices, guidelines for graduate programs, development and evaluation agencies, and the shared values of the scientific community in the field of Business Administration.

IMPACT AS A PERSPECTIVE

The position of confrontation mentioned here develops along two paths: that of responsible science (or research) and that of responsive science (or research). We take as a basis and guidance the notion of research impact to address each of them.

There are several conceptions and difficulties inherent in the comprehension of impact, as previously discussed in the RAE Perspectives session (Alperstedt & Andion, 2017; Lazzarini, 2017;

Oliveira Junior, 2018) and elsewhere (Allen, 2018; Bornmann, 2012; Brewer, 2011; Crotty, 2018; Dantas, 2004). Here, impact refers to the multidimensional set of effects caused by the scientific field (we regard the “scientific field” as a social arena constituted of interests, relations, and institutions guiding the production and dissemination of scientific knowledge) in several spheres of society, including academia.

Thus, the impact is largely associated with the societal returns of research, expressed by economic, cultural, social, or environmental effects from the actions of teaching and research entities in different spheres of society beyond the academic community (Donovan, 2011; Grant, Brutscher, Kirk, Butler, & Wooding, 2010). It is also associated with a kind of paradigm shift, through which there is a growing appreciation of knowledge oriented toward different publics and needs of society, in addition to the knowledge produced for the scientific community itself (Hill, 2016). It also involves the assumption that science and society would maintain a social contract in which imperative social problems must be the focus of the production of scientific knowledge (Nightingale & Scott, 2007).

From the above, we will briefly discuss the association between the impact and social engagement of research, referring to the notion of responsible science and its manifestation in the activities aimed at the social insertion of graduate programs and the preference for certain research phenomena.

Scientific responsibility and inequality as object

Responsible research (or science) is guided by epistemic and social values that cherish not only rigor but also relevant and useful knowledge for society (Tsui, 2016). It is, therefore, socially engaged, because it focuses on the societal impact of research, not only considering the publication and use of the information in the academic field but also affecting the forms of “appropriation and use of knowledge by society” (Wood Jr., Costa, Lima & Guimarães, 2016, p. 24). For the purpose of our argument, the social engagement of research was translated here in terms of intention and intervention by graduate programs. While the former refers to the preference for certain objects or phenomena at which research efforts and resources are mostly directed, intervention refers to actions oriented toward changing social reality.

That said, intervening actions implemented by graduate programs may manifest social engagement in a range of ways depending on their relevance and limitations (Lazzarini, 2017; Lima & Wood Jr., 2014; Wood Jr. et al., 2016). Under the Brazilian

graduate evaluation system, such actions tend to be interpreted in terms of the form of social insertion of the programs, entailing initiatives, and their effects on the training of qualified personnel; the repercussions of the research among audiences outside science; and the transformation of knowledge into technologies. In general terms, they encompass a relational dimension with other spheres of society (Ozanne et al., 2017).

Recently, another type of engagement initiative has been successfully implemented, in the form of institutional protocols, manifestoes, and collaborative networks aimed at repositioning the assessment of research impact beyond the academic field. As examples, we may cite the Leiden Manifesto (Hicks, Wouters, Waltman, Rijcke, & Rafols, 2015), The Metric Tide report (Wilsdon et al., 2015), and the San Francisco Declaration on Research Assessment, known as DORA (ASCB, 2013). In this issue, the RAE editorial (see Tonelli & Zambaldi, 2018) referred to this movement by citing the Responsible Research in Business and Management (RRBM) Network initiative. This initiative unites different entities around principles oriented to the defense of the societal value of research and business schools in the face of the potential crisis of legitimacy that builds up from accumulated criticism of the quality, integrity, and distancing of research from the real world (RRBM Network, 2017).

With regard to the first issue of social engagement and also the focus of this study, inequality, the scientific production in Brazil in the area of Business Administration is still scarce. Some numbers are illustrative. From a sample of just over 39,000 theses and dissertations defended in the area of Business and Public Administration in the Catalogue of Thesis and Dissertations of Capes (Coordination for the Improvement of Higher Education Personnel), 200 contained the term “inequality” in their title or abstract. On the SPELL database, among the 44,500 works cataloged, there were only 43 papers containing the term “inequality” in the title. From National Association of Postgraduation and Research in Administration (Associação Nacional de Pós-Graduação e Pesquisa em Administração - ANPAD) events, there have been 23 papers since 1999, and in the SciELO Citation Index Brazil, we found 26 articles, of which 15 were published between 2013 and 2017. Finally, among the more than 1,600 valid research groups on the National Council for Scientific and Technological Development (Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq) platform, only 10 active and certified groups used the term “inequality” in the group name, research line, or research line keyword.

Although this survey has left aside works on the subject that have not used the term in the fields considered in the analysis—or those published in databases and other media not

analyzed—the results suggest that little attention has been given to social inequality as a research subject in the area of Business Administration. Thus, although researchers and research groups may have an eventual interest in the subject, they do not express a generalized interest which is structured in research lines or areas of concentration.

This implies the loss of an opportunity to acquire more knowledge about the phenomenon on which we shed light and a weakening of the ability to understand its theoretical interfaces with the Business Administration area, especially the mechanisms associated with the organizational practices underlying the reproduction and persistence of inequality as a social problem (Alperstedt & Andion, 2017; Amis et al., 2018). Moreover, the low commitment and low sensitivity of the research activities of social inequality drastically reduce the potential societal impact that could be derived from the area of Business Administration in terms of the expectation or confirmation of its influence on and benefits to society (Lima & Wood Jr., 2014).

Responsiveness and institutional integrity

So far, we have tried to position the issue around responsible research, i.e., the orientation toward society underlying the social engagement practices of graduate programs. From this point on, we appeal to the notion of responsiveness, considering that the question should be thought of in the light of two institutionalization mechanisms of the scientific field: formalization of rules and the moral commitment of the community.

Formal rules, in principle, set behavioral norms. They are generally interpreted as a coercive expression of the regulatory order because they have in their constitution assertions that “forbid, require or permit some action or outcome” (Ostrom, 1990, p. 139). However, they are also mechanisms for the establishment of social relations, and they influence the way social reality is understood (Cotterrell, 2006). Therefore, they carry different expressions of informality in their formality; more specifically, they represent some value substance associated with the abstract aspects of their constitution, have an interpretive opening, and are subject to negotiation processes related to their formal validity, adequate representation of the reality for which they are addressed, communicability, and change (Cotterrell, 2006; Stinchcombe, 2001).

In the context of Brazilian graduate programs, there is an abundance of formal rules and guidelines set forth in ordinances, resolutions, and specific documents produced by different entities. The normative content produced by Capes

and CNPq stands out for having guidelines, standards, and sanctions associated with different dimensions of scientific activity, affecting the promotion of research and the evaluation of graduate programs. For this reason, they are the subject of recurring debates in the academic world.

It is important to note the inductive effect produced by the rules once they signal the conditions for the recognition and reward of programs and researchers. On the one hand, they are brought into organizations that sometimes establish specific structures to ensure compliance with the precepts established by the rules. It is not uncommon to find regimental devices or incentive systems in graduate programs oriented toward this end, as with the requirements or rewards for the production of papers. On the other hand, rules affect the individual behavior of the researcher, who considers their contents and effect on the programs as parameters for action. The consequence of this process may vary in the adherence to the substance of the rule, which is sometimes dysfunctional (Friedman, 2016), as in the case of productivist logic.

Thus, returning to the central problem of this essay, would it be possible to suppose that rules produced by development and evaluation agencies are enough to induce the desired societal impact, such as the social inequality here addressed? Probably not. Informality, which underlies the formal rules previously mentioned, raises at least one necessary condition for its statement to produce concreteness in behavioral patterns aligned with its substance: its association with the moral order of the scientific community (Selznick, 1992). It is noteworthy that what is suggested does not address the reasons that lead an individual to obey a rule, but rather that a system of rules maintains institutional integrity in the structure of the scientific field and is responsive in “acknowledging the legitimacy of an appropriate range of claims and interests” (Selznick, 1992, p. 463).

Therefore, community is a relevant element. Hence, since social engagement, tied to social inequality, is part of the moral commitment of the scientific community, it is expected that the organizations involved will be treated as moral agents, infused with value, and thus as responsible and responsive participants in the moral order (Selznick, 1992). Conversely, in the absence of an underlying value that links social inequality to the social engagement of organizations, the greater will be the likelihood of obtaining instrumental responses to rules that recommend the impact. In this sense, the organizations involved will less be institutionalized, and the institutional integrity to sustain social change will be diminished.

In summary, the formalization of rules is, in principle, an inductive mechanism of behaviors, but the inductive capacity

of the rules is greater when sustained by the moral aspects of the scientific community. Thus, the injection of moral principles from the scientific community into the rules that induce societal impact and the actions of social engagement are conditions for institutional integrity. Furthermore, the responsiveness of science to social inequality depends on the conditions for maintaining the institutional integrity of the rules and organizations of the scientific field (e.g., graduate programs, development and evaluation agencies, and others).

FINAL CONSIDERATIONS

Throughout this essay, we sought to discuss the societal impact of scientific research in the area of Business Administration addressing the social inequality issue. We have used the notion of scientific responsibility in an attempt to explore the issue of social engagement in graduate programs. In addition, we proposed attention to responsiveness and, consequently, to institutional integrity, by focusing on the formal rules and sensitivity related to socially valued aspects within the scientific community. We understand that there must be some complicity between the organizational and institutional levels to enhance the effective commitment of research on social problems, such as social inequality.

It is noteworthy that marginalizing the phenomenon of social inequality in the scientific field, as well as other relevant social problems, might be as harmful as the problem itself since it removes legitimacy and public recognition of their importance as an object of analysis. Moreover, it expresses detachment from implicit and manifest interests of the area of Business Administration (it is difficult to believe that this would not lead to an approximation to the position of negation of the object, mechanisms, and constituents). However, initiatives of social engagement, formalization of the institutional processes of evaluation, and recognition and production of research on the subject, although incipient, have been gaining relevance in the academic debate. This space, opened by the RAE Journal to address the issue, is one of the initiatives contributing to the gradual infusion of substantive value to research in this area.

“Social scientists should focus particularly on influencing how people interpret their reality by drawing on the empirical research we pride ourselves on” (Lamont, 2018, p. 436). Thus, in conclusion, we argue that adequately (maintaining) the relationship between responsibility and scientific responsiveness favors initiatives of societal impact, and, especially, the conditions for societal impact.

ACKNOWLEDGEMENTS

The author thanks Samir Adamoglu de Oliveira and Bruno Batista de Carvalho Luz for their criticisms and suggestions made on the preliminary versions of this paper.

REFERENCES

- Allen, D. G. (2018). *Rethinking Impact*. *Journal of Management*, 44(7), 2507-2510. doi:10.1177/0149206318785902
- Almeida, J. F. (1984). *Temas e conceitos nas teorias da estratificação social*. *Análise Social*, 20(81-82), 167-190.
- Alperstedt, G. D., & Andion, C. (2017). *Por uma pesquisa que faça sentido*. *RAE-Revista de Administração de Empresas*, 57(6), 626-631. doi:10.1590/S0034-759020170609
- American Society for Cell Biology (ASCB). (2012). San Francisco declaration on research assessment. Retrieved from <https://sfdora.org/read/>
- Amis, J. M., Munir, K. A., Lawrence, T. B., Hirsch, P., & McGahan, A. (2018). *Inequality, institutions and organizations*. *Organization Studies*, 39(9), 1131-1152. doi:10.1177/0170840618792596
- Bornmann, L. (2012). *Measuring the societal impact of research*. *EMBO reports*, 13(8), 673-676. doi:10.1038/embor.2012.99
- Brewer, J. D. (2011). *The impact of impact*. *Research Evaluation*, 20(3), 255-256. doi:10.3152/095820211X12941371876869
- Cotterrell, R. (2006). *Law, culture and society: Legal ideas in the mirror of social theory*. Aldershot, UK: Ashgate.
- Crotty, D. (2018). Measuring societal impact or, meet the new metric, same as the old metric [online]. The Scholarly Kitchen. Retrieved from <https://scholarlykitchen.sspnet.org/2018/08/02/societal-impact-meet-new-metric-old-metric/>
- Dantas, F. (2004). *Responsabilidade social e pós-graduação no Brasil: Idéias para (avali)ação*. *Revista Brasileira de Pós-Graduação*, 1(2), 160-172.
- Dodd, N., Lamont, M., & Savage, M. (2017). *Introduction to BJS special issue*. *The British Journal of Sociology*, 68(S1), S3-S10. doi:10.1111/1468-4446.12326
- Donovan, C. (2011). *State of the art in assessing research impact: Introduction to a special issue*. *Research Evaluation*, 20(3), 175-179. doi:10.3152/095820211X13118583635918
- Eisenstadt, S. N. (1995). *Power, trust, and meaning: Essays in sociological theory and analysis*. Chicago, IL: The University of Chicago Press.
- Friedman, L. M. (2016). *Impact: How law affects behavior*. Cambridge, UK: Harvard University Press.
- Grant J., Brutscher, P-B., Kirk, S. E., Butler, I., & Wooding, S. (2010). *Capturing research impacts: A review of international practice*. Santa Monica, CA: RAND.

Edson Ronaldo Guarido Filho

- Guellati, Y., Monteiro, C. D., & Oliveira Júnior, A. (2017). O Brasil em 2035: Tendências e incertezas para a área social. Instituto de Pesquisa Econômica Aplicada (IPEA), Discussion paper 2348. Rio de Janeiro, RJ: IPEA.
- Hansson, S. O. (2017). *Science denial as a form of pseudoscience*. *Studies in History and Philosophy of Science*, 63, 39-47. doi:10.1016/j.shpsa.2017.05.002
- Hicks, D., Wouters, P., Waltman, L., Rijcke, S., & Rafols, I. (2015). *The Leiden manifesto for research metrics*. *Nature*, 520(7548), 429-431. doi:10.1038/520429a
- Hill, S. (2016). *Assessing (for) impact: Future assessment of the societal impact of research*. *Palgrave Communications*, 2, 16073. doi:10.1057/palcomms.2016.73
- Instituto Brasileiro de Geografia e Estatística. (2018). *Pesquisa Nacional por Amostra de Domicílio Contínua*. Retrieved from <https://www.ibge.gov.br/estatisticas-novportal/multidominio/condicoes-de-vida-desigualdade-e-pobreza/17270-pnad-continua.html?=&t=o-que-e>
- Lamont, M. (2018). *Addressing recognition gaps: Destigmatization and the reduction of inequality*. *American Sociological Review*, 83(3), 419-444. doi:10.1177/0003122418773775
- Lazzarini, S. (2017). *Pesquisa em Administração: Em busca de impacto social e outros impactos*. *RAE-Revista de Administração de Empresas*, 57(6), 620-625. doi:10.1590/S0034-759020170608
- Lima, G. M. R., & Wood Jr., T. (2014). *The social impact of research in business and public management*. *RAE-Revista de Administração de Empresas*, 54(4), 458-463. doi:10.1590/S0034-759020140410
- Marens, R. (2018). *Laying the foundation: Preparing the field of business and society for investigating the relationship between business and inequality*. *Business & Society*, 57(6), 1252-1285. doi:10.1177/0007650316679990
- Medeiros, M., Souza, P. H. G. F., & Castro, F. A. (2015). *A estabilidade da desigualdade de renda no Brasil, 2006 a 2012: Estimativa com dados do imposto de renda e pesquisas domiciliares*. *Ciência & Saúde Coletiva*, 20(4), 971-986.
- Morgan, M. (2017). *Extreme and persistent inequality: New evidence for Brazil combining national accounts, surveys and fiscal data, 2001–2015*. *World Inequality Database (WID.org) Working Paper Series*, 12, 1-50.
- Nightingale, P., & Scott, A. (2007). *Peer review and the relevance gap: Ten suggestions for policy-makers*. *Science and Public Policy*, 34(8), 543-553. doi:10.3152/030234207X254396
- Oliveira Junior, M. D. M. (2018). *O futuro dos programas de pós-graduação em Administração: Novas escolhas e novos caminhos*. *RAE-Revista de Administração de Empresas*, 58(1), 87-90. doi:10.1590/S0034-759020180107
- Ostrom, E. (1990). *Governing the commons*. Cambridge, UK: Cambridge University Press.
- Ozanne, J. L., Davis, B., Murray, J. B., Grier, S., Benmecheddal, A., Downey, H. ... Veer, E. (2017). *Assessing the societal impact of research: The relational engagement approach*. *Journal of Public Policy & Marketing*, 36(1), 1-14. doi:10.1509/jppm.14.121
- Queiroz, C. (2018). *Olhar pioneiro sobre a desigualdade social*. Entrevista com Elisa Pereira Reis. *Pesquisa Fapesp*. Retrieved from <http://revistapesquisa.fapesp.br>
- Reis, E. P. (2000). *Percepções da elite sobre pobreza e desigualdade*. *Revista Brasileira de Ciências Sociais*, 15(42), 143-152. doi:10.1590/S0102-69092000000100010
- Responsible Research for Business and Management Network (2017). *A vision of responsible research in business and management: Striving for useful and credible knowledge*. Position Paper, RRBM.
- Selznick, P. (1992). *The moral commonwealth: Social theory and the promise of community*. London, UK: University of California Press.
- Souza, J. (2004). *A gramática social da desigualdade brasileira*. *Revista Brasileira de Ciências Sociais*, 19(54), 79-96. doi:10.1590/S0102-69092004000100005
- Souza, J. (2015). *A tolice da inteligência brasileira: Ou como o país se deixa manipular pela elite*. São Paulo, SP: LeYa.
- Souza, P. H. G. F. (2016). *A desigualdade vista do topo: A concentração de renda entre os ricos no Brasil, 1926–2013*. Doctoral thesis. Universidade de Brasília, Brasília.
- Specter, M. (2009). *Denialism: How irrational thinking harms the planet and threatens our lives*. New York, NY: Penguin.
- Stinchcombe, A. L. (2001). *When formality works: Authority and abstraction in law and organizations*. Chicago, IL: University of Chicago Press.
- Tonelli, M. J., & Zambaldi, F. (2018). *Ciência responsável e impacto social da pesquisa em Administração*. *RAE-Revista de Administração de Empresas*, 58(3), 215-216. doi:10.1590/S0034-759020180301
- Tsui, A. (2016). *Reflections on the so-called value-free ideal: A call for responsible science in the business schools*. *Cross Cultural & Strategic Management*, 23(1), 4-28. doi:10.1108/CCSM-08-2015-0101
- Wilsdon, J., Allen, L., Belfiore, E., Campbell, P., Curry, S., Hill, S. ... Johnson, B. (2015). *The metric tide: Report of the independent review of the role of metrics in research assessment and management*. Retrieved from http://blogs.lse.ac.uk/impactofsciences/files/2015/07/2015_metrictide.pdf
- Wood Jr, T., Costa, C. C. M., Lima, G. D. M. R., & Guimarães, R. C. (2016). *Impacto social: Estudo sobre programas brasileiros selecionados de pós-graduação em administração de empresas*. *RAC-Revista de Administração Contemporânea*, 20(1), 21-40. doi:10.1590/1982-7849rac20161842