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Social sciences and the mining sector: Some insights into recent research trends

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ABSTRACT

The number of science publications is growing exponentially, thus increasing the need for understanding the knowledge base of various research streams and their emerging branches. From a social science perspective, the literature on the mining sector – the industrial sector that extracts ores and minerals from the ground – has also witnessed steady growth. However, this literature is rather fragmented in regards to the thematic topics and the geographical focus. To respond to this, this paper offers a systematic literature review of the social science research on the mining sector. The publication database of this review includes a set of 483 systemically selected papers from 976 authors, covering empirical research conducted in 73 countries from 5 continents: Africa, Europe, Asia, Australia and America. Our contribution is twofold. Firstly, we provide an analysis of the geography of the research in terms of both authorship and empirical focus. In terms of the geographical coverage of the empirical cases, Australia appears as the most studied country in the field, followed by countries in other regions such as Asia (China, India, Russia and Turkey), Africa (Ghana, South Africa and the Democratic Republic of the Congo), North America (the USA and Canada), Latin America (Brazil and Chile) and Europe (Poland, Spain and Sweden). However, this dispersion is not reflected in the geographical coverage of the affiliations of the authors. Secondly, we identify the most popular social science research topics on the mining sector. Our results show that the social science research on the mining sector shifted from the traditional research streams (e.g., industrialisation and growth, colonialization, technological and economic development, and the resource curse) to the new streams of research on social, environmental and economical sustainability (e.g., the social license to operate, corporate social responsibility, criticality of the rare earth elements, material flow analysis and environmental impacts). Overall, our study serves as an entry point for researches who are interested in social science research on the mining sector.

1. Introduction

The number of science publications is growing exponentially, doubling every 9–10 years (Bornmann and Mutz, 2015). This growth leaves researchers, policy makers as well as practitioners with a sea of knowledge, although several publications have remained unread and uncited for decades (Larivière et al., 2007; Meho, 2007). From a scholarly perspective, the inevitable growth in science has increased the need for understanding the knowledge base of various research streams in a systematic and structured way. Thus, the systematic literature review approach (Tranfield et al., 2003) has become an important method with which to synthetize the cutting-edge scientific knowledge generated by numerous publications in a field at a given point in time. Consequently, the fast-growing social science research literature on industrial sectors (e.g., industry-specific studies on economics, political science, human geography, demography and sociology) has been systematically reviewed in several studies, focusing on, for instance, the energy sector (Sovacool, 2014a, 2014b), the cultural and creative industries (Cho et al., 2016), the agriculture and food sector (Poulsen et al., 2015), the tourism sector (Benckendorff and Zehrer, 2013) and the air transport sector (Ginieis et al., 2012). However, in the social sciences, the mining sector – defined in this paper as "the industrial sector that extracts ores and minerals from the ground" – has not been systematically and extensively reviewed to date.

Historically, the mining sector has been studied using various perspectives, which have, over many decades, enriched our understanding of the dynamics and competitiveness of the industry. Thanks to decades of research, we know how the industry is organized, we understand its operations, prices and labour-related issues as well as the role of mining in spurring economic development, innovations and growth processes. Although the earlier literature did not focus on contemporary issues such as innovations, learning, knowledge spillovers and safety, but

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tended to focus on inputs/outputs from the mines, these issues have recently become key topics of research (e.g., Corder et al., 2015; Martinez-Fernandez, 2010; Upstill and Hall, 2006; Walker and Minnitt, 2006). The research on mining has come a long way since Smith (1928) recognized mining output as an important measure of a nation's competitiveness, noting that the prosperity of nations should be measured by the volume of ore output and not by the value it generates. Technological development and knowledge formation as a nexus of transformation in the mining sector that was discussed more than half a century ago (see e.g., Fisher, 1953; Ginsburg, 1957) is still valid. In addition, the academic discourses on the role of mining on development in developing countries that engaged sociologists, political scientists, development economists, and economics and followed the creation of the economic commissions such as the Economic Commission for Latin America (ECLA) by the United Nations in the 1950s have provided us with insights into the mechanisms that condition or constrain development. Interestingly, the discussions on the inability of mining and its locations to develop effectively evolved; for instance, the notion that the mining sector lacked self-propelling growth processes since it did not function as “industries motriches” (Perroux, 1955) with both forward and backward linkages needed for development (Hirschman, 1971, 1958). Furthermore, the intense discussions within the social sciences with the inception of concepts such as the “development” of the “underdevelopment” (Frank, 1973, 1970, 1967), and of the “unequal exchange, ”dependency theory” (Emmanuel, 1972) that were mainly underpinned by a Marxian approach and that used mining as well as other resource-exploiting activities/industries as the empirical point of departure have enriched the scholarship on mining.

Following globalization, the notion of the “resource-curse” literature – which, simplified, stated that natural resource-based activities, including mining, had an adverse impact on growth – has emerged (Gylfason, 2001; Sachs and Warner, 2001, 1995). For instance, the works by Sachs and Warner (2001, 1999, 1995) that have been cited thousands of times have formalised the long-standing idea that resources (including minerals) inhibit growth. Although providing explanations, the resource-curse hypothesis has also come under criticism and there are several critical studies that have rejected the idea that a resource curse represents a general trend among resource-based economies. Some social scientists have argued that if you control for the factor of “institutions”, the correlation between natural resource abundance and the growth levels disappears (Mehlum et al., 2006). The resource-curse thesis, together with the “Dutch Disease”, which has a family resemblance to the resource-course thesis (see e.g., Corden, 1984; Matsen and Torvik, 2005), emerged at a time when the process of globalization and the industrial catching up of some countries could be argued to have resulted in what might be termed as a “new scramble” for natural resources. In addition, there is the observation that some of the richest and/or fastest growing economies have a significant share of natural resources, including Sweden and Australia, where mining, for instance, contributes significantly to GDP. However, the diminishing role of industrial activities in old industrialized nations and the waves of the Tiger economies from the 1950s–1980s that took place without significant natural resource bases provide a solid argument for the presence of the resource curse. At the same time, the proliferation of technologies in, for example, the mining sector, has transformed mining into a highly-automated industry resulting in significant shifts in skills, competencies and working cultures compared to what hitherto has been the case.

More recently, the scholarship on mining has centred on the impact of climate change and mitigation strategies (see e.g., Azapagic, 2004; Hamann, 2003; Moran et al., 2014; Schoenberger, 2016) and spans across several academic disciplines in the social sciences. In addition, the recent research looks at issues such as green supply chain management (Kusi-sarpong et al., 2015; Luthra et al., 2015), the social license to operate (Moffat and Zhang, 2014; Prno and Slocombe, 2012), materials criticality (Glöser et al., 2015; Lapko et al., 2016), policy making (Andriamasinoro and Angel, 2012; Moussa et al., 2015) and financial aspects (Bekiros et al., 2015; Savolainen, 2016). Even though the research has become increasingly diverse, only a few literature reviews have been undertaken to identify the scholarly knowledge base. These reviews focus on only a few sub-fields of social science research on the mining sector rather than having a broader scope. For example, Smith (2013) presented a literature review of the research methods and models used in the assessment of the impacts of extractive resource taxation. He provided an overview of previous research that had drawn from the economic theory of the extractive industries and the theory of optimal taxation. Another example is the study by Savolainen (2016) that reviewed the scholarly literature that conducts real option analyses of metal-mining investments. Savolainen sorted the literature into two groups: focused (valuations and managerial) and project timelines (exploration, development, extraction and reclamation). In general, these literature reviews on the mining sector are specific to only a few sub-fields, and do not attempt to cover a broader range of social science-related topics. Addressing this gap, this paper poses the following research question: *What is the state-of-the-art social science research on the mining sector?*

In order to answer the research question posed in this paper, we use a systematic literature review approach – a common research methodology that synthesizes all relevant studies on a specific topic, limiting the bias of systemic assembly and critical appraisal (Cook et al., 1995, p. 167). The publication database is based on the Social Science Citation Index (SSCI) from the Web of Science database, including 483 papers from 976 authors, covering empirical research conducted in 73 countries from 5 continents (Africa, Europe, Asia, Australia and America). Our analysis is twofold. Firstly, we provide an analysis of the geography of the research in terms of both authorship and empirical focus. Secondly, we identify the most popular social science research topics on the mining sector.

Apart from this introduction, the paper consists of three sections. In Section 2, we explain the research design and the data in detail, including the methodological steps involved in the data collection and data analysis. This section also gives the methodological background for the systematic literature review approach. In Section 3, we provide the results and discussion. This section is divided into two parts: a synthesis of key social science research topics on the mining sector and an analysis of the geography of the research. Finally, the conclusions of the paper and the implications are presented in Section 4.

2. Methodology

2.1. Systematic literature review

In general, the term “systematic literature review” is used to refer to both the methodology employed in a study or the study itself. Kitchenham (2004) defines a systematic literature review as “a means of identifying, evaluating and interpreting all available research relevant to a particular research question, or topic area, or phenomenon of interest”. Systematic literature review research can be distinguished from traditional narrative reviews in that it adopts a replicable and detailed methodology (Cook et al., 1995; as cited in Tranfield et al., 2003, p. 209). Systematic literature reviews have a longer history in the medical sciences than in other fields such as the social sciences. Today, they are widespread and have become a key research activity in most of the scientific disciplines. Mulrow (1994) argues that there is always a need for systematic literature reviews in order to separate the known from the unknown in the scholarly literature. However, identifying the known and unknown is a challenging process. That is why systematic literature reviews should be conducted with predefined and transparent methodological steps.

In this paper, we follow the three-stage procedure of the systematic literature review from Tranfield et al. (2003), who transferred the principles of the systematic review methodology usually used in the