Linking stakeholder engagement to profitability through sustainability-oriented innovation: a quantitative study in the minerals industry

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Abstract

Firms' capability to develop sustainability-oriented innovation (SOI) can be enhanced by stakeholder engagement (SE) to acquire a wide range of external knowledge in support of those innovations. While we understand some of the transactional and relational attributes at stake for firms to leverage engagement with external stakeholders, we do not yet fully understand all the underlying mechanisms that are conducive to greater SOI outputs (through new or improved products, processes and organizational practices). At the same time, stakeholder theory emphasizes the importance of such engagements for firms' financial performance (FP), even though these findings are far from conclusive. Therefore, this paper suggests and tests a mediation model to establish an empirical basis for the associations between SE, SOI and FP. The results based on data collected from 101 mineral companies in Norway show that both the transactional and relational interactions matter for improving SOI outputs. Interestingly, SOI is a full mediator in the association between SE and FP, measured by profitability. This suggests that external engagement activities do not directly link to FP, and that the (financial) benefit begins to appear once a firm is able to transform the acquired knowledge from external stakeholders to innovative outputs.

Keywords: stakeholder engagement; innovative output; sustainability; profitability; mediator

1. Introduction

The increase in both the size and significance of social and environmental challenges has made it inevitable for firms to integrate these aspects of sustainability with their prevalent strategic focus on profit seeking (Hall & Vredenburg, 2003). This has led to emergence of corporate sustainability perspective, outlining economic, environmental and social sustainability as pathways to gain competitive advantage (Amini & Bienstock, 2014; Hart, 1995). Here, practicing socio-environmental sustainability follows a 'business case for sustainability' logic (Schaltegger et al., 2012), where managers seek economic success while performing better in social and environmental aspects, by means of for instance improving their corporate image and getting social legitimacy.

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The role of innovation in the quest for sustainability has received considerable attention from academics and businesses. It has been argued that firms have no choice but making sustainability-oriented 'changes' to the status quo of value-chain, product/service offerings and business model, in order to remain competitive (Nidumolu et al., 2009). More specifically, sustainability-oriented innovation (SOI) acts as a strategic approach through which firms innovate on different areas of products, processes and organizational practices to realize the various objectives of sustainability (Klewitz & Hansen, 2014). While recent studies in this domain call for transitions from focusing on a single area of innovation to a broader approach where product, process and organizational changes are pursued concurrently (Adams et al., 2016), we consider that such shifts also add to the complexity and uncertainty associated with SOI (Sharma, 2005) as a demanding innovation approach.

Previous research suggests that engaging stakeholders is a prerequisite for overcoming the complexity and uncertainty of SOI as it enable firms to incorporate external knowledge in their innovation processes (Rodriguez et al., 2002; Segarra-Oña et al., 2017). They further evidence the necessity of going beyond engaging primary stakeholders (those within the supply-chain), and consider secondary stakeholders (e.g. environmental activists, universities and local communities) even more important in the context of SOI (Hall & Martin, 2005). What we already know from the emerging literature on SE and SOI is centralized around either the characteristics and various roles of stakeholders (Goodman et al., 2017), or the organizational capabilities required for effective learning to happen (Kazadi et al., 2016). However, the conceptual argument of this literature that engaging more stakeholder groups is beneficial for firms' capability to achieve innovative outputs, has yet to be examined empirically.

Moreover, SE is usually perceived as costly and outside the core business activity (Nidumolu et al., 2009; Sharma, 2005), hence lack of knowledge about its significance might impede managers' ability to fully recognize the value of such engagements in terms of financial returns. While examining the performance outcomes of SE has been a major theme in the previous research, mixed findings make it difficult to understand the exact association between firms' SE practices and their performance (Laplume et al., 2008). Rather than a straightforward association, organizational resources and capabilities might mediate the effect of firms' activities regarding stakeholders and socio-environmental management on their performance (Dixon-Fowler et al., 2013; Martinez-Conesa et al., 2017). Considering that innovation capability is among the most important determinants of firm performance (Mone et al., 1998), it could be considered as a mediating factor that enable firms to transform external stakeholders' knowledge to financial benefits.

Therefore, this study addresses three research questions: (1) To what extent does SE affect a firm's SOI outputs, and (2) Does increasing engagement and SOI outputs relate to higher profitability? (3) Is SOI a mediator in SE-FP association? To address the first question, we follow Jones (1995) in distinguishing between transactional and relational interactions with external stakeholders, hence defining 'high SE' as being considerable in quality and quantity of those types of interactions (Greenwood, 2007). This will also help us to address the call for research that goes beyond the prevalent focus on characteristics of organizations or their

stakeholders (Hörisch et al., 2014) by shedding some light on the characteristics of the 'relationships' between organizations and stakeholders.

Then, by building on the natural resource-based view (NRBV) of the firm, we argue that SOI outputs in terms of processes, products and organizational practices, act as a capability through which firms continuously respond to sustainability challenges, thereby improving their competitiveness (Hart & Dowell, 2011), here measured as profitability. Finally, our theoretical model tests if SOI is a mediating factor in the link between SE and profitability, hence extends the recent contributions (Martinez-Conesa et al., 2017) that consider innovation to explain the link between social and financial performance. To test our hypotheses, we opted to study the minerals industry in Norway for two main reasons; firstly, the Scandinavian firms are characterized by a long tradition of engaging stakeholders in their business activities (Strand & Freeman, 2015). Second, resource extractive industries suit to corporate sustainability perspective (Sharma, 2005) as they faces the environmental and social challenges to the greatest extent.

This paper also makes two empirical contributions. First, our quantitative approach could add to the prevalent qualitative stance of the literature in this domain, hence providing empirical insight on the link between engagement practices and firm-level outcomes that has not been sufficiently examined before (Watson et al., 2017). Second, we draw on the recent literature that view SOI as an evolving capability (Adams et al., 2016), and bring a fresh perspective to the research on innovations in sustainability contexts by operationalizing SOI along a range, rather than a dichotomy (succeeded to innovate or not).

The remaining parts of the paper is structured as follows; in section 2, we review the state-of-the art on the intersection between SE, corporate sustainability and innovation, and presents our research hypotheses. Section 3 introduces our empirical setting and the measures, and section 4 presents the results of statistical analysis. Section 5 concludes the paper with discussions around the findings and implications for research and practice.

2. Literature review and hypotheses

2.1. Theoretical background

Sustainable development, as an overarching concept, proposes a mindset for growth that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (WECD, 1987, p. 8). Subsequently, Elkington (1999) has extended this concept to the business-level through his 'Triple Bottom Line (TBL)' approach by arguing that businesses should satisfy three criteria in order to ensure success in long-term: economic prosperity, environmental protection and social equity. By building on the TBL approach, Wilson (2003) further elaborates that 'corporate sustainability' is a management paradigm that recognizes the significance of environmental and social performance, in addition to profitability. Important here is that economic, environmental and social aspects of corporate sustainability are interrelated (Amini et al., 2014) in a sense that despite of potential contradictions, they should be pursued simultaneously by adopting combinations of different strategies at the firm-level (Hahn et al., 2015).

Similar to the competitive landscape, firms' innovation practices has also undergone changes driven by the broad corporate sustainability perspective (Nidumolu et al., 2009). This has led to the emergence of several concepts at the intersection of innovation with different aspects of sustainability, such as green innovation, CSR-innovation, eco-efficiency and sustainability-oriented innovation (SOI), among the others. However, the latter seems to be more aligned with the holistic approach to sustainability, as it denotes a strategic orientation towards sustainability by deliberate improvement (incrementally or radically) in existing processes, products, technologies and business models (Klewitz et al., 2014).

While adopting an innovative approach to improve individual aspects of sustainability is neither new in research nor for practice, what differentiates SOI from the traditional approaches to innovation is the multiplicity of purposes, impacts and focus areas that adds to the complexity and uncertainty associated with innovation activities (Jay & Gerard, 2015). Complexity arises as a result of socio-technical diversity inherent in sustainability contexts (Clarke & Roome, 1999), where incorporating environmental and social considerations require knowledge about technologies, regulative standards and societal expectations.

Uncertainty, on the other hand, points to the risks and costs associated with SOI. Social and environmental improvements might be achieved at the expense of increasing the cost of processes and products, which could result in market and system failures of innovations (Foxon & Pearson, 2008). SOI, with its potential impact on wider groups of stakeholders, may create conflict situations due to the opposing interests between the focal firm and its stakeholders, for instance local communities (Hall et al., 2005; Watson et al., 2017). Because of these uncertainties, the desired outcome from SOI (e.g. market success of green products) is likely to be unknown. In below, we will discuss in what ways SE may enable firms to overcome the complexity and uncertainty of SOI.

2.1. Leveraging on stakeholders' knowledge for SOI

Before moving on, it is necessary to get a better understanding of the terms 'stakeholder' and 'stakeholder engagement'. A stakeholder "is any group or individual who can affect, or is affected by, the achievement of a corporation's purpose" (Freeman, 2010, p. 9), which in this paper, is improving SOI outputs and FP. For SE, although a single definition doesn't exist, we follow Greenwood (2007, pp. 317-318) who defines it as "practices that the organization undertakes to involve stakeholders in a positive manner in organizational activities." He separates SE from corporate responsibility as a purely moral attitude, and considers it as strategic processes through which "an organization responds to the needs of stakeholders with the aim of furthering the goals of the organization" (Greenwood, 2007, p. 324). This implies creating mutual value for the firms and their wider groups of stakeholders, as one of the tenets of corporate sustainability (Hörisch et al., 2014). By means of addressing socio-environmental sustainability through their interactions with stakeholders, firms strive to maximize the value accrued to their shareholders and other economic stakeholders.

In Hall et al.'s opinion (2003), complexity and uncertainty of SOI at the firm-level boil down to the lack of internal knowledge about technological and social aspects of sustainability, which

in turn impedes effective decisions. In this regard, engaging stakeholders in innovation processes provides access to their needs and expectations (Luyet et al., 2012), improves the firms' internal capacity to understand their stakeholders' language (Veldhuizen et al., 2013), and nurtures trust-based dialog between the firm and its societal stakeholders that infer increased knowledge for all parties (Herremans et al., 2016). Therefore, SE is not only beneficial for 'obtaining' the external knowledge, but also for 'commercializing' it (West & Bogers, 2014), i.e. to create and capture values that are of interest to both the focal firm and its stakeholders.

A deeper look into the attributes of SE directs us to what stakeholder theorists refer to as transactional vs. relational interactions (Hillman & Keim, 2001; Jones, 1995). In transactional or one-way interaction process, the primary intention of the firm is to learn about the needs and expectations of the stakeholder(s) without their direct involvement in the learning processes (Herremans et al., 2016). This inbound knowledge flow entails utilizing pecuniary (contract-based) and non-pecuniary (information search) mechanisms to supplement the internal knowledge base (Chesbrough & Crowther, 2006; Dahlander & Gann, 2010). For example, in the case of environmental management, Roome and Wijen (2006) discuss the adoption of available sustainable solutions from other companies as a means of providing the basis for change processes and innovation.

In a study of Canadian extractive industries, Bansal (2005) evidenced a positive association between pursuing an active mimicking strategy and corporate sustainability performance. She explains that firms who continuously adopt existing ideas and solutions from other companies or organizations such as industry associations decrease the uncertainty of their social and environmental sustainability practices. Holmes and Smart (2009) indicate the importance of spotting 'weak signals' for building an appropriate capability to respond to the societal stakeholders' demands. Here, powerful search mechanisms such as employing boundary spanners increases the frequency of transactions and provides timely access to ideas and opportunities, which in turn results in innovative outcomes. High quality transactional interactions go beyond ad-hoc and market-based transactions, thus involve a time dimension that adds to the depth of these relationships and converts them to resources that are not easy to duplicate by competitors (Hillman et al., 2001). A recent literature review by Dangelico (2016) on green product innovations reveals strong proof for the positive effect of firms' ability to establish and manage 'intense' knowledge flows from a variety of stakeholders such as customers, suppliers and special interest groups.

H1a. *Transactional SE is positively associated with SOI outputs*

On the other hand, relational or two-way interactions entail knowledge exchange processes between a firm and its stakeholders (Onkila, 2011). Known as coupled knowledge flow in the innovation literature, they occur mainly via formal mechanisms such as alliances and socially constructed relationships such as personal networks (Faems et al., 2008; West et al., 2014). Others maintain that relational interactions with external stakeholders are grounded on mutual trust and honesty, hence require the focal firm to disclose and share its internal information (e.g. issues, solutions, requirements) in order to establish an effective dialogue with its stakeholders

(Gould, 2012; Herremans et al., 2016). Consequently, the probability of creating shared value through SOI depends on the ability of the firm to effectively manage its networks of relationships with multiple stakeholders (Kazadi et al., 2016). This could provide a learning milieu for the firm and its stakeholders for reaching a common understanding about the specific purpose(s) of a sustainable product, process or organizational practice.

Compared to the transactional interactions, their relational counterpart has received more attention from the researchers who linked SE to SOI. Nevertheless, the focus has been mainly on exploring the capabilities required to learn from different types of stakeholders. By emphasizing the necessity of actively involving multiple stakeholders in innovation processes, Kazadi et al. (2016) illustrate that 'stakeholder co-creation capabilities' are highly crucial in the context of SOI since the inability of firms to attract specific groups of stakeholders can even result in the stop of innovation projects. Similarly, Hall et al. (2005) report on the case of Monsanto, a biotechnology corporation, that had to deal with a variety of economic, environmental and social risks associated to its new herbicide product. To this end, the company established new communication channels with their secondary stakeholders to hear and address their concerns about the product.

Recent studies also suggest that secondary stakeholders are even more important that those within the typical supply-chain of a company, and use this insight to propose that two-way interactions with a diverse range of stakeholders is beneficiary in different stages of SOI (Goodman et al., 2017). In the context of new product development, firms who integrate issues and demands that are important to both primary and secondary stakeholders could earn the social approval as a success factor for commercialization of their products (Driessen & Hillebrand, 2013). This line of reasoning allows us to hypothesize that:

H1b. *Relational SE is positively associated with SOI outputs*

To the best of our knowledge, only two studies has quantitatively examined the effect of SE on outcomes related to SOI. Ayuso et al. (2011) argued for a positive link between diversity of engagement and tendency of firms to undertake SOI, but did not find support for this hypothesis when controlling for the firms' knowledge management practices. On the contrary, Ketata et al. (2015) found empirical support for their propositions that both the quantity and quality of SE increase the degree of sustainability achieved through a firm's innovations. However, common in both of the above studies is the limitation regarding the dependent variable, i.e. SOI. While in the first study, the dependent variable is tendency of firms but not the actual innovative outputs in terms of products, processes or practices, the second study only include innovative firms in the analysis, hence missing the baseline (firms with no reported activities of SOI). Another caveat of Ketata et al.'s (2015) measure of SOI lies in the fact that it doesn't represent sustainability-oriented practices but also allowing the intrusion of actions such as greenwashing, since it assesses the sustainability-related effects of 'all innovations' a firm has developed. Coincidental practices such as greenwashing does not conform to the definition of SOI (Baumgartner & Ebner, 2010) that implies deliberate improvements as an integrated part of a firm's strategy and routines.

2.2. Linking SOI to FP

Organization scholars maintain that innovation capability is an important source of superior business performance (Mone et al., 1998). They encourage researchers to establish empirical links between determinants of this capability, innovation outcomes, and FP, in order to elucidate the likely value of innovation to firm managers (Crossan & Apaydin, 2010). In the domain of corporate sustainability, Bocken et al. (2014) developed a conceptual framework to explain how different types of SOI, including technological, social and organizational outcomes, could provide firms with financial benefits whilst helping them to create social values for their communities. Their proposed business model archetypes range from 'efficiency maximization' aiming at reducing environmental and financial costs to 'adopting stewardship roles' towards the society with the purpose of generating positive reputation in their communities.

Our point of departure for linking SOI to FP is the natural resource-based view (NRBV) of the firm, as a theory that concerns competitive advantage to be increasingly dependent on capabilities driven by corporate sustainability (Hart, 1995). By extending the resource-based view (RBV) and in close connection with the dynamic capabilities approach (Teece et al., 1997), NRBV introduces pollution prevention, product stewardship and sustainable development, as the three main strategic approaches for continuous reconfiguration of firm-level resources and capabilities in sustainability contexts (Hart et al., 2011). While the complexity and uncertainty of sustainability objectives exhibit rapidly changing business environments, dynamic capabilities rooted in these strategies will help firms to address environmental and social issues as an integrated part of their overall business strategy, thereby gaining advantage against their competitors.

As Rodriguez et al. (2002) explain, innovations that target corporate sustainability are typical examples of valuable, rare and inimitable assets, which reflects their competitive potential as depicted by RBV theorists (Barney, 1991). SOI is difficult to imitate concerning the participation of several groups of stakeholders in their development (Hillman et al., 2001). Moreover, interactions with stakeholders often involve the exchange of tacit social and environmental knowledge that are hard to be copied by competitors (Zollo et al., 2013). Accordingly, we argue that SOI is likely to provide sustained FP. In one of the first empirical studies that draws on NRBV, Sharma and Vredenburg (1998) examined if the capability for continuous innovation, triggered by proactive environmental strategies, predicts the competitive advantage of firms in different aspects. Their findings corroborated this link, hence supporting the assumption that SOI capability is positively related to cost reduction and process optimization, among the other benefits.

From a narrower approach to SOI, researchers has so far provided convincing empirical evidence to highlight the effect of environmental, and more generally, green innovations, on different aspects of firms' performance. By examining the link between green product/process innovations and new product success in China, Wong (2013) found that product innovation capability predicts higher product success compared to process innovation capability. In a similar vein, Aguilera-Caracuel and Ortiz-de-Mandojana (2013) showed that the intensity of green innovation, measured by the share of registered green patents, is positively related to FP

expressed in return on assets (ROA). However, they did not find any significant performance difference between green innovators and non-green innovators that based on their opinion emanates from the fact that the financial benefit from such innovations appears in long-term.

While the existing research contributed to our understanding about the link between different types of SOI and performance, we have yet to know whether undertaking various SOI activities at the same time could also provide firms with better FP. The need for such insight stems from the growing necessity for a holistic approach to SOI, that is, developing innovation capabilities at different levels of process, product and organizational practices (Adams et al., 2016). This could be also perceived in NRBV, where sustainability-related strategies are supposed to be interconnected, in a sense that achieving a certain output (for instance, product stewardship) might depend on the existence of others (for instance, pollution prevention) (Hart, 1995). Therefore, considering different types of SOI in isolation might limit our understanding about their interrelation, and the likely positive effect of a broader SOI approach on FP. Accordingly, we hypothesize that:

H2. *A firm's SOI outputs positively contribute to its FP*

2.3. SOI as a mediator of SE-FP association

Considering hypotheses H1a and H1b that propose a positive association between SE and SOI, and H2 that considers the latter as being positively related to FP, one could also assume that SE might conduce to FP regardless of SOI outputs. This alternative explanation is indeed rooted in the stakeholder theory, particularly the instrumental approach to stakeholder relationships, which basically proposes that firms practicing SE could outperform their competitors on various long term financial indicators (Donaldson & Preston, 1995; Jones, 1995). However, the empirical studies have shown mixed results (Laplume et al., 2008), implying that the likely effect of SE on FP is contingent upon other variables that should be taken into account.

Whereas the contingency of SE-FP association has yet to be studied thoroughly, a similar perspective could be found in the literature examining the association between firms' socio-environmental activities (and/or performance) and their FP. In an effort to address this debate, Dixon-Fowler et al.'s (2013) meta-analysis underpins that firms with better environmental performance exhibit more focus on continuous innovation as an strong organizational capability, hence increase their efficiency by lowering costs. Indeed, environmental management does not directly contribute to financial benefits, but rather, cultivates innovation as an organizational capability that generate competitive advantage (Sharma et al., 1998). In the context of SMEs, Martinez-Conesa et al. (2017) found that firms with proactive CSR strategies achieve better financial performance, and this association could be augmented through an increase in innovation performance relative to others in their industry.

By applying the contingency perspective to SE-FP association, we argue that SE may not lead to financial benefit for all firms under all conditions. Unlike to the previous studies that identify SE as an organizational capability (Ayuso et al., 2006; Watson et al., 2017), this argument posits that even though relationships with stakeholders provide firms with new knowledge resources, they may not result in superior performance if the knowledge is not converted to innovative

outputs. Unique innovation capabilities with potential for competitive advantage could be developed through combinations of external stakeholders' knowledge, as one type of necessary resource, with other resources (e.g. firms' internal knowledge), in order to bring benefits to the firm and its stakeholders (Cohen & Levinthal, 1990; Teece et al., 1997). For instance, Driessen et al. (2013) suggest that while addressing the interests of stakeholders is not directly related to indicators of competitive advantage such as FP, it may result in valuable, rare and inimitable organizational capabilities that eventually improve the performance. Therefore, it is likely that tapping to external knowledge might not per se be related to firm performance, but instead conduce to the development of a capability that in turn improves FP. This discussion implies a fully mediating role for SOI, leading us hypothesize that:

H3. *SOI fully mediates the association between SE and FP*

Figure 1 illustrates our theoretical framework as described above. It consists of three core elements: SE, SOI outputs and FP. First, we test the association between SE, featured by transactional and relational interactions, and firms' SOI outputs. As for the second hypothesis, the effect of SOI on FP is examined. Finally, the indirect effect of SE on FP is investigated in H3, by introducing SOI as a mediating variable.

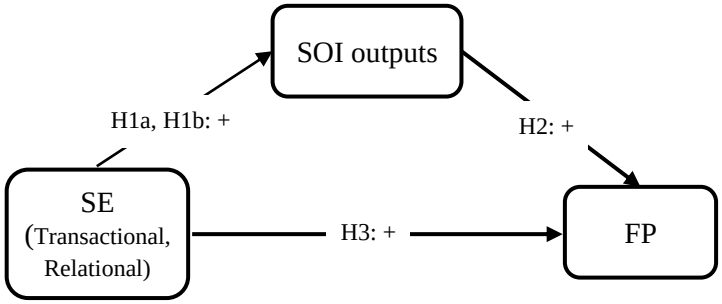

Figure 1: Theoretical framework

3. Methods

3.1. Sample and data

The Norwegian minerals industry serves as the empirical setting for our study. By definition, this industry comprises of firms that are involved in extracting and primary processing of minerals in five main categories: industrial minerals, natural and dimension stone, metallic ores, energy minerals (except oil and natural gas) and construction minerals (Geological Survey of Norway, 2016). We refer to two main criteria that guided us to choose this empirical setting, that is, urgency of corporate sustainability perspective in the minerals industry, and the cooperative culture in the Scandinavian context. First, the minerals industry is generally characterized by a high degree of environmental and social pressure, as well as economic difficulty due to the fluctuations in the commodity markets (Laurence, 2011). The situation is even more challenging in a country such as Norway that commits to strict environmental and social regulations. For instance, a considerable number of existing mines and proved reserves in Norway are located in peripheral districts with nature-based activities such as herding and fish farming, which in turn makes it crucial for firms to integrate environmental and social

sustainability into their business practices. In addition, previous studies in organization and management literature argue that institutionalized cultural norms such as trust, welcoming critical voices and long-term approach towards value-creation nurture company-stakeholder cooperation in the Scandinavian business context (Strand et al., 2015). We therefore consider that our empirical setting is an interesting context as it marries the features of SE and corporate sustainability.

Data regarding SE and innovation activities was gathered by means of an author-designed survey that asked firms to specify their innovation outcomes, relationships with external stakeholders and internal routines for knowledge sharing in the period 2013-2015 (Ghassim, 2018). Dillman et al.'s (2014) tailored survey approach was carefully followed in testing the questionnaire, configuring the online survey instrument and contacting the target population. Following relevant surveys such as the Community Innovation Survey (CIS), we did not include firms that had less than five employees in the end of 2015. Accordingly, 193 companies were identified through the Norwegian registry of business enterprises. The questionnaire was directed to company managers as their perceptions about stakeholders are central in stakeholder relationships (Mitchell et al., 1997). Prior to the survey, we made initial contacts with several firms during the annual gathering of Norwegian Minerals Industry (the industry's trade association) to increase the awareness about this study. However, we deliberately avoided to use the term 'sustainability' both in our preliminary discussions and in the questionnaire in order to reduce social desirability bias.

A pilot test was conducted in October 2016 to establish the construct validity of the survey instrument. Six managers from the sample firms and two industry informants received a draft of the questionnaire and then were interviewed over phone. This resulted in some minor adaptations and reformulations of questionnaire items. A personalized email invitation was thus sent to the chief executive managers of 193 companies, including a cover letter and the link to online questionnaire. Finally, and after two rounds of follow-up contacts, 101 companies (response rate: 52%) provided complete responses during the period from February to April 2017. The respondent firms account for 78% of the total employees and 83% of the total annual sales value in the overall population of the Norwegian minerals industry.

For firms' FP, we draw on the openly accessible database of accounting data in Norway, called Proff®. The majority of Norwegian firms are legally required to submit their annual accounts to the governmental authorities, which is also used as a reliable open source of information for instance in B-to-B partnerships. We particularly matched respondents from the survey with the financial database in order to collect their gross sales value and operational profits in the years 2012 and 2016.

To assess late-response bias, we compared the three groups of respondents, late-respondents (including two subgroups of respondents after the reminder email and those after the follow-up phone call) and non-respondents in terms of size, sales value and innovation outcome. The result revealed no significant difference between these groups. To reduce common method bias, we adopted both procedural and statistical approaches following the suggestions of Podsakoff et al. (2003). First, two different sources of information (survey and financial database) were

used so that the data for all predictor and outcome variables were not obtained from the same respondents. We also used different response types such as Likert scales, yes/no answers, indications of percentages and questions requiring absolute numbers in the questionnaire. Moreover, the respondents were assured full anonymity in order to reduce evaluation apprehension and obtain reliable answers. As for the statistical remedies, we employed Harman's single-factor test by loading all of the variables in an exploratory factor analysis. The unrotated factor solution (the principal component factor analysis) revealed the presence of four distinct factors with eigenvalue greater than 1.0, rather than a single factor. The four factors together accounted for 71% of the total variance; the first (largest) factor did not account for a majority of the variance (22%). Thus, no general factor is apparent, suggesting that common method bias is not a substantial validity threat to this study.

3.2. Measures

For FP, we follow the extant literature on the performance effects of innovation (Faems et al., 2010; Piening & Salge, 2015), and use *return on sale (ROS)* defined as the extent of total revenues that is actually converted into profits. As using contemporary data for dependent and independent variables might raise the issue of endogeneity (Fiske et al., 2010), we used time-lagged operational profit and sales value in year 2016. Again, following the earlier studies, we include firms' ROS in the year prior to the survey period, i.e. 2012, to control for the likely effect of past performance on future performance.

As described in section 2, SOI is generally categorized into processes, products and organizational practices (Klewitz et al., 2014). In each of these categories, the questionnaire provided various areas for innovation, and asked managers to specify their innovative outputs in the period 2013-2015. For process innovations, we took into account the following improvements: maximizing resource and energy efficiency, minimizing pollution and creating value from waste, and promoting the use of renewable resources. Product innovations capture development of mineral products that either serve as an input for new markets such as renewable energy technologies or feature improved purity and recyclability. Lastly, the organizational dimension of SOI in our study pertains to new practices aimed at obtaining social approval, including three different aspects (Suopajärvi et al., 2016): communication about environmental and social impacts, involvement in the development of a mine, contributing to the socio-economic welfare of the local community (e.g. creating jobs). For simplicity, we refer to the last category as social innovations. *SOI* is then measured along a 4-point scale (0 to 3), when 0 indicates no innovations in the three categories described above and 3 specifies at least one type of innovation in each of the categories. Between these extremes, two other levels represents firms that declared one and two types of innovative output in the survey period.

Regarding SE, we included six different groups of external stakeholders in the questionnaire: customers, suppliers, NGOs/interest organizations, public authorities, competitors/peer companies and universities. Greenwood (2007, p. 322) defines 'high SE' as "where these activities [transactional and relational interactions] are numerous and/or these activities are of

high quality"[†]. In other words, high SE is related to both the quantity (variety) and quality (strength) of relationships with external stakeholders. Whereas relational mode of SE is inherently intense, transactional interactions denote weak connections between a firm and its stakeholders (Herremans et al., 2016). Accordingly, for transactional interactions (*TRA*), firms were asked to state how often they searched for knowledge from each of the above stakeholder groups, based on a 5-point scale from never (=1) to very often (=5). We then calculated the number of stakeholder groups that a firm declared to search 'often' (=4) and 'very often' (=5), hence considering frequent interactions as those that are of high quality. Regarding relational interactions (*REL*), firms indicated their collaboration activities during the survey period, enabling us to measure the number of stakeholder groups that were engaged in this type of interactions. For instance, a firm scores 6 in TRA if it engaged all the six stakeholder groups often or very often, and 0 if all of them were engaged at medium (=3) or lower levels. On the other hand, a score of 6 in REL shows that the company collaborated with all the stakeholder groups, and 0 if with none of them.

Next to firms' ROS in 2012, we also control for several other variables. R&D activities and employees' education level may influence the ability of firms to pursue SOI (Ketata et al., 2015). The dummy variable *INRD* captures whether a firm performed internal R&D activities during 2013-2015. For education level (*EDN*), we calculated the share of personnel with university degree. Furthermore, earlier studies suggest that the amount of benefit from SE depends on a firm's internal capacity to share and integrate the acquired knowledge (Ayuso et al., 2011; Wong, 2013). Accordingly, we included the variable 'knowledge assimilation capacity' (*ASSIM*) as a firm's ability to analyze, interpret and understand knowledge. It was then measured by averaging the scores from a five-point Likert scale (low = 1 to high = 5) for four questionnaire items adopted from Flatten et al. (2011). Firm size could influence its capacity to pursue sustainability practices and also FP (Hörisch et al., 2015). The variable *SIZE* is loaded to all our models gauged as the natural logarithm of number of full-time equivalent employees at the end of 2015. To account for inter-sectorial variety in the minerals industry, the variable *SECTOR* is introduced as four dummies representing four different types of minerals sector in our final sample. Finally, it is argued that family firms have a higher tendency to seek corporate sustainability due to the relatively longer-term view in their management team (Laplume et al., 2008). To this end, the binary variable *FAMILY* is added to our model.

4. Analysis and results

Data analysis was performed by following different procedures in SPSS. In a preliminary stage, it was required to identify different clusters of firms in terms of their SOI outputs. In this regard, we performed a combined cluster analysis (hierarchical and non-hierarchical procedures) that increase the validity of final cluster solutions (Ketchen & Shook, 1996). First, firms' reported process, product and social innovations (if any) were used for a hierarchical cluster analysis (Ward's method and the squared Euclidian distance measure), which is particularly appropriate for identification of number of clusters (Ketchen et al., 1996). By inspecting the dendrogram, a

[†] emphasis in the brackets by the authors

'seven clusters' solution was to be apparent. However, the theoretical discussion favors a 'four-cluster' solution where firms with similar number(s) of SOI output (0-3) are homogenous. Consequently, in the second step of our cluster analysis, k-means method was employed to examine the results for four- and seven-cluster solutions. While the results seemed to be appropriate for both solutions, we followed Ketchen et al.'s (1996) recommendation and re-examined the results analysis for splitted (halved) sub-samples. The findings showed that the four-cluster solution is more consistent; hence, we chose to proceed our hypotheses tests with four levels of SOI. As shown in the Appendix, the homogeneity of these four clusters could be also confirmed by highly significant F-values in the subsequent ANOVA analysis.

4.1. Descriptive statistics

Table 1 presents the descriptive statistics and correlation coefficients for the dependent, independent and control variables. Our sample covers a range from micro-companies (5 to 9 employees) to large ones (over 250 employees), with the smallest and largest having 5 and 315 full-time equivalent employees, respectively. As for the sector, the construction mineral companies are highly represented in the sample, compared to the other three categories[‡]. However, this over-representation is in accordance with the overall structure of the minerals industry in Norway and could not be an issue for generalizing the findings. On average, ROS in 2016 has increased compared to 2012. A deeper look into this variable shows that while some companies are struggling with making profit and even experience negative profitability (cost exceed sales), some companies assured sustained profitability growth over time.

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Insert Table 1 about here
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Similarly, firms in our sample demonstrate different levels of SOI output, which on average appears to be on one SOI type. More specifically, non-innovators account for 44%, focused innovators (one type of SOI) for 26%, strong innovators (two types of SOI) for 21%, and finally, all-round innovators (three types of SOI) constitute 9% of firms in the sample. According to the mean values for TRA and REL, Norwegian mineral companies engaged between one and two external stakeholders in their innovation processes in the survey period. Based on the fairly strong and significant correlation between these variables and SOI, we believe that the low mean values for TRA and REL is due to the extremely low SE of non-innovators. We further examine this argument in testing the hypotheses.

The correlation coefficients between independent and control variables, specifically those above 0.5 and significant, suggest that multicollinearity might be an issue. We therefore ran variance inflation factor (VIF) test for all the independent and control variables, which resulted in VIF values ranged from 1.13 to 1.47. Since these values are well below the rules of thumb

[‡] Although per definition the industry includes a fifth category, i.e. energy minerals, there was only one active company in this category in the survey period and we decided not to include it due to the likely problems in making the data subject unidentifiable.

of 10 or 4 (O'brien, 2007), we can conclude that multicollinearity is not a serious concern in our analysis.

4.2. Test of hypotheses

The first question we examine is to what extent external SE affects SOI outputs. To this end, we developed hypotheses H1a and H1b, respectively addressing the effects of transactional and relational SE. We test these hypotheses by employing an ordinal logit regression, as the dependent variable is measured on an ordinal scale[§]. The results is shown in Table 2.

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Insert Table 2 about here
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A fundamental assumption of ordinal regression is that the effect of independent (including control) variables are the same for each level of the dependent variable. In SPSS, this assumption could be examined by a test of parallel lines (Norušis, 2006), which rejects the similarity of effects (the null-hypothesis in this test) when the result is significant. Thus, for each of the models testing H1a and H1b, the results for the test of parallel lines is also presented (see Table 2). Overall, our results indicate a non-significant result for this test in all the three models (p-values are greater than 0.1); hence, we assume that the predicting variables have identical effects on the various levels of SOI output.

Model 1 is the baseline model that includes the effect of control variables: ROS2012, INRD, EDN, ASSIM, FAMILY, SIZE and SECTOR. In model 2, we introduce the effect of TRA to the previous model in order to test H1a. As shown in Table 2, the coefficient is positive and highly significant, in agreement to H1a. Model 3, on the other hand, adds the effect of REL to model 1. The regression coefficient is again positive and highly significant, as hypothesized in H1b. Model 4 loads the effects of both independent variables, and corroborates the positive and significant coefficients for the independent variables obtained in the previous models. Model 4, as the final model in the ordinal regression, is highly significant ($\lambda^2(11) = 94.775$, $p = .000$) with a McFadden pseudo R-square of .375 that shows the overall goodness-of-fit for the model. The results described above indicate that both the transactional and relational SE are positively associated to SOI. Ceteris paribus, the odds of achieving higher SOI outputs improves by 99.4% and 78.9% with a unit rise in transactional and relational SE, respectively. As for the control variables, EDN, ASSIM and SIZE are positive and significant in all the models. The coefficients for inter-sectorial variance show that only the metallic ore firms differ in terms of SOI outputs.

Our second hypothesis suggests that firm's SOI outputs positively contribute to their FP. Linear regression and multiple OLS method was performed to test this hypothesis. As shown in Table 3, we first loaded the effect of controls to model 5. Subsequently, SOI is added to create model 6. Concerning the control variables, the regression coefficient for ROS2012 shows that prior

[§] An alternative might be to treat SOI capability as a nominal variable, meaning that different levels of SOI output have not a natural ordering. Therefore, we also ran the analysis using multinomial logit model and found similar results as the one obtained from ordinal logit regression. The results are available from the authors upon request.

FP is an important predictor of subsequent performance. Interestingly, we found that firm size is not significant for FP, whereas non-family firms seems to outperform their counterparts.

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Insert Table 3 about here
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For the theoretical argument suggested in this study, model 6 provides information about the positive impact of SOI on firm's FP. More specifically, a single unit increase in SOI (e.g. from one to two types of innovative output) could then increase the profitability by 3.186%, a highly significant effect at $p<0.001$. Comparing the standardized coefficients for ROS2012 and SOI in model 6, we see that the effect of prior FP on the subsequent performance is just over two times the effect of SOI on the latter. The goodness-of-fit statistics for model 6 indicate that adding SOI results in a significant improvement compared to model 5 that only include controls (F change = 13,572, $p<0.001$).

The last hypothesis of this study (H3) goes beyond straightforward relationships tested before, and suggests if SOI fully mediates the SE-FP association. While the traditional practice in mediation analysis was to require the existence of a significant direct path from predictor to outcome variable, recent advancements in this area argues for unnecessity of such a link (Aguinis et al., 2017). This argument draws on the fact that mediation is established through two paths: (1) from the predictor to the mediator and (2) from the mediator to the outcome variable. As we already investigated these two paths in our ordinal and linear regressions (H1 and H2), test of H3 deals particularly with examining the size and significance of the indirect link between the predictor (SE) and outcome variable (FP).

Accordingly, we followed Zhao et al.'s (2010) instruction for doing mediation analysis in SPSS that is built upon Preacher-Hayes bootstrapping script. As we have two predictor variables (TRA and REL), the analysis is done separately for each of them while controlling for the other. Including in both models are our controls, as described above. The results reveal that SOI fully mediates the effect of both TRA and REL on ROS2016, which supports H3. More specifically, for TRA, the mean indirect effect from the bootstrap analysis is positive and significant (effect size = .741), with a 95% confidence interval excluding zero (.1991 to 1.6625). Concerning REL, the mean indirect effect is positive and significant (effect size = .6485), with a 95% confidence interval excluding zero (.1191 to 1.5758). The ratios of indirect to total effect indicate that SOI accounts for 56% and 50% of total effects of TRA and REL on ROS2016, respectively.

5. Discussion

As firms are increasingly pressured to leverage innovation in the quest for balancing social, environmental and economic sustainability (Klewitz et al., 2014; Nidumolu et al., 2009), a central question would then concerns the antecedents and consequences of accomplishing SOI. In light of the growing literature emphasizing the utmost importance of SE in tackling sustainability challenges (Hall et al., 2005; Segarra-Oña et al., 2017), this paper sets out to examine the mechanisms through which externally acquired knowledge could contribute to firms' SOI outputs and financial performance. By drawing on the stakeholder theory, we

focused on two specific modes of SE, i.e. transactional and relational, and adopted a nuanced approach to quantitatively test the association between SE, SOI outputs and FP. This has enabled us to reveal the mediating effect of SOI in SE-FP association, hence suggesting SOI as a mechanism that conditions the financial benefit from engaging highly with external stakeholders.

Concerning the association between SE and SOI, both transactional and relational modes of SE are conducive to broader range of SOI outputs, covering process, product and social innovations. Given the complexity and uncertainty of adopting such a holistic approach to SOI, SE enable firms to access a diverse range of knowledge resources that in turn increase their ability in understanding socio-technical requirements and mitigating conflicting interests (Clarke et al., 1999; Watson et al., 2017). Our findings extend this insight by showing that not only the variety of stakeholders engaged in innovation processes matter for SOI, but also engagement practices should be frequent enough to result in strong relationships that spur effective learning. Therefore, we respond to Hörisch et al.'s (2014) call for more attention to the intricacies of the relationships with external stakeholders, as it does not anymore suffice to answer "What types of stakeholder groups should be engaged", but rather "How to engage dissimilar stakeholders?" in order to fulfill various sustainability objectives.

More specifically, regarding transactional SE, firms need to implement ongoing knowledge acquisition activities that compensate for the low direct involvement of stakeholders in these one-way relationships. Assuming external stakeholders as mere information sources, rather than co-creators of knowledge, may hinder mutual understanding required for closing the gap between conflicting goals (Kazadi et al., 2016). Others also understate transactional SE from a 'competitive advantage' point of view by arguing that they are easily duplicable by competitors due to the dearth of socially complex resources (e.g. knowledge assets and trust) embedded in them (Hillman et al., 2001). However, our study allows to conclude that repeating transactional processes such as actively mimicking the established technical solutions in the market (Bansal, 2005) or employing boundary spanners to spot weak signals from societal stakeholders (Holmes et al., 2009) could provide firms with timely access to external knowledge, and consequently increase the probability of innovation.

Relational SE differs from the transactional one in the sense that it requires relatively long-term commitments together with the desire of the focal firm in sharing the internal knowledge with external stakeholders. This trust-based relationship, in turn, increases the exchange of complex technical and social knowledge (Hillman et al., 2001), especially in the case of highly uncertain innovations that entail a variety of economic, environmental and social risks (Hall et al., 2005). Our results corroborate earlier findings about the importance of engaging a diverse set of stakeholders in SOI practices (Goodman et al., 2017; Kazadi et al., 2016; Sharma, 2005), and furthermore provide empirical insights that move beyond the small case samples used in the extant literature.

As for the association between SOI and FP, we found convincing evidence to support the hypothesis that adopting a holistic SOI approach and broadening the scope of innovations into different areas of process, product and organizational practices explain superior profitability.

While a positive association between narrower approaches to SOI (e.g. technological advances in products and processes) and FP has been identified in the previous studies (Aguilera-Caracuel et al., 2013; Martinez-Conesa et al., 2017; Sharma et al., 1998), our finding sheds more light on SOI as a multi-dimensional capability that enable firms to simultaneously address various sustainability objectives. A firm that focuses on innovations with limited sustainability approaches, for instance environmental process innovations, might not be necessarily more profitable than its counterparts (Aguilera-Caracuel et al., 2013). Instead, combining advancements in technological processes with improvements in product quality and effective communication with societal stakeholders could assist a firm in reaping the financial benefits of environmental management by differentiating its product in the respective markets (Bansal, 2005).

The competitive value of SOI as a unique capability directs us to describe the results about the fully mediated hypothesis. Our results show that the direct association between SE (both transactional and relational) and FP does not exist, as the mere access to external knowledge may hardly denote valuable, rare and inimitable assets required for superior FP (Barney, 1991). This is in contradiction with other studies that identify SE as an organizational capability by arguing that relationships with external stakeholders provide firms with access to complementary resources (Ayuso et al., 2006; Watson et al., 2017). While we do not reject the benefit of SE in terms of complementary resources, our data let us to believe that firms accumulate valuable capabilities when they are able to combine external inputs, as one type of resource, with other resources such as their internal knowledge (Cohen et al., 1990; Teece et al., 1997). Hence, the only-indirect SE-FP association is fully mediated by SOI outputs that translate the benefits of SE to financial outcomes.

Based on these findings, we can formulate some implications for practice. Firm managers should recognize the benefits and limitations of SE as regarding innovative and financial outcomes. Whereas both transactional and relational relationships may enhance firms' capability in carrying out innovations, the manner in which these mechanisms of SE conduce to innovative outputs differ. Besides considering the need for engaging a wide set of external stakeholders, specific attention should be devoted to make the engagement practices strong enough (e.g. by increasing the frequency of transactions) such that timely access to knowledge resources and effective learning are secured. However, managers should also be aware of their internal capacity limitations, and the extent their human and financial resources ought to be allocated to external engagement activities. In this regard, transactional SE are advantageous over its relational counterpart as the latter entails mutual commitments and greater pressure to sacrificing own interests.

Another lesson from this study is the positive financial effect that broadening the scope of SOI might have. Indeed, focusing on either process, product or organizational innovations may hinder firms to address one or another aspect of sustainability, thereby missing their profitability in the long run. For instance, the 'green growth movement' has found its way in to the policy discourse in Norway and is increasingly changing the strategic orientation of firms in the minerals industry. Thus, it is expected that firms that lag behind this movement and fail to move

beyond the prevalent focus on process innovations might then face the risk of sudden changes in customers' product specifications. In addition, building appropriate capabilities for continuously innovating processes, products and organizational practices not only has a direct impact on FP, but also is a mechanism through which the (financial) benefit from engagement activities unfolds.

This study certainly has some limitations that motivate future research. Since firms usually do not have enough internal resources to engage intensely with all the external stakeholders, there might exist a trade-off point where performance is optimized. A particular attention should be paid to the marginal returns (in terms of both innovation and financial outputs) from transactional and relational SE, as they are usually used in combination. Accordingly, a potential avenue for SOI research would be to investigate the role of internal factors such as absorptive capacity in moderating the complementary/substitution effect of SE on SOI and FP. Another limitation of this study is inherent in our empirical setting. While examining the associations between SE, SOI and FP in a single industry provides deep insights on how firms in a particular sector respond to sustainability concerns, we encourage future research to test our model in other sectors and country contexts. Finally, SOI is one out of possibly several factors that serve to clarify the nature of the SE-FP association. As this complex association is still under-researched, examining other contingency factors will help us to better understand under what conditions firms' efforts invested in engaging stakeholders and addressing broader sustainability concerns would pay off in economic terms.

Declarations of interest: none

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Appendix

Table A1: Results from the hierarchical cluster analysis

Preliminary clusters in terms of SOI output			i	ii	iii	iv	v	vi	vii
			No innovation	All	Only social	Product & social	Only Process	Process & product	Process & social
process innovation	No	Count	45	0	9	4	0	0	0
	Yes	Count	0	9	0	0	17	4	13
product innovation	No	Count	45	0	9	0	17	0	13
	Yes	Count	0	9	0	4	0	4	0
social innovation	No	Count	45	0	0	0	17	4	0
	Yes	Count	0	9	9	4	0	0	13
Total		Count	45	9	9	4	17	4	13
		% of all	44%	9%	9%	4%	17%	4%	13%

Table A2: Results of ANOVA between clusters in terms of different SOI output

		Sum of Squares	df	Mean Square	F	Sig.
whether the company has introduced a process innovation	Between Groups	57.115	1	57.115	126.982	.000
	Within Groups	44.529	99	.450		
	Total	101.644	100			
whether the company has introduced a product innovation	Between Groups	51.599	1	51.599	102.074	.000
	Within Groups	50.045	99	.506		
	Total	101.644	100			
whether the company has introduced a social innovation	Between Groups	60.113	1	60.113	143.298	.000
	Within Groups	41.530	99	.419		
	Total	101.644	100			

Table 1: Descriptive statistics and correlation coefficients

	Variable	Mean	SD	Min.	Max.	1	2	3	4	5	6	7	8	9
1	ROS2016	9.8	8.848	-5.45	45.63									
2	SOI	.94	1.01	0	3	.36**								
3	TRA	1.46	1.06	0	4	.19	.56**							
4	REL	1.2	1.2	0	5	.39**	.62**	.59**						
5	ROS2012	8.72	9.23	-20.56	48.52	.71**	.11	.04	.24*					
6	INRD	.12	.33	0	1	.07	.52**	.44**	.4**	-.11				
7	EDN	.17	.13	.00	.63	.14	.41**	.25*	.36**	.12	.15			
8	ASSIM	3.12	.86	1.5	4.75	.23*	.54**	.34**	.38**	.01	.44**	.2*		
9	FAMILY	.63	.48	0	1	-.13	.07	.07	-.06	-.05	-.04	.24*	.03	
10	SIZE	2.94	1.13	1.61	5.75	.18	.51**	.34**	.39**	.07	.47**	.2*	.29**	.04

Note: n = 101;
** indicates significance at $p < 0.01$ and * indicates significance at $p < 0.05$.

Table 2: Regression results for the effect of SE on SOI

	Model 1	Model 2	Model 3	Model 4
Threshold				
SOI = 0	3.182† (1.744)	5.197** (1.948)	4.069* (1.811)	5.336** (1.983)
SOI = 1	5.138** (1.835)	7.365*** (2.07)	6.276** (1.932)	7.626*** (2.114)
SOI = 2	7.866*** (1.831)	10.172*** (2.09)	9.079*** (1.959)	10.462*** (2.144)
ROS2012	.011 (.024)	.011 (.026)	-.006 (.027)	-.001 (.028)
INRD	-2.42 (.946)	-1.249 (.992)	-1.666 (.959)	-.986 (1.008)
EDN	7.895*** (1.973)	7.662*** (2.011)	6.194** (2.077)	6.581** (2.133)
ASSIM	.875*** (.287)	.795** (.304)	.767* (.301)	.722* (.311)
FAMILY	-.15 (.464)	-.131 (.484)	-.446 (.49)	-.317 (.505)
SIZE	.691** (.231)	.646** (.242)	.645** (.241)	.624* (.246)
SECTOR categories				
Metallic ores	1.336 (1.062)	2.421 (1.134)	1.718† (1.116)	2.417* (1.163)
Industrial minerals	-1.041 (.686)	-.574 (.7)	-.511 (.725)	-.297 (.735)
Natural stone	-.242 (.536)	-.487 (.563)	.179 (.555)	-.119 (.581)
Construction minerals		Reference category		
TRA		.923** (.266)		.690* (.287)
REL			.804*** (.235)	.582* (.253)
Goodness-of-fit				
Chi-Square	76.726***	89.535***	88.864***	94.775***
McFadden pseudo R^2	.303	.354	.351	.375
Test of parallel lines				
Chi-Square	15.304	18.045	11.156	9.097

Note: Standard errors in parenthesis;
*** indicates significance at p<0.001, ** at p<0.01, * at p<0.05 and † at p<0.1

Table 3: Regression results for SOI-FP association

	Model 5	Model 6
constant	.823 (3.245)	4.534 (3.208)
ROS2012	.696*** (.07)	.669*** (.066)
INRD	-.042 (2.552)	-.143 (2.509)
EDN	.127 (5.215)	.019 (5.277)
ASSIM	.118 (.838)	.026 (.828)
FAMILY	-.157* (1.367)	-.158* (1.283)
SIZE	.063 (0.669)	-.029 (.658)
SECTOR dummies	included	included
SOI		.363*** (.865)
Adjusted R^2	.49	.551
F-value *for* ΔR^2	14.728***	13.572***

Note 1: standardized coefficients (β) are reported (except for constant).
Note 2: Standard errors in parenthesis.
*** indicates significance at p<0.001, ** at p<0.01 and † at p<0.1