Received: 2 April 2018 | Revised: 21 February 2019 | Accepted: 1 March 2019

DOI: 10.1002/joom.1021

RESEARCH ARTICLE

WILEY

Does supply chain visibility affect operating performance? Evidence from conflict minerals disclosures

Caroline Swift | **V. Daniel R. Guide Jr.** | **Suresh Muthulingam**

Smeal College of Business, The Pennsylvania State University, Pennsylvania

Correspondence
V. Daniel R. Guide, Jr., Smeal College of Business, The Pennsylvania State University, University Park, PA 16802.
Email: dguide@psu.edu

Handling Editor: Brian Jacobs

Abstract

Firms are increasingly held accountable for their suppliers' transgressions. Consequently, firms need to develop upstream visibility to exercise control over their supply chains. An emerging body of work has recognized the importance of supply chain visibility and has examined it using analytical models, behavioral methods, and case studies. Still, large-sample empirical evidence on the benefits of supply chain visibility remains elusive. We seek to bridge this gap by examining conflict minerals disclosures (mandated by the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act) and financial reports to evaluate whether firms with greater visibility into their conflict minerals supply chains achieve improved operating and market performance. We use the data from conflict minerals disclosures (Form SD) to distinguish between firms that have high or low visibility into their conflict minerals sources. Then, we use event study methods to analyze differences in operating and market performance between firms with high visibility and firms with low visibility. We find that firms with high visibility into their conflict minerals supply chains achieve higher profitability than comparable firms with less visibility. In addition, we find that firms with high visibility into their conflict minerals supply chains realize improved sales performance and stock market valuations. Our results are relevant to managers because they show that firms can attain operational and market benefits by improving visibility in their supply chains.

KEYWORDS

conflict minerals, event study, operating performance, supply chain visibility

1 | INTRODUCTION

Government agencies, non-governmental organizations (NGOs), investors, and consumer groups increasingly hold firms responsible for the actions of their suppliers (Lee & Rammohan, 2017). As a result, firms may be exposed to potential violations on account of their suppliers (Hartmann & Moeller, 2014). In many instances, supplier violations could lead to serious consequences that not only result in financial costs but can also affect firm reputation (Marshall, McCarthy, McGrath, & Harrigan, 2016). For example, in 2007 Mattel recalled millions of toys due to lead paint that entered its supply chain from unauthorized paint subcontractors. The recall ultimately cost the firm over $110 million for fees, fines, and the administration of product returns, besides damaging its market reputation (Hoyt, Lee, & Tseng, 2008; Sodhi & Tang, 2012). To combat such problems firms must exercise sufficient control over their supply chains. But, in some situations, firms may find it challenging to monitor even their first-tier suppliers and sourcing partners. Consider Chipotle, a restaurant chain that differentiates itself by sourcing food from local producers. In 2015 and 2016, an outbreak of *Escherichia coli*

and the norovirus was traced to Chipotle, but the restaurant was unable to identify the origins of the contamination due to its decentralized supply chain. Chipotle's revenue dropped nearly 30%, and the company faced the difficult and costly task of winning back customer trust (Walker & Merkley, 2017). However, the challenges of monitoring suppliers do not stop at the first tier. This is because suppliers often outsource to other suppliers, which compounds the monitoring challenge. In multi-tier supply chains, outsourcing and subcontracting make the scope of the supply chain exponentially large and, as a result, firms can lose visibility of their supply chain partners. In extreme cases, firms may not even know who their suppliers are or what they are doing. For example, Tesco lost nearly €300 million in market value in 2013 when horse meat was discovered in beef products sold at its stores. The complex food supply chain with multiple levels of suppliers made it difficult for Tesco to isolate the origin of the horse meat, which prolonged the financial and reputational damage for the firm (Fletcher, 2013).

Given these challenges, it is essential for firms to develop a better understanding of their suppliers and supply chain partners. Consequently, supply chain visibility—"the ability to trace the points of origin of materials used in a product" (Lee & Rammohan, 2017)—is emerging as an important concept to manage supply chains effectively. The importance of supply chain visibility stems from the idea that when firms can trace the origin of their materials, they develop knowledge about their supply chain partners. This knowledge can help firms avoid problems at their supplier locations and within their supply chains. The extant literature has recognized the significance of supply chain visibility and many papers have used case studies to explore the consequences for firms when they lack supply chain visibility (e.g., Doorey, 2011; Hoyt et al., 2008; Walker & Merkley, 2017). The common rationale across these studies is to infer the significance of visibility from its absence. Although this approach is suitable to illustrate the consequences of insufficient visibility, it does not provide a complete picture of potential benefits from supply chain visibility. Presumably, firms that have more visibility throughout their supply chains can exercise higher control over their supply function. In turn, this higher control could lead to operational improvements and cost savings. But, to the best of our knowledge, little research has explored potential benefits from improved supply chain visibility. Therefore, we examine whether firms with greater supply chain visibility achieve improved operating and market performance. Specifically, we investigate how supply chain visibility affects firm profitability, sales, and market value.

Although the literature recognizes the importance of supply chain visibility, researchers have found it challenging to measure and assess its benefits. This is because firms are often reluctant to share details about their supply chains and, moreover, subcontracting at suppliers makes it challenging to obtain information on upstream supply chain partners. In this study, we overcome these challenges by using data from a unique empirical context that allows us to observe the extent to which firms are able to trace the origin of a select group of minerals used in their products. Our data pertains to all firms that come under the purview of Section 1502 of the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act ("Dodd-Frank Act" from now onwards). This act mandates that, starting in 2013, publicly traded firms must "disclose annually whether any conflict minerals that are necessary to the functionality or production of a product…originated in the Democratic Republic of the Congo or an adjoining country" (SEC Final Rule: Conflict Minerals, 2012). These "conflict minerals"—tin, tantalum, tungsten, and gold—are commonly used in the production of consumer goods and electronics (Bales, 2016; Epstein & Yuthas, 2011). Although Section 1502 was enacted to protect human rights in war-torn regions of Africa, it is also the first public reporting requirement for supply chain sourcing in a wide cross section of firms.

Supply chain visibility into conflict minerals sources ("SCV" from now onwards) is essential to meet the requirements of the Dodd-Frank Act. This is because firms can only determine mineral origins if they are able to track the source of materials across multiple tiers of suppliers in their supply chains. As many firms are far removed from the origins of minerals used in their products, meeting the requirements of the Dodd-Frank Act can be demanding. To better understand their concerns about complying with disclosure requirements, we spoke with managers across a variety of firms ranging from manufacturers of industrial equipment (e.g., 3M) to computer hardware (e.g., IBM). Managers pointed out that significant effort is required to develop visibility, which is essential to trace the origins of the conflict minerals. For example, the Director of Environmental Compliance at IBM mentions that "… sometimes we choose suppliers for our direct suppliers"—which indicates the effort IBM exerts to gain visibility in its supply chain (Ferretti, 2015). Overall, our interactions highlight that SCV is critical to manage the responsibilities and risks associated with conflict minerals disclosures. This makes conflict minerals reporting an ideal setting to study the impact of supply chain visibility.

Our data comes from the population of conflict minerals disclosures made by firms in the first two years of reporting mandated by the Dodd-Frank Act (i.e., 2013 and 2014). We combine this data with information from Compustat to create a database of 1,180 firms for the disclosure period 2013–2014. We use information from the conflict minerals disclosures to identify firms that demonstrate superior levels of visibility into their conflict minerals supply chains. Then, we use firm size, performance, and industry to match firms with high levels of SCV to comparable firms with low levels

of SCV. We use these matched groups to perform an event study to detect significant improvements in operating and market performance for firms with higher levels of SCV.

Our work contributes to the understanding of overall supply chain visibility in three ways. First, although our context is limited to conflict minerals supply chains, our article is one of the earliest to provide large-sample empirical evidence of the benefits of upstream visibility. By doing so, we augment extant research that has mainly relied on analytical models, behavioral methods, and case studies to examine the impact of supply chain visibility. Second, we find that firms with higher SCV realize improved operating performance. Over our study horizon, firms with higher SCV realize average return on assets (ROA) of 5.1 percentage points over that of comparable firms with lower SCV. Third, our work also shows that firms with more visibility into their conflict minerals supply chains reap market benefits. Firms with higher SCV experience significant improvements in sales growth and Tobin's Q relative to firms with lower SCV. In this way, we provide quantifiable evidence of the benefits of upstream supply chain visibility that has been elusive so far. Our results are also of relevance to managers because they show that firms can attain operational and market benefits by improving supply chain visibility.

The rest of the paper is organized as follows: In Section 2, we review the relevant literature. In Section 3, we develop our hypotheses. In Section 4, we describe our data collection process and define the relevant variables. In Section 5, we detail our event study methodology. In Section 6, we present the results of our analysis. In Section 7, we describe various replications and robustness checks of our main results. In Section 8, we discuss our results and conclude.

2 | LITERATURE REVIEW

We draw from and contribute to the literatures on supply chain visibility, conflict minerals disclosures, and sustainable operations. Here, we discuss the relevant literature and highlight the contributions of our paper.

There is a growing body of work that examines the benefits of improving visibility in supply chains. One stream of work explores the benefits of visibility using analytical and conceptual models. For example, Lamming, Caldwell, Phillips, and Harrison (2005) and Lamming, Caldwell, and Phillips (2006) propose that supply chain transparency provides benefits for both buyers and suppliers. Chen, Zhang, and Zhou (2018) model optimal levels of supply chain transparency in an environment with NGO pressure. Marucheck, Greis, Mena, and Cai (2011) illustrate that consumer health and safety would benefit from more traceability in supply chains. Another stream of work explores the impact of supply chain visibility using behavioral methods. For instance, Kraft, Valdés, and Zheng (2018) and Pigors and Rockenbach (2016) use laboratory experiments to show that consumers react positively when firms increase visibility. However, there is limited empirical evidence on the benefits of supply chain visibility. Although case studies have explored the impact and challenges of improving visibility in the supply chain (e.g., Doorey, 2011; Egels-Zandén, Hulthén, & Wulff, 2015; Mol, 2015), they only offer a nominal understanding of how supply chain visibility affects firm performance. Within the context of conflict minerals supply chains, we contribute to the understanding of how supply chain visibility can improve a firm's operating and market performance.

There is a large body of work that explores business disclosures (see Healy & Palepu, 2001; Verrecchia, 2001 for a review). In the context of the Dodd-Frank Act, the literature on disclosures mainly examines the accounting and financial aspects of the legislation. For example, studies have looked at the effects of Dodd-Frank disclosure rules on credit ratings (Dimitrov, Palia, & Tang, 2015), derivatives trading (Loon & Zhong, 2016), and executive pay (Kelly & Seow, 2016). However, the conflict minerals provision of Dodd-Frank remains relatively unexplored. The literature on conflict minerals has mainly examined their role in contributing to human rights abuses (e.g., Bales, 2016), or assessing solutions to them (e.g., Schwartz, 2016; Vogel & Raeymaekers, 2016). One stream of work in this literature has examined the business impact of managing conflict minerals and conflict minerals disclosures. Arikan, Reinecke, Spence, and Morrell (2017) and Epstein and Yuthas (2011) discuss the broad implications of conflict minerals for a firm's management strategy. Kalkanci, Ang, and Plambeck (2016) show that in a competitive environment, only firms that have conflict mineral-free supply chains should voluntarily disclose their conflict minerals findings. Zhang, Aydin, and Heese (2017) model the potential impacts of levying financial penalties on the conflict minerals supply network. Hofmann, Schleper, and Blome (2018) and Young (2018) conduct exploratory studies to understand firms' concerns regarding responsible sourcing and conflict minerals management. Kim and Davis (2016) and Dalla Via and Perego (2018) identify firm characteristics that are associated with conflict mineral-free firms and better disclosure compliance, respectively. The emphasis of this stream of work has been to understand how firms respond to conflict minerals disclosure requirements. What remains relatively unexplored in this literature is whether firms can benefit from their conflict minerals disclosures. One exception is Griffin, Lont, and Sun (2014), who analyze voluntary conflict minerals disclosures released by some firms prior to the Dodd-Frank Act and report that conflict minerals reporting could reduce shareholder value. By contrast, we examine data on all firms that filed conflict minerals disclosures and find that firms with higher visibility into their conflict minerals

sources improved their operating performance, sales, and stock market valuations.

The OM literature recognizes the link between sustainability and performance improvement (e.g., Corbett & Klassen, 2006; Plambeck, 2013). A growing body of empirical work investigates this link across a variety of domains, such as industrial manufacturing (Fu, Kalkanci, & Subramanian, 2018), supplier management (Porteous, Rammohan, & Lee, 2015), executive appointments (Hendricks, Hora, & Singhal, 2014), and waste management (Dhanorkar, Donohue, & Linderman, 2015). Likewise, upstream visibility is critical for a firm's overall sustainability. Firms can hardly claim to be dealing in ethical and sustainable goods, if their inputs are sourced in ways that are destructive to humans and the environment. This is especially true in the electronics and garment industries where firms may have sourced materials from jobbers and sub-contractors without knowing that the items are produced in inhumane or environmentally detrimental work settings (Anner, 2018; Caro, Chintapalli, Rajaram, & Tang, 2018; Distelhorst, Locke, Pal, & Samel, 2015). We add to this literature by investigating how supply chain visibility—an important construct essential for improving sustainability in supply chains—also helps firms improve their operating performance, revenues, and market valuation.

In summary, our article contributes to the OM literature by assessing how supply chain visibility is related to firm operating performance through the lens of conflict minerals disclosures.

3 | HYPOTHESES

In our hypotheses, we explore the links between supply chain visibility into conflict minerals sources (i.e., SCV) and operating performance, revenue, and market valuation.

We first look at SCV's potential implications for operating performance. Specifically, we investigate the consequences that SCV may have for firm profitability. Developing SCV requires effort. Typically, firms need to invest in employee time and travel, IT tools, external resources, and consulting to build SCV (Bayer, 2014). Such efforts entail additional costs, which could form a barrier that prevents firms from undertaking efforts to build visibility. In fact, Section 1502 of the Dodd-Frank Act—which requires firms to build visibility into their conflict minerals sources—has many opponents who claim that compliance with the law is burdensome, involves unnecessary costs, and affects profitability (Griffin et al., 2014; Seay, 2012; Taylor, 2012). Based on the filing information of firms in 2013, the average firm's costs for compliance with Section 1502 was estimated at $545,000 (Bayer, 2014). Naturally, firms would incur additional costs to comply with the law.

But what is not immediately apparent is that firms might also benefit from building SCV as they work to comply with the Dodd-Frank Act. This is because when firms develop SCV, they can also gain greater knowledge of their procurement function. In turn, this knowledge can be leveraged to improve operations and reduce costs for three potential reasons. First, firms with enhanced SCV have a better understanding of their sourcing operations. Consequently, such firms are better positioned to evaluate buying practices, make cost-saving improvements, and increase operational efficiency. Firms could negotiate better procurement contracts, streamline sourcing to reduce waste, and work with suppliers to improve operations at supplier factories. Second, improved knowledge of upstream operations can help firms avoid supply risks that might disrupt their sourcing operations. Such firms can reduce costs due to stockouts, backorders, and excess inventory, and thereby increase productivity and utilization of assets. Third, initiatives that introduce structure to operations and entail documentation of processes can reduce costs. This effect has been observed for a variety of operational initiatives such as ISO 9000 certification (e.g., Corbett, Montes-Sancho, & Kirsch, 2005), TQM and Six Sigma program adoption (e.g., Hendricks & Singhal, 2001; Swink & Jacobs, 2012), and operations or supply chain enterprise systems implementation (e.g., Bendoly, Rosenzweig, & Stratman, 2009; Hendricks, Singhal, & Stratman, 2007). Because preparation of conflict minerals disclosures involves a structured process with significant discipline and documentation (Griffin et al., 2014), firms that enhance their SCV due to conflict minerals reporting are also likely to reduce costs.

We conjecture that the upstream visibility gained through the conflict minerals reporting process actually delivers a net benefit to a firm's operating performance despite the costs associated. Therefore, we hypothesize that firms with higher SCV realize improvements in profitability. We measure profitability with return on assets (ROA), which is calculated as operating income divided by total assets (Compustat: OIBDP/AT).

Hypothesis 1 *Higher SCV leads to increased profitability as measured by return on assets (ROA).*

If we find support for Hypothesis 1, we also plan to examine component parts of ROA to better understand what is driving these improvements. ROA can be broken down into two primary components: asset turnover (sales/assets; Compustat: SALE/AT) and return on sales (ROS; Compustat: OIBDP/SALE). In turn, ROS can be further broken down into cost of goods sold (COGS; Compustat: COGS/SALE) and selling, general, and administrative expenses (SG&A; Compustat: XSGA/SALE).

In addition to reducing costs, firms can leverage enhanced SCV to boost revenues. There are three mechanisms that could increase sales. First, in the context of conflict minerals disclosures, firms with enhanced SCV get public recognition

for adopting ethical sourcing practices. Disclosures of SCV grant legitimacy to firms' corporate social responsibility claims (e.g., Gualandris, Klassen, Vachon, & Kalchschmidt, 2015; Mueller, Dos Santos, & Seuring, 2009). This is because the disclosures indicate to the public that the firm knows where its products come from and that the firm is willing to report this information in legally binding documents. This recognition is important because consumers increasingly avoid firms that do not adopt ethical sourcing practices (New, 2010). In fact, evidence indicates that the demand for goods sourced or produced in a responsible manner has increased with consumers' growing concern for ethical issues related to sourcing (e.g., De Pelsmacker, Driesen, & Rayp, 2005). As a result, firms with enhanced SCV can be well-positioned to cater to the demand of responsibility-conscious consumers and increase revenues.

Second, firms with enhanced SCV can also increase revenues because of operational factors. Visibility into the supply chain allows firms to be more sensitive about potential supply risks and disruptions that might affect production. Consequently, high-SCV firms can have lower exposure to unexpected issues that might disrupt production schedules or affect their ability to meet customer requirements. Thus, firms with enhanced SCV can maintain high levels of customer service that can lead to increased revenues (Hendricks & Singhal, 2005).

Third, firms with enhanced SCV can benefit because of the increased attention that governments and businesses are paying to social and environmental issues. Governments are increasingly adopting standards for their procurement processes to encourage responsible commerce and avoid potential problems such as human rights abuses, environmental destruction, and political unrest (McCrudden, 2007; Preuss, 2007). This can be seen in recent legislation (e.g., conflict minerals legislation in the U.S. and EU) and the formation of industry action groups (e.g., The Supply Chain Initiative). In some instances, certifications or organizational standards (e.g., EPEAT approval) may be requirements for winning government contracts. For example, Flammer (2018) finds that companies with more transparent corporate social responsibility practices win more government contracts. Firms with enhanced SCV will be better placed to conform to the sourcing guidelines of governments and, hence, increase revenues.

Along similar lines, SCV can play an important role in business-to-business transactions. Firms are increasingly being held accountable for the inputs they source and for the actions of their suppliers (Lee & Rammohan, 2017). For these reasons, firms need to establish visibility into their supply chains to help mitigate potential supplier risks. One way firms can achieve visibility is to contract with firms that themselves have high visibility. Additionally, manufacturers that need to file conflict minerals disclosures will also benefit by working with firms that have high SCV. Industry organization such as the Responsible Business Alliance (RBA) (formerly the Electronic Industry Citizenship Coalition) is already promoting this behavior as all members are expected to comply with the RBA code of conduct, as well as contract with suppliers who do the same (RBA Code of Conduct, 2018). As a result, firms with higher SCV are likely to be more desirable supply partners and achieve higher revenues.

Together, the mechanisms discussed above indicate that firms with enhanced SCV can increase their revenues. We measure changes in revenue by sales growth, which is the percentage change in sales over the previous year.

Hypothesis 2 *Higher SCV leads to increased sales as measured by sales growth.*

Finally, when a firm enhances SCV, three potential mechanisms can affect its stock market valuations. First, the literature finds that stock market valuations are higher for firms with more transparent management practices (e.g., Cheng, Ioannou, & Serafeim, 2014; Gualandris et al., 2015). A firm's conflict minerals disclosure is a public declaration of its level of SCV and, therefore, it signals to stakeholders the extent of knowledge and control the firm has over its conflict minerals sourcing. Consequently, firms that have higher visibility into their conflict minerals sourcing will obtain higher stock market valuations. Second, several studies highlight that firms can lose market value, market share, and customer patronage from disruptions within their supply chains (e.g., Hendricks & Singhal, 2003; Kleindorfer & Van Wassenhove, 2004). Scholars have also shown that firms with a good understanding of their supply chain operations are better positioned to reduce risk and avoid supply disruptions (Chopra & Sodhi, 2014; Pettit, Croxton, & Fiksel, 2013). As conflict minerals disclosures require a comprehensive understanding of supply chain operations, firms that enhance their SCV will be better positioned to avoid disruptions and gain higher valuations. Third, research shows that the stock market reacts positively when firms adopt CSR programs (e.g., Flammer, 2015; Klassen & McLaughlin, 1996) and implement environmental initiatives (e.g., Jacobs, Singhal, & Subramanian, 2010). As improving visibility of conflict minerals sourcing is also closely tied with ethical sourcing, improving labor conditions, and reducing environmental damage, we expect higher stock market valuations for firms that improve visibility in their conflict minerals supply chains.

To measure the market value of the firm, we use Tobin's Q. Because the announcement of mandatory conflict minerals disclosures was an exogenous event affecting all manufacturers at the same time, directly estimating abnormal stock price performance is problematic in our study. Unlike typical event studies that use independent disclosures or announcements, the

conflict minerals announcements and disclosure deadlines occur at the same time for all firms. This confounds the estimation of abnormal stock price movement. Because of this, we have chosen a longer term measure of stock price movement in Tobin's Q. We use the method proposed by Chung and Pruitt (1994) to measure Tobin's Q. This method has been widely adopted in the OM literature (e.g., Corbett et al., 2005; Gray, Siemsen, & Vasudeva, 2015 Jacobs, Kraude, & Narayanan, 2016). It calculates Tobin's Q using the Compustat variables (MV + PS + DEBT)/TA, where MV is the market value of outstanding common stock, PS is the liquidating value of outstanding preferred stock, DEBT is the sum of book value of inventories, long-term liabilities, and current liabilities less current assets, and TA is the book value of the firm's total assets. Based on the above discussion, we hypothesize:

Hypothesis 3 *Higher SCV leads to increased market valuation of the firm as measured by Tobin's Q.*

4 | DATA

We collected data from two sources. The first source is the database of conflict minerals disclosures filed by firms with the United States Securities and Exchange Commission (SEC). These disclosures, called Form SD (Specialized Disclosure), must be filed annually with the SEC in accordance with Section 1502 of the Dodd-Frank Act. This act mandates that manufacturers or firms that contract to manufacture[1] review their product lines for conflict minerals (i.e., tin, tantalum, tungsten, and gold). If any product contains one or more of these four minerals, the firm must investigate its supply chain to determine whether these minerals may have originated from the mines in the Democratic Republic of the Congo or an adjoining country. Specifically, the firm needs to identify whether any of these minerals originated from mining operations that fund armed conflict and other human rights abuses. The findings of this supply chain investigation must be publicly reported in the Form SD filed with the SEC, starting from 2013.

In order to meet the conflict minerals disclosure requirements of the Dodd-Frank Act, a firm needs to develop a deeper understanding of its supply chain. This is because to determine the origin of the conflict minerals in its products, a firm must trace the mineral source upstream through multiple tiers of suppliers to the original smelter or refinery (SOR) where the mineral enters the firm's supply chain. Typically, SORs purchase mineral ores from mines to produce and sell usable metals. Therefore, once a firm has identified the SORs in its supply chain, it can check the status of each SOR to verify that it does not source mineral ores from mines that fund armed conflict.[2] This supply chain investigation is complicated because many firms have complex supply chains with multiple tiers and thousands of suppliers, and conflict minerals could enter several tiers upstream in the supply chain (Kim & Davis, 2017). One example of this complexity is illustrated in Figure 1, which depicts the Philips supply chain with multiple tiers and several suppliers at each tier. To identify the SORs that supply the conflict minerals, Philips needs to trace the minerals used in its products across several thousand manufacturers and sub-manufacturers, which is a complicated task.

As a part of conflict minerals due diligence, firms are encouraged to work toward identifying the SORs in their supply chains (OECD, 2016). But, given the complexity in global supply chains, many firms find it challenging to do so. In fact, Kim and Davis (2016) point out that nearly 80% of the firms in their conflict minerals study could not fully determine their raw minerals' countries of origin. Consequently, a firm that can trace its minerals all the way to their SORs and report that information in its Form SD can be considered not only to have undertaken a higher level of due diligence for the conflict minerals inquiry (OECD, 2016 The Responsible Minerals Initiative, 2015) but also seen as a firm that has deeper upstream visibility in its conflict minerals supply chain. Thus, the information in a firm's Form SD allows us to understand the extent of the firm's SCV and differentiate firms that have a record of their SORs (i.e., a firm with high SCV) from firms that do not have this level of detailed information (i.e., a firm with low SCV). Towards this end, we collected the entire population of Forms SD filed with the SEC for the first two years of disclosure under the Dodd-Frank Act (i.e., 2013 and 2014). The total number of Forms SD filed in 2013 and 2014 were 1,330 and 1,279, respectively. These filings are all publicly available in the SEC's EDGAR database. We examined each Form SD (and any applicable appendices) to record a firm that indicated specific knowledge of

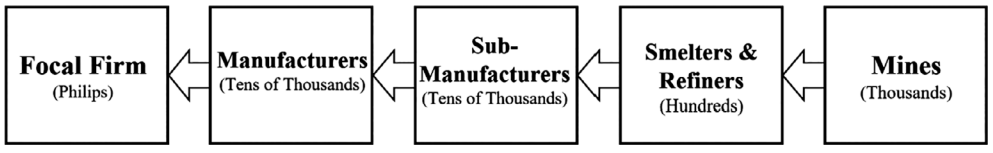

FIGURE 1 Philips conflict minerals supply chain.
Adapted from http://www.philips.com/a-w/about/company/suppliers/supplier-sustainability/our-programs/conflict-minerals.html (accessed on May 25, 2017)

TABLE 1 Industry breakdown of firms in sample

Total firms	**1,180**	**100.0%**
Include SOR information (2013)	300	25.4%
Include SOR information (2014)	491	41.6%
Industry (2-digit SIC)		
Mining and construction (10–19)	31	2.6%
Manufacturing		
Food, textiles, and apparel (20–23)	35	3.0%
Lumber, furniture, paper, and printing (24–27)	42	3.6%
Chemicals and petroleum refining (28–29)	88	7.5%
Rubber, leather, stone, glass, concrete, and metals (30–34)	96	8.1%
Industrial machinery and computer equipment (35)	152	12.9%
Electronics and equipment (36)	256	21.7%
Transportation equipment (37)	80	6.8%
Measurement, medical, and laboratory equipment (38)	173	14.7%
Miscellaneous (39)	16	1.4%
Transportation and communications (40–49)	27	2.3%
Wholesale and retail (50–59)	100	8.5%
Finance, insurance, and real estate (60–69)	5	0.4%
Services (70–89)	76	6.4%
Other (99)	3	0.3%

Note. Percentages are proportion of total firms.

its SORs as a firm with high SCV. The remaining firms which did not identify their SORs were recorded as firms with low SCV.[3]

The second data source is Compustat. This database was used to collect financial information for all firms in our study from 2008 to 2016. Then, we combined the data from the conflict minerals disclosures and the Compustat database using the firm name and Compustat's GVKEY, a unique firm identifier. After merging both sets of data, we retained 1,289 Form SD records for 2013 and 1,229 Form SD records for 2014. This is slightly less than the population filed in each year. The reason for this discrepancy is missing or incomplete financial data for 30 firms in 2013 and 29 firms in 2014. Mergers, acquisitions, privatization of firms, or duplicate disclosures filed by corporate subsidiaries (in these cases, only the record of the parent firm was retained) are responsible for the remaining 11 firms in 2013 and 21 firms in 2014. Finally, to maintain consistency in our analysis, we restricted our sample to only include firms that filed Form SD in both 2013 and 2014. This left us with 1,180 firms that form the basis for the analysis in this study. Table 1 indicates the industry breakdown of the firms that filed Form SD in our final sample.

5 | METHODOLOGY

We aim to investigate whether firms with higher visibility into their conflict minerals supply chains achieve better operating performance. To do this, we use an event study following the guidance of Barber and Lyon (1996), which has been widely implemented in OM studies of operating performance (e.g., Corbett et al., 2005; Hendricks & Singhal, 1997; Swink & Jacobs, 2012).

An event study allows us to compare the operating performance of firms that have included information about their SORs in their Form SD (suggesting high SCV) to that of firms that either do not include this information or have not filed a Form SD at all (in either case, suggesting low SCV). Essentially, we seek to identify low-SCV firms that are similar to high-SCV firms in the years before mandatory conflict minerals reporting. These low-SCV firms serve as a benchmark comparison and counterfactual to the high-SCV firms.

Barber and Lyon (1996) demonstrate that an appropriate method to do this is to match high-SCV firms to similar low-SCV firms in a preevent period based on a combination of firm performance (e.g., ROA), size (e.g., total assets), and industry (e.g., SIC code). We need to make two decisions to do this. First, we must choose a pre-event period in which to perform the matching. As Dodd-Frank was not passed until the middle of 2010, we use 2010 for our matching period. This allows us to observe potential differences in operating performance in the time leading up to, as well as after, the first conflict minerals disclosures (in 2013 and 2014). Second, we must specify a matching method. Similar studies in the OM literature (e.g., Corbett et al., 2005 Hendricks & Singhal, 2008 Swink & Jacobs, 2012) underscore the difficulty of finding proper matching specifications that can balance performance, size, and industry. To deal with the tradeoffs among all three criteria, we test four different specifications for our benchmark portfolios.

Barber and Lyon's (1996) study shows that the most important matching criteria are firm performance and industry. Therefore, our first method—*performance-industry (SIC2)*—creates benchmark portfolios for each high-SCV firm using the following algorithm:

Step 1. For each high-SCV firm, we identify all low-SCV firms within the same two-digit SIC code whose ROA in 2010 (our pre-Dodd-Frank match year) was within 90–110% of the high-SCV firm's ROA.

Step 2. If no firms were identified in Step 1, we then match performance within the 90–110% ROA range using all firms in the same one-digit SIC code.

Step 3. If no firms were identified in Step 2, we then match performance within the 90–110% ROA range regardless of SIC code.

Our second method incorporates firm size. Barber and Lyon (1996) find that matching on firm size in addition to performance and industry does not provide much additional benefit. However, following the OM literature (e.g., Corbett et al., 2005; Lo, Pagell, Fan, Wiengarten, & Yeung, 2014), we include size as a matching criterion to establish robustness across a number of dimensions. This second method—*performance-size-industry (SIC2)*—follows our first method except we remove firms from the benchmark portfolios that are extreme mismatches in size. In this case, we remove any firm whose total assets is more than a factor of 50 away from the total assets of the high-SCV firm to which it is matched.

Next, as industry is such a strong predictor of which firms actually file conflict minerals disclosures (i.e., affecting electronics and machinery manufacturers more than others), we also attempt methods that match more tightly on industry. Therefore, our third method—*performance-industry (SIC3)*—follows the first method above but begins with a preliminary step (*Step 0*) to match high-SCV firms within the same three-digit SIC code instead of starting from two-digit SIC code. This results in smaller benchmark portfolios on average but tighter matches overall. Finally, the fourth method—*performance-size-industry (SIC3)*—follows the third method above but again removes firms from the benchmark portfolios that are extreme mismatches in size (i.e., outside a factor of 50). Matching results for all four methods are presented in Table 2.

Then, we use event study methods to identify significant differences in operating performance between the high- and low-SCV groups in our matched samples. This allows us to calculate the difference between the actual operating performance of a high-SCV firm and its expected performance, which we refer to as abnormal performance. In this case, the expected performance of the high-SCV firm is the actual operating performance of its matched low-SCV benchmark portfolio. We calculate expected performance of firm i in period $\tau + l$ as

$$E\left[HSCV_{i,\tau+l}\right] = HSCV_{i,\tau} + \left(LSCV_{i,\tau+l} - LSCV_{i,\tau}\right) \quad (1)$$

where *HSCV* is the performance of a high-SCV firm and *LSCV* is the average performance of its matched low-SCV firms. Thus, abnormal performance is calculated as

$$AP_{i,\tau+l} = HSCV_{i,\tau+l} - E\left[HSCV_{i,\tau+l}\right] \quad (2)$$

which simplifies to the difference in performance between the high-SCV firm and the average performance of its matched low-SCV firms in future period $\tau + l$.

Before evaluating abnormal performance, we first trim the data at the 2.5% level in each tail to control for outliers (following Hendricks & Singhal, 2008; Swink & Jacobs, 2012). We must also choose the most appropriate statistical tests for our analysis. Several scholars indicate that nonparametric tests are preferred over standard parametric *t*-tests in event studies (e.g., Barber & Lyon, 1996; Corbett et al., 2005). Therefore, we evaluate abnormal operating performance using nonparametric tests, specifically the Wilcoxon signed-rank (WSR) test and the sign test. The WSR test is preferred due to greater statistical power, but it is only appropriate with a symmetric distribution. When the data are skewed, the sign test is more appropriate (Cowan, 1992). We report *p*-values for both nonparametric tests (WSR test and sign test) and also include *t*-test *p*-values for completeness.

With this event study design, we evaluate our hypotheses by testing whether abnormal performance of ROA (and its component parts), sales growth, and Tobin's Q are different from zero in the hypothesized direction. Our approach utilizes two comparison tests to calculate abnormal performance for high-SCV firms. Test 1 is the main comparison for our analysis. In this test, we use data from Form SD filings in 2014 to examine whether firms that included SOR information experienced abnormal performance compared to a benchmark. Even though 2013 was the first year of filing, there are three reasons why we use the data from 2014 disclosures for our main comparison. First, disclosures filed in 2014 were recognized to be more comprehensive and substantial as compared to those filed in 2013 (Littenberg, Damania, & Matos, 2014). This is reflected in the fact that the number of amendments to the Form SD filings decreased by nearly 80% from 2013 to 2014. Second, several organizations such as Amnesty International and the Responsible Minerals Initiative pointed out some improvements to the disclosure filings in 2013, which resulted in significant modifications to the disclosures filed in 2014 (Digging for Transparency, 2015; Littenberg et al., 2014). As a result, more firms filed a Form SD including SOR information in 2014 than in 2013 (41.6 vs. 25.4%, respectively). Finally, other recent studies on conflict minerals have also used data from the 2014 disclosure filings for analysis (e.g., Kim & Davis, 2016). Summary statistics for Test 1 are presented in Table 3.

Test 2 is a supplement and endogeneity check to our main comparison. For this test, we incorporate 2013 Form SD data, which allows us to provide deeper insights and robustly address specific challenges pertinent to our setting. In Test 2, we define our high-SCV test group to include only firms that had low SCV in 2013 but achieved high SCV in 2014. Thus, the sample constitutes firms that improved their SCV during the period of our study. We matched these firms to firms that have low SCV in 2013 as well as in 2014. Hence, we compare the difference in operating performance of the firms that improved their SCV status to firms that remain at low SCV for both years. This comparison allows us to study the potential benefits that can accrue to firms when they improve their SCV. Additionally, it addresses

TABLE 2 Matching results for Test 1[a]

	Performance-industry (SIC2)	Performance-size-industry (SIC2)	Performance-industry (SIC3)	Performance-size-industry (SIC3)
Step 0 matches[b]	n/a	n/a	325	301
Step 1 matches[c]	442	430	117	128
Step 2 matches[d]	39	50	39	51
Step 3 matches[e]	4	5	4	5
Total firms matched	485	485	485	485
Mean group size	10.5	8.3	6.3	5.3
Median group size	7	6	3	3
Maximum group size	145	115	145	115
Number of groups with a single firm	49	57	118	127

[a]High-SCV firms are those than reported SOR records in 2014.
[b]All low-SCV firms within the same three-digit SIC code as the high-SCV firm, and whose performance and/or size are within the specified range of the high-SCV firm.
[c]All low-SCV firms within the same two-digit SIC code as the high-SCV firm, and whose performance and/or size are within the specified range of the high-SCV firm.
[d]All low-SCV firms within the same one-digit SIC code as the high-SCV firm, and whose performance and/or size are within the specified range of the high-SCV firm.
[e]All low-SCV firms whose performance and/or size are within the specified range of the high-SCV firm regardless of SIC code.

two potential issues with our study. First, this test helps to mitigate endogeneity concerns by isolating the firms that have actively improved their SCV over the time period of our study, thus bolstering a claim for causality. Second, this eliminates the need to account for the performance of firms that voluntarily provided information on their conflict minerals supply chains prior to Dodd-Frank. A small number of firms began publishing voluntary conflict minerals reports before they were mandated to do so by the SEC. While these firms are a part of the high-SCV group of Test 1, they are exclusive from the sample being analyzed in Test 2. Therefore, if the Test 2 results corroborate those in Test 1, we can conclude that these firms with early voluntary disclosures have not biased our results. The matching results and summary statistics for Test 2 are very similar to those of Test 1, and thus we report them in the Supporting Information Appendix to this paper (Supporting Information Tables B1 and B2, respectively).

6 | RESULTS

6.1 | Matching results

We first present results comparing all four of our matching methods. Table 4 shows results for abnormal performance of ROA in Test 1. Table 4 is presented in four panels, with Panels A, B, C, and D corresponding to matching methods *performance-industry (SIC2)*, *performance-size-industry (SIC2)*, *performance-industry (SIC3)*, and *performance-size-industry (SIC3)*, respectively. Each panel includes the sample size (*N*), the mean and median of abnormal performance (AP), and the three one-tailed *p*-values for the WSR test, the sign test, and the *t*-test. The column marked "sk" shows an "s" if the distribution of the abnormal performance has absolute skewness greater than 1. When the skewness is greater than 1, the sign test (instead of the WSR test) should be used to evaluate the significance of abnormal performance (Corbett et al., 2005 Hair, Black, Babin, Anderson, & Tatham, 1998). In each table, the first block (i.e., first two rows) reports the abnormal performance in the years prior to the passage of the Dodd-Frank Act. This enables us to confirm whether the high-SCV firms and their low-SCV benchmarks exhibited similar performance trends before they began preparing for the first mandatory conflict minerals disclosures in 2013 and 2014. The remaining six blocks of results report annual or longer term abnormal performance for each year included in our study. For example, the second block shows one-year, two-year, three-year, four-year, five-year, and six-year differences beginning from 2010. Likewise, the third block reports abnormal performance for all annual differences between 2011 and 2016. The fourth, fifth, sixth, and seventh blocks report abnormal performance for annual differences beginning in years 2012, 2013, 2014, and 2015, respectively.

In addition to this, Table 5 presents an overview of abnormal performance for ROA across all four matching methods. The significance levels presented in Table 5 are determined by the relevant nonparametric test statistic (i.e., sign test for skewed distributions, Wilcoxon signed-rank test otherwise). Panel A of Table 5 consolidates the results from Table 4 (Test 1 ROA); Panel B displays the corresponding ROA results from Test 2.[4] From Table 5, we can see little variation across the four methods, suggesting that the results are very robust to differences in matching specification. This pattern of consistency holds for all

TABLE 3 Test 1 descriptive statistics for high-SCV firms and matched low-SCV benchmark portfolios

High-SCV firms (n = 485)	**Mean**	**Median**	***SD***	**Minimum**	**Maximum**
ROA	0.047	0.058	0.124	−0.715	0.410
ROS	0.042	0.061	0.356	−7.177	0.551
COGS/sales	0.579	0.590	0.189	0.053	1.400
SG&A/sales	0.297	0.256	0.368	0.015	7.261
Asset turnover (sales/assets)	1.053	0.907	0.614	0.097	5.400
Sales growth	0.274	0.139	0.779	−0.395	15.043
Tobin's Q	2.004	1.618	1.172	0.590	11.191
Assets ($ millions)	10,481.78	1,658.30	40,455.80	3.60	751,216.00
Sales ($ millions)	7,916.78	1,489.30	19,220.26	2.56	186,397.60
Performance-industry (SIC2) (n = 5,110)	**Mean**	**Median**	***SD***	**Minimum**	**Maximum**
ROA	0.047	0.057	0.124	−0.717	0.397
ROS	−0.347	0.070	3.638	−49.723	2.007
COGS/sales	0.683	0.601	1.259	0.193	27.576
SG&A/sales	0.559	0.257	2.570	0.015	32.110
Asset turnover (sales/assets)	1.072	0.947	0.547	0.140	4.685
Sales growth	0.814	0.190	5.080	−0.598	55.037
Tobin's Q	1.809	1.618	0.749	0.567	6.765
Assets ($ millions)	4,594.94	1,463.00	9,968.48	7.74	99,320.98
Sales ($ millions)	3,737.76	1,220.12	8,773.46	5.18	136,589.17
Performance-size-industry (SIC2) (n = 4,013)	**Mean**	**Median**	***SD***	**Minimum**	**Maximum**
ROA	0.047	0.057	0.124	−0.717	0.397
ROS	−0.195	0.071	2.550	−37.466	2.007
COGS/sales	0.631	0.607	0.311	0.187	5.395
SG&A/sales	0.485	0.244	2.137	0.023	31.771
Asset turnover (sales/assets)	1.039	0.923	0.537	0.164	4.685
Sales growth	0.785	0.179	5.039	−0.598	55.037
Tobin's Q	1.816	1.622	0.741	0.567	6.765
Assets ($ millions)	4,730.80	1,463.00	11,520.95	19.70	132,278.16
Sales ($ millions)	4,119.02	1,203.89	10,955.62	6.34	181,937.54
Performance-industry (SIC3) (n = 3,047)	**Mean**	**Median**	***SD***	**Minimum**	**Maximum**
ROA	0.047	0.058	0.124	−0.720	0.397
ROS	−0.473	0.063	5.096	−83.731	2.007
COGS/sales	0.800	0.594	3.704	0.178	81.689
SG&A/sales	0.564	0.261	2.597	0.010	32.110
Asset turnover (sales/assets)	1.087	0.947	0.608	0.005	4.690
Sales growth	0.902	0.184	5.741	−0.598	62.863
Tobin's Q	1.832	1.576	0.960	0.567	13.523
Assets ($ millions)	4,638.62	937.96	13,328.44	7.74	132,278.16
Sales ($ millions)	3,772.96	796.28	11,619.56	1.67	181,937.54
Performance-size-industry (SIC3) (n = 2,574)	**Mean**	**Median**	***SD***	**Minimum**	**Maximum**
ROA	0.047	0.058	0.125	−0.720	0.397
ROS	−0.208	0.064	2.572	−37.466	2.007

(Continues)

TABLE 3 (Continued)

Performance-size-industry (SIC3) (n = 2,574)	Mean	Median	*SD*	Minimum	Maximum
COGS/sales	0.637	0.604	0.424	0.168	6.700
SG&A/sales	0.492	0.248	2.165	0.010	31.771
Asset turnover (sales/assets)	1.055	0.892	0.600	0.164	4.690
Sales growth	0.862	0.180	5.692	−0.598	62.863
Tobin's Q	1.827	1.605	0.843	0.555	6.739
Assets ($ millions)	4,430.42	1,012.88	12,560.02	9.39	132,278.16
Sales ($ millions)	3,933.79	868.63	11,562.04	5.22	181,937.54

Note. High-SCV firms are those than reported SOR records in 2014. Summary statistics based on 2010 financial records.

operating performance measures in both Tests 1 and 2. Therefore, we only present and discuss the results of method four—*performance-size-industry (SIC3)*—as it is our most conservative method. However, results for all tests across all matching specifications are available in the Supporting Information Appendix (Test 1 in Appendix A and Test 2 in Appendix B).

6.2 | Performance results

Our first hypothesis predicts that firms with high SCV will realize higher profitability, as measured by ROA. To evaluate abnormal performance for ROA, we start by looking at the results in Panel D of Table 4 (i.e., Test 1 ROA results using *performance-size-industry (SIC3)*). We look at the abnormal performance in the first block, which is the years just before our matching year of 2010 (i.e., 2008–2009 and 2009–2010) to confirm that there are no significant pre-disclosure-era differences in ROA between high-SCV firms and their low-SCV benchmarks. Ensuring that both groups are comparable before the passage of Dodd-Frank helps to mitigate endogeneity concerns with the study. Conversely, we begin to observe sustained abnormal performance in ROA starting from 2010 to 2011. For example, for the period 2010–2016, the average ROA for high-SCV firms was 5.1 percentage points ($p < 0.001$) higher than that of their low-SCV benchmarks. Next, we look to Table 6 for abnormal performance in ROA for our Test 2 comparisons (i.e., the endogeneity check). These results also exhibit a similar pattern as observed in Test 1. From 2010 to 2016, Test 2 shows that the average ROA for high-SCV firms was 5.5 percentage points ($p < 0.001$) higher than the average of their low-SCV counterparts. Overall, the evaluation of abnormal performance for ROA supports Hypothesis 1.

Hypothesis 2 predicts that high-SCV firms will realize higher sales, as measured by sales growth. To evaluate abnormal performance in sales, we look at the Test 1 results in Panel A of Table 7. We do see evidence of improvements in sales beginning in 2010. For example, for the period 2010–2016, the average sales growth for high-SCV firms was 8.5 percentage points ($p < 0.001$) higher than that of their low-SCV benchmarks. We also see renewed improvements in the later years of the study. For example, from 2014 to 2016, the average sales growth for high-SCV firms was 5.2 percentage points ($p < 0.001$) higher than that of their low-SCV counterparts. Our Test 2 endogeneity check largely supports these results. For example, in Panel B of Table 7, we can see that the sales growth of high-SCV firms from 2010 to 2016 is 4.8 percentage points ($p < 0.05$) higher than the low-SCV firms on average. However, unlike in Test 1, high-SCV firms in Test 2 do not experience renewed improvement in later years (e.g., 2014–2016). But overall, this evaluation of abnormal performance in sales growth supports Hypothesis 2.

Hypothesis 3 predicts that high-SCV firms will realize abnormal improvements in market value, as measured by Tobin's Q. To evaluate abnormal performance, we look at the Test 1 results in Panel A of Table 8. The results show evidence of improvement in Tobin's Q starting from 2010. For example, from 2010 to 2016 high-SCV firms have Tobin's Q that is 0.140 ($p < 0.01$) higher than that of their low-SCV benchmarks on average. The results for Test 2 in Table 8 Panel B display an even stronger pattern. For example, between 2010 and 2016 high-SCV firms have Tobin's Q that is 0.290 ($p < 0.001$) higher than that of low-SCV firms on average. Overall, our comparison tests of Tobin's Q provide support for Hypothesis 3.

6.3 | ROA decomposition

As we found support for Hypothesis 1, we break down ROA into its financial components to see what is driving this improvement in profitability for high-SCV firms. Table 9 displays the abnormal performance medians and significance levels for these components, consolidated for both Tests 1 and 2. Complete results for both tests can be found in Supporting Information Appendices A and B, respectively.

First, ROA can be decomposed into asset turnover (sales/assets) (Table 9 Panel A) and ROS (Table 9 Panel B). Looking at results for asset turnover in Panel A, we do see a bit of improvement beginning in 2010 but it does not appear

TABLE 4 Test 1 abnormal performance in ROA

Panel A: Performance-industry (SIC2)								Panel B: Performance-size-industry (SIC2)							
From year	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (t -test)	From year	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)
2008–2009	437	0.008	−0.023	s	0.995	1.000	0.385	2008–2009	438	−0.001	−0.018	s	0.995	1.000	0.562
2009–2010	450	−0.026	−0.010	s	0.991	0.996	0.721	2009–2010	450	−0.008	−0.007		0.970	0.987	0.951
2010–2011	457	0.026	0.016	s	0.000***	0.000***	0.252	2010-2011	457	0.017	0.011		0.000***	0.000***	0.000***
2010-2012	454	0.092	0.028	s	0.000***	0.000***	0.013**	2010-2012	452	0.023	0.020		0.000***	0.000***	0.000***
2010-2013	448	0.018	0.032	s	0.000***	0.000***	0.246	2010-2013	446	0.039	0.026	s	0.000***	0.000***	0.000***
2010-2014	443	0.074	0.029	s	0.000***	0.000***	0.035**	2010-2014	438	0.031	0.020	s	0.000***	0.000***	0.000***
2010-2015	419	0.050	0.034	s	0.000***	0.000***	0.000***	2010-2015	415	0.037	0.024		0.000***	0.000***	0.000***
2010-2016	392	0.082	0.038	s	0.000***	0.000***	0.000***	2010-2016	384	0.041	0.029		0.000***	0.000***	0.000***
2011-2012	454	0.041	0.011	s	0.004***	0.000***	0.099*	2011-2012	452	0.003	0.006		0.014**	0.006***	0.227
2011-2013	448	0.042	0.023	s	0.000***	0.000***	0.052*	2011-2013	446	0.022	0.017		0.000***	0.000***	0.000***
2011-2014	443	0.007	0.015	s	0.000***	0.000***	0.400	2011-2014	438	0.012	0.012		0.000***	0.000***	0.002***
2011-2015	419	0.004	0.021	s	0.000***	0.000***	0.431	2011-2015	415	0.020	0.017		0.000***	0.000***	0.000***
2011-2016	392	0.019	0.028	s	0.000***	0.000***	0.188	2011-2016	384	0.026	0.020		0.000***	0.000***	0.000***
2012-2013	448	0.024	0.013	s	0.000***	0.000***	0.206	2012-2013	446	0.022	0.011		0.000***	0.000***	0.000***
2012-2014	443	−0.020	0.004	s	0.080*	0.224	0.722	2012-2014	438	0.013	0.005		0.047**	0.016**	0.003***
2012-2015	419	0.060	0.015	s	0.000***	0.000***	0.063*	2012-2015	415	0.020	0.014		0.001***	0.001***	0.001***
2012-2016	392	0.019	0.022	s	0.000***	0.000***	0.225	2012-2016	384	0.024	0.018		0.000***	0.000***	0.000***
2013-2014	443	−0.048	−0.011	s	1.000	0.998	0.989	2013–2014	438	−0.012	−0.010		1.000	1.000	0.999
2013–2015	419	0.000	−0.003	s	0.549	0.652	0.502	2013–2015	415	−0.003	−0.004		0.650	0.837	0.732
2013–2016	392	0.038	0.007	s	0.030**	0.059*	0.132	2013-2016	384	0.004	0.002		0.216	0.361	0.258
2014–2015	419	−0.024	0.004	s	0.056*	0.086*	0.793	2014-2015	415	0.007	0.005		0.015**	0.048**	0.066*
2014-2016	392	−0.017	0.011	s	0.000***	0.000***	0.679	2014-2016	384	0.015	0.010		0.001***	0.000***	0.001***
2015-2016	392	0.077	0.007	s	0.005***	0.071*	0.029**	2015-2016	384	0.004	0.001		0.230	0.323	0.237

(Continues)

TABLE 4 (Continued)

Panel C: Performance-industry (SIC3)								Panel D: Performance-size-industry (SIC3)							
From year	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)	From year	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)
2008–2009	436	0.012	−0.021	s	0.993	1.000	0.376	2008–2009	436	−0.005	−0.013		0.975	0.997	0.728
2009–2010	450	0.001	−0.007	s	0.959	0.960	0.490	2009–2010	449	−0.009	−0.005		0.952	0.971	0.961
2010–2011	453	0.012	0.014	s	0.000***	0.000***	0.333	2010-2011	452	0.020	0.012		0.000***	0.000***	0.000***
2010-2012	443	0.078	0.026	s	0.000***	0.000***	0.065*	2010-2012	440	0.030	0.020	s	0.000***	0.000***	0.000***
2010-2013	434	0.024	0.030	s	0.000***	0.000***	0.193	2010-2013	430	0.045	0.026	s	0.000***	0.000***	0.000***
2010-2014	427	0.042	0.034	s	0.000***	0.000***	0.000***	2010-2014	419	0.041	0.026	s	0.000***	0.000***	0.000***
2010-2015	402	0.027	0.031	s	0.000***	0.000***	0.120	2010-2015	389	0.040	0.022	s	0.000***	0.000***	0.000***
2010-2016	367	0.084	0.038	s	0.000***	0.000***	0.000***	2010-2016	353	0.051	0.030	s	0.000***	0.000***	0.000***
2011-2012	443	0.008	0.010	s	0.013**	0.003***	0.387	2011-2012	440	0.005	0.008		0.021**	0.009***	0.098*
2011-2013	434	0.072	0.023	s	0.000***	0.000***	0.014**	2011-2013	430	0.025	0.019		0.000***	0.000***	0.000***
2011-2014	427	0.004	0.017	s	0.000***	0.000***	0.423	2011-2014	419	0.021	0.013		0.000***	0.000***	0.000***
2011-2015	402	0.012	0.023	s	0.000***	0.000***	0.215	2011-2015	389	0.023	0.017		0.000***	0.001***	0.000***
2011-2016	367	0.042	0.025	s	0.000***	0.000***	0.011**	2011-2016	353	0.033	0.019		0.000***	0.000***	0.000***
2012-2013	434	0.037	0.012	s	0.000***	0.000***	0.061*	2012-2013	430	0.024	0.011		0.000***	0.000***	0.000***
2012-2014	427	−0.003	0.012	s	0.006***	0.004***	0.522	2012-2014	419	0.015	0.010		0.010**	0.006***	0.003***
2012-2015	402	−0.005	0.015	s	0.008***	0.001***	0.578	2012-2015	389	0.013	0.013		0.008***	0.001***	0.029**
2012-2016	367	0.004	0.019	s	0.000***	0.008***	0.415	2012-2016	353	0.024	0.020		0.001***	0.001***	0.000***
2013-2014	427	−0.082	−0.008	s	0.982	0.990	0.970	2013–2014	419	−0.007	−0.006		0.995	0.998	0.942
2013–2015	402	0.028	−0.004	s	0.502	0.598	0.230	2013–2015	389	−0.005	−0.005		0.778	0.845	0.812
2013–2016	367	0.018	0.006	s	0.149	0.266	0.269	2013–2016	352	0.003	0.005		0.290	0.244	0.310
2014–2015	402	0.017	−0.002	s	0.542	0.708	0.197	2014–2015	389	0.000	−0.001		0.583	0.580	0.511
2014–2016	367	0.039	0.007	s	0.009***	0.008***	0.086*	2014-2016	352	0.012	0.011		0.005***	0.003***	0.007***
2015-2016	367	0.050	0.008	s	0.010**	0.087*	0.052*	2015-2016	352	0.009	0.004		0.071*	0.075*	0.072*

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

strong or sustained. Conversely, in Panel B we can see that ROS exhibits a clear pattern of significant abnormal performance mirroring that of ROA. For example, over the period 2010–2016 in Test 1, high-SCV firms realized median ROS that is 3.4 percentage points ($p < 0.01$) higher than that of their low-SCV counterparts. For the same period in Test 2, the realized median of high-SCV firms is 5.2 percentage points ($p < 0.01$) higher than that of their low-SCV counterparts.

Because asset turnover does not exhibit convincing contributions to profitability, we do not decompose it further for additional evaluation. However, we can break ROS down into cost of goods sold (COGS) and selling, general, and administrative expenses (SG&A). We evaluate the contribution of each by testing abnormal performance in COGS/sales and SG&A/sales, which are presented in Table 9 Panels C and D, respectively. Again, we see similar patterns for both measures. For 2010–2016 in Test 1, high-SCV firms experience median improvements of 2.6 ($p < 0.01$) and 1.0 ($p < 0.01$) percentage points over low-SCV firms in COGS/sales and SG&A/sales, respectively. For the same period in Test 2, the median improvements are 3.1 ($p < 0.01$) and 1.1 ($p < 0.05$) percentage points, respectively.

7 | SENSITIVITY ANALYSES

In addition to our main tests (Tests 1 and 2) and matching methods, we conducted an array of additional tests and procedures. Below we describe (1) alternate specifications of high- and low-SCV firms, and (2) replications and robustness checks.

7.1 | Specification of high and low SCV

Categorizing firms based on their conflict minerals reporting is challenging given the non-standardized format of Form SD. While the SEC and third-party organizations (such as the OECD and the Responsible Minerals Initiative) provide guidance for reporting, firms largely determine what and how much information they disclose on their own. Through our examination of the Form SD, an obvious distinguishing factor that emerges is that some firms were able to track their conflict minerals supply chains all the way back to the SOR level (25.4 and 41.6% of firms that filed Form SD in 2013 and 2014, respectively). This forms the basis of our analysis, as described in Section 4. However, in pursuit of the most effective way to operationalize high and low SCV, we also explored additional classification schemes. Our original classification categorized firms into four levels (from lowest to highest SCV) based on the information we could glean from the Form SD:

1. *Level 1:* The Form SD does not include any substantial SOR information (689 firms). Note: This is the same as our current low-SCV categorization.
2. *Level 2:* The Form SD includes a number and/or list of known SORs (150 firms).
3. *Level 3:* The Form SD includes a detailed list and the conflict-free audit status of known SORs (228 firms).
4. *Level 4:* The Form SD includes a detailed list and conflict-free audit status of known SORs, plus mineral countries of origin (113 firms).

Our analysis of these additional categories did not reveal any significant differences in performance among Levels 2, 3, and 4. However, all three levels (i.e., Levels 2, 3, and 4) exhibit significant differences in performance when compared with Level 1. As a result, we simplified our presentation by combining Levels 2, 3, and 4, which becomes our definition of high SCV in this paper.

After collapsing our classification method to two levels of SCV (high and low), we examine the distribution of reported SORs to ensure that our decision to use two categories is appropriate given the data. The distribution of the number of SORs reported in Form SD in 2014 is shown in Figure 2.

From Figure 2, we can see that the number of firms that reported *any* SORs is still quite low compared to the zero SOR group, which helps to support our high-versus-low categorization. However, to even further validate our classification scheme, we remove firms from the sample that do report SORs, but only a small number of them. We then reanalyze the data to see if it changes the results. We try three breakpoints for removing such firms:

1.Removing firms that report fewer than 10 SORs.

2.Removing firms that report fewer than 25 SORs.

3.Removing firms that report fewer than 50 SORs.

When we replicate our analyses after removing firms within these three breakpoints, we still observe a nearly identical pattern of results. We believe that this additional breakpoint analysis supports our primary categorization of measuring SCV based on whether a firm has reported any record of SORs in its Form SD.

7.2 | Robustness checks

We also performed three additional procedures to check the robustness of our results. First, we conducted an extra test (Test 3) as a complement to our main comparison tests (i.e., Tests 1 and 2). For Test 3, we identified firms that have high SCV in both 2013 and 2014. We matched these firms to portfolios of firms that have low SCV in both 2013 and 2014. This matched sample allows us to compare the performance of firms that have high SCV in both observable years of our study to those firms with low SCV in both years. Test 3 serves as a robustness check and the results are largely the

TABLE 5 Overview of abnormal performance for Tests 1 and 2 across matching methods

	Panel A: Test 1[a] abnormal performance in ROA				Panel B: Test 2[b] abnormal performance in ROA			
From year	Performance-industry (SIC2)	Performance-size-industry (SIC2)	Performance-industry (SIC3)	Performance-size-industry (SIC3)	Performance-industry (SIC2)	Performance-size-industry (SIC2)	Performance-industry (SIC3)	Performance-size-industry (SIC3)
2008–2009								
2008–2010								
2010–2011	***	***	***	***	***	***	***	***
2010-2012	***	***	***	***	***	***	***	***
2010-2013	***	***	***	***	***	***	***	***
2010-2014	***	***	***	***	***	***	***	***
2010-2015	***	***	***	***	***	***	***	***
2010-2016	***	***	***	***	***	***	***	***
2011-2012	***	**	***	**	***	***	***	***
2011-2013	***	***	***	***	***	***	***	***
2011-2014	***	***	***	***	***	***	***	***
2011-2015	***	***	***	***	***	***	***	***
2011-2016	***	***	***	***	***	***	***	***
2012-2013	***	***	***	***	***	***	***	***
2012-2014		**	***	**				
2012-2015	***	***	***	***	***	***	***	***
2012-2016	***	***	***	***	***	***	***	***
2013-2014								
2013–2015								
2013–2016	*				**	*	*	*
2014-2015	*	**			***	***	**	**
2014-2016	***	***	***	***	***	***	***	***
2015-2016	*		*	*				

Note. Significance based on appropriate nonparametric statistic (sign test for skewed distributions, Wilcoxon signed-rank test otherwise).

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

[a]High-SCV firms are those that reported SORs in 2014.

[b]High-SCV firms are those that reported SORs in 2014 but not in 2013.

TABLE 6 Test 2 abnormal performance in ROA using performance-size-industry (SIC3) matching

From year	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)
2008–2009	188	−0.007	−0.017		0.951	0.997	0.721
2009–2010	196	−0.007	−0.005		0.893	0.913	0.824
2010–2011	197	0.012	0.010		0.008***	0.077*	0.005***
2010-2012	190	0.028	0.021	s	0.000***	0.000***	0.000***
2010-2013	186	0.042	0.026	s	0.000***	0.000***	0.000***
2010-2014	179	0.035	0.025		0.000***	0.000***	0.000***
2010-2015	169	0.049	0.026	s	0.000***	0.000***	0.000***
2010-2016	160	0.055	0.034	s	0.000***	0.000***	0.000***
2011-2012	190	0.017	0.018		0.000***	0.000***	0.000***
2011-2013	186	0.031	0.024	s	0.000***	0.000***	0.000***
2011-2014	179	0.024	0.014		0.001***	0.004***	0.001***
2011-2015	169	0.039	0.031		0.000***	0.000***	0.000***
2011-2016	160	0.047	0.032	s	0.000***	0.000***	0.000***
2012-2013	186	0.018	0.010		0.005***	0.011**	0.001***
2012-2014	179	0.009	0.006		0.170	0.116	0.096*
2012-2015	169	0.028	0.021	s	0.002***	0.000***	0.002***
2012-2016	160	0.031	0.022		0.001***	0.016**	0.000***
2013-2014	179	−0.012	−0.006		0.992	0.988	0.984
2013–2015	169	0.011	−0.001		0.750	0.561	0.094*
2013-2016	160	0.015	0.012		0.059*	0.089*	0.040**
2014-2015	169	0.019	0.009		0.014**	0.141	0.027**
2014-2016	160	0.026	0.016		0.001***	0.004***	0.001***
2015-2016	160	0.010	0.002		0.177	0.238	0.141

Note. High-SCV firms are those that reported SORs in 2014 but not in 2013.
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

same as our main comparison (Test 1). Complete details and results of Test 3 are available in Supporting Information Appendix C.

Second, we replicate all three comparison tests (i.e., Tests 1, 2, and 3) with propensity score matching instead of the coarsened matching described in Section 5. This replication serves two primary purposes. First, it is a different matching method, which further helps demonstrate the robustness of our results. Second, in this replication, we restrict the pool of control firms to only those that have filed a low-SCV Form SD. This is to address any concerns that it may be improper to expand the control group beyond just those firms that have filed Form SD as we do in our main analysis. From this method, we find largely the same patterns of results. However the results do appear to be noisier, likely due to the restricted control group and, consequently, lower quality matches. Complete details and results of our propensity score approach are available in Supporting Information Appendix D.

Finally, we replicate our tests using only manufacturing firms (SIC 2000–3999). While Dodd-Frank §1502 mainly applies to manufacturing firms, it also covers any firm that contracts to manufacture. Therefore, conflict minerals reporting requirements also apply to a significant number of retailers, wholesalers, service providers, or holding companies that contract to manufacture goods to sell. The broad scope of this provision might introduce bias into our analysis from nonmanufacturing firms that have less supply chain focus (e.g., a holding company or service provider). Therefore, we replicate our analysis using only manufacturing firms in the sample. Our results remain materially unchanged.

8 | DISCUSSION AND CONCLUSIONS

We extend the current understanding of supply chain visibility by examining how visibility in one context—conflict minerals—affects a firm's operating performance, sales, and market valuation. Our results show that firms with high SCV achieve higher profitability—an average ROA of 5.1 percentage points higher—than comparable firms with low

TABLE 7 Tests 1 and 2 abnormal performance in sales growth using performance-size-industry (SIC3) matching

	Panel A: Test 1[a] abnormal performance in sales growth							Panel B: Test 2[b] abnormal performance in sales growth						
From year	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)	N	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)
2008–2009	417	0.003	0.013		0.269	0.085*	0.423	181	−0.026	0.012		0.310	0.229	0.890
2009–2010	436	−0.018	−0.002		0.851	0.557	0.841	188	0.019	0.003		0.407	0.413	0.264
2010–2011	440	0.026	0.022		0.034**	0.083*	0.060*	193	0.018	0.000		0.216	0.500	0.235
2010–2012	428	0.077	0.064		0.000***	0.000***	0.000***	186	0.076	0.040		0.009***	0.017**	0.009***
2010–2013	419	0.079	0.049		0.000***	0.000***	0.000***	182	0.067	0.042		0.008***	0.016**	0.007***
2010–2014	408	0.024	0.036		0.005***	0.000***	0.088*	175	0.026	0.029		0.082*	0.065*	0.181
2010–2015	380	0.070	0.060		0.000***	0.001***	0.000***	166	0.065	0.033		0.026**	0.122	0.006***
2010–2016	343	0.085	0.053		0.000***	0.000***	0.000***	157	0.048	0.035		0.030**	0.055*	0.038**
2011–2012	440	0.043	0.041		0.000***	0.001***	0.000***	190	0.053	0.049		0.003***	0.008***	0.004***
2011–2013	429	0.023	0.034		0.003***	0.013**	0.028**	186	0.022	0.035		0.025**	0.062*	0.145
2011–2014	418	−0.015	−0.006		0.703	0.705	0.873	179	0.005	0.021		0.169	0.227	0.404
2011–2015	388	0.014	0.016		0.068*	0.085*	0.148	169	0.023	0.014		0.132	0.269	0.133
2011–2016	351	0.034	0.036		0.004***	0.004***	0.007***	160	0.008	0.006		0.217	0.290	0.351
2012–2013	429	−0.011	0.002		0.271	0.500	0.840	186	−0.024	−0.002		0.857	0.643	0.924
2012–2014	418	−0.051	−0.028		1.000	0.999	1.000	179	−0.036	−0.008		0.883	0.815	0.940
2012–2015	388	−0.016	−0.011		0.878	0.898	0.898	169	−0.008	−0.009		0.632	0.779	0.651
2012–2016	351	0.005	0.005		0.483	0.335	0.360	160	−0.019	0.007		0.279	0.346	0.834
2013–2014	418	−0.038	−0.041		1.000	1.000	1.000	179	−0.019	−0.015		0.686	0.773	0.827
2013–2015	388	−0.009	−0.014		0.866	0.857	0.775	169	0.000	−0.010		0.700	0.822	0.497
2013–2016	351	0.021	0.010		0.167	0.228	0.056*	160	−0.005	−0.004		0.644	0.710	0.599
2014–2015	388	0.031	0.020		0.008***	0.009***	0.006***	169	0.021	0.015		0.139	0.178	0.135
2014–2016	351	0.052	0.036		0.000***	0.000***	0.000***	160	0.016	0.006		0.250	0.152	0.217
2015–2016	351	0.020	0.029		0.032**	0.004***	0.049**	160	−0.009	0.025		0.418	0.066*	0.688

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

[a]High-SCV firms are those that reported SORs in 2014.

[b]High-SCV firms are those that reported SORs in 2014 but not in 2013.

TABLE 8 Tests 1 and 2 abnormal performance in Tobin's Q using performance-size-industry (SIC3) matching

	Panel A: Test 1[a] abnormal performance in Tobin's Q							Panel B: Test 2[b] abnormal performance in Tobin's Q						
From year	*N*	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)	*N*	AP mean	AP median	sk	*p*–value (WSR test)	*p*–value (sign test)	*p*–value (*t*-test)
2008–2009	406	0.030	0.044		0.045**	0.021**	0.108	174	0.010	0.038		0.230	0.202	0.395
2009–2010	417	0.028	−0.007		0.558	0.652	0.122	177	−0.003	−0.038		0.870	0.854	0.538
2010–2011	419	0.012	0.024		0.228	0.102	0.319	179	0.042	0.042		0.051*	0.026**	0.099*
2010-2012	411	0.055	0.065		0.006***	0.019**	0.034**	173	0.142	0.122		0.000***	0.001***	0.000***
2010-2013	401	0.035	0.086		0.070*	0.055*	0.161	169	0.152	0.196		0.001***	0.002***	0.001***
2010-2014	392	0.092	0.126		0.003***	0.007***	0.011**	164	0.175	0.210		0.000***	0.000***	0.001***
2010-2015	366	0.103	0.143		0.003***	0.004***	0.013**	155	0.252	0.211		0.000***	0.000***	0.000***
2010-2016	330	0.140	0.136		0.004***	0.005***	0.004***	148	0.290	0.216		0.000***	0.001***	0.000***
2011-2012	419	0.048	0.055		0.001***	0.000***	0.007***	180	0.100	0.076		0.001***	0.010**	0.000***
2011-2013	411	0.026	0.051		0.084*	0.047**	0.212	176	0.118	0.101		0.001***	0.003***	0.002***
2011-2014	402	0.076	0.076		0.017**	0.012**	0.014**	171	0.133	0.091		0.004***	0.003***	0.006***
2011-2015	376	0.093	0.072		0.008***	0.055*	0.019**	162	0.232	0.100		0.000***	0.007***	0.000***
2011-2016	340	0.120	0.076		0.009***	0.005***	0.010**	153	0.251	0.141		0.001***	0.001***	0.000***
2012-2013	420	−0.042	0.012		0.211	0.330	0.952	181	−0.006	0.037		0.153	0.051*	0.566
2012-2014	412	0.018	0.007		0.321	0.365	0.291	175	0.039	0.033		0.204	0.225	0.195
2012–2015	381	0.044	0.073		0.031**	0.016**	0.127	165	0.154	0.139		0.001***	0.003***	0.004***
2012-2016	345	0.075	0.060		0.049**	0.053*	0.059*	156	0.178	0.140		0.002***	0.001***	0.006***
2013-2014	412	0.066	0.041		0.018**	0.042**	0.009***	175	0.055	−0.006		0.705	0.675	0.074*
2013-2015	381	0.076	0.063		0.005***	0.002***	0.021**	165	0.137	0.080		0.003***	0.001***	0.004***
2013-2016	345	0.101	0.072		0.021**	0.012**	0.016**	156	0.192	0.100		0.008***	0.006***	0.002***
2014-2015	382	0.042	0.028		0.041**	0.120	0.064*	166	0.119	0.064		0.001***	0.001***	0.002***
2014-2016	346	0.063	0.050		0.062*	0.018**	0.061*	157	0.120	0.077		0.015**	0.019**	0.015**
2015-2016	348	0.023	−0.004		0.728	0.606	0.205	158	−0.001	−0.050		0.640	0.850	0.515

*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.

[a]High-SCV firms are those that reported SORs in 2014.

[b]High-SCV firms are those that reported SORs in 2014 but not in 2013.

TABLE 9 Tests 1 and 2 abnormal performance medians for asset turnover, ROS, COGS/sales, and SG&A/sales using performance-size-industry (SIC3) matching

	Panel A: Asset turnover		Panel B: ROS		Panel C: COGS/sales		Panel D: SG&A/sales	
	Test 1[a]	Test 2[b]	Test 1[a]	Test 2[b]	Test 1[a]	Test 2[b]	Test 1[a]	Test 2[b]
From year	AP median	AP median	AP median	AP median	AP median	AP median	AP median	AP median
2008–2009	0.011	0.010	−0.011	−0.005	0.002	0.002	0.002	0.004
2009–2010	0.007*	0.006	−0.005	−0.004	0.004	0.008	0.001	0.000
2010–2011	0.014**	0.016**	0.012***	0.008**	−0.005***	−0.005	0.001	0.000
2010–2012	0.018**	0.042**	0.022***	0.021***	−0.009***	−0.008*	−0.008***	−0.008***
2010-2013	0.028***	0.025**	0.037***	0.032***	−0.015***	−0.014***	−0.009***	−0.008***
2010-2014	0.026*	0.015	0.021***	0.026***	−0.013***	−0.013***	−0.006***	−0.008***
2010-2015	0.013	0.008	0.029***	0.032***	−0.017***	−0.021***	−0.010***	−0.014***
2010-2016	−0.006	−0.012	0.034***	0.052***	−0.026***	−0.031***	−0.010***	−0.011**
2011-2012	0.011*	0.011	0.013***	0.018***	−0.003***	−0.002	−0.008***	−0.008***
2011-2013	0.025**	0.032*	0.023***	0.019***	−0.011***	−0.008***	−0.009***	−0.009***
2011-2014	0.014	0.003	0.016***	0.019***	−0.015***	−0.007***	−0.008***	−0.009***
2011-2015	−0.008	−0.026	0.022***	0.028***	−0.019***	−0.020***	−0.009***	−0.010***
2011-2016	−0.034	−0.041	0.027***	0.045***	−0.024***	−0.034***	−0.012***	−0.012***
2012-2013	0.006	−0.006	0.014***	0.012***	−0.007***	−0.009***	−0.003***	−0.003**
2012-2014	−0.014	−0.024	0.006**	0.007*	−0.010***	−0.007***	−0.001	−0.002
2012–2015	−0.034	−0.039	0.009**	0.018**	−0.010***	−0.019***	−0.002	−0.004
2012–2016	−0.029	−0.028	0.014***	0.020***	−0.018***	−0.028***	−0.005	−0.007
2013–2014	−0.006	−0.010	−0.009	−0.004	0.000	0.000	0.001	0.001
2013–2015	−0.024	−0.028	−0.006	0.001	−0.001	−0.007*	−0.002	0.002
2013–2016	−0.050	−0.040	0.008*	0.017***	−0.005**	−0.012***	0.002	0.001
2014-2015	−0.013	−0.024	0.000	0.007	0.000	−0.006***	−0.002*	−0.002*
2014-2016	−0.026	−0.024	0.013***	0.020***	−0.002	−0.010***	−0.003	−0.004*
2015-2016	−0.014	−0.017	0.001*	−0.001	−0.001	0.000	−0.001	0.000

Note. Significance based on appropriate nonparametric test (sign test for skewed distributions, Wilcoxon signed-rank test otherwise).
*$p < 0.1$; **$p < 0.05$; ***$p < 0.01$.
[a]High-SCV firms are those that reported SORs in 2014.
[b]High-SCV firms are those that reported SORs in 2014 but not in 2013.

SCV. We find evidence that both cost efficiencies and sales growth contribute to these improvements. We also find that firms with high SCV steadily improve their market valuation.

As discussed in our hypotheses, complying with conflict minerals disclosure requirements can be burdensome and costly (Griffin et al., 2014; Seay, 2012; Taylor, 2012). However, through the process of compliance, firms also generate greater SCV. As a result, firms that build SCV develop deeper knowledge about the operations of their direct suppliers as well as the operations of their upstream supply chain partners. Firms can leverage the knowledge developed through enhanced SCV to reduce costs. Our observation of improvements in profitability supports this notion. When we break down ROA into sales/assets and ROS, it is clear that the improvements in profitability are driven by cost efficiencies (see Table 9 Panel B) and not asset utilization (see Table 9 Panel A). On even further examination, these costs improvements are realized by both COGS and SG&A expenses (see Table 9 Panels C and D). This shows that firms with higher SCV are benefitting not only through reduced direct production costs (like manufacturing inputs) but also through efficiencies in ancillary costs (like overhead and indirect procurement).

Moreover, our findings indicate that the performance improvements from the SCV initiatives outweigh the costs of managing conflict minerals reporting because firms with higher SCV also improve their overall profitability. This suggests that to meet the disclosure requirement, high-SCV firms made operating changes during the process of

preparing high-SCV disclosures that led to improved performance. In this way, our results are aligned with research on operational initiatives in OM (e.g., quality management—Hendricks & Singhal, 1997; ISO 9000 certification—Corbett et al., 2005), which find that firms benefit by developing a better understanding of their operations.

It is important to note that the performance benefits of SCV start to realize right after the passage of Dodd-Frank in 2010—not after the first disclosures in 2013 or 2014. This is because firms are improving their SCV as they begin preparing their conflict minerals disclosures. Thus, they are making internal operational improvements that affect firm performance even before they actually file a Form SD. It seems that it is not the disclosure itself that leads to the improvement, but instead it is the work that goes into the disclosure preparation that makes the difference. Similar patterns of improvement have been observed in firms that undertake programs such as ISO 9000 (Corbett et al., 2005) or Six Sigma (Shafer & Moeller, 2012). In these cases, the majority of the improvements that firms experience are realized in the implementation process leading up to the program certification.

This discussion leads to an unexpected pattern in the results. We observe that the performance improvements drop off in the later years of our study (e.g., little or no abnormal performance 2013–2014 or 2014–2015). A possible explanation for this is that firms in the low-SCV groups in 2013 and 2014 may have improved their SCV in later years, thus leading low-SCV firms to become higher performing on average and eliminating the performance gap with the earlier high-SCV firms. Alternately, this helps demonstrate that SCV is not a proprietary tool and is therefore not a means of sustained competitive advantage. Again, a similar pattern has been observed in the case of ISO 9000, where certification offers performance boosts to early adopters. However, noncertified firm performance eventually catches up to that of certified firms (Corbett et al., 2005).

Our results on sales growth and Tobin's Q are surprising in that high-SCV firms experience improvements even before they disclose their levels of SCV. That is, firms are realizing improvements starting from 2010 and not only after they file their Form SD in 2013 or 2014. In the case of sales growth, it seems unlikely that these early improvements are attributable to higher volumes of consumer sales, as the firms have not yet advertised their improvements in SCV. Conversely, sales growth is likely because operating performance improvements have bolstered market opportunities. For example, a firm with more supply chain visibility has lower exposure to supply risks that might affect its ability to meet customer requirements. Consequently, firms with better SCV can maintain high levels of customer service, leading to increased revenues. In their study of supply chain glitches (i.e., supply and demand mismatches), Hendricks and Singhal (2005) find the counterargument true as well. That is, firms that have trouble meeting customer requirements due to supply chain issues experience significant negative abnormal performance in sales. Therefore, it aligns with our results that firms with superior SCV also realize significant revenue growth.

However, we do observe renewed improvements in sales growth in the later years of the analysis (i.e., 2014–2015 and 2015–2016). These are the years immediately following the first filings of Form SD. Therefore, the improvements here may be attributable to the release of the disclosures, and not the operational improvements realized by preparing the disclosures. The disclosures alert customers and the general

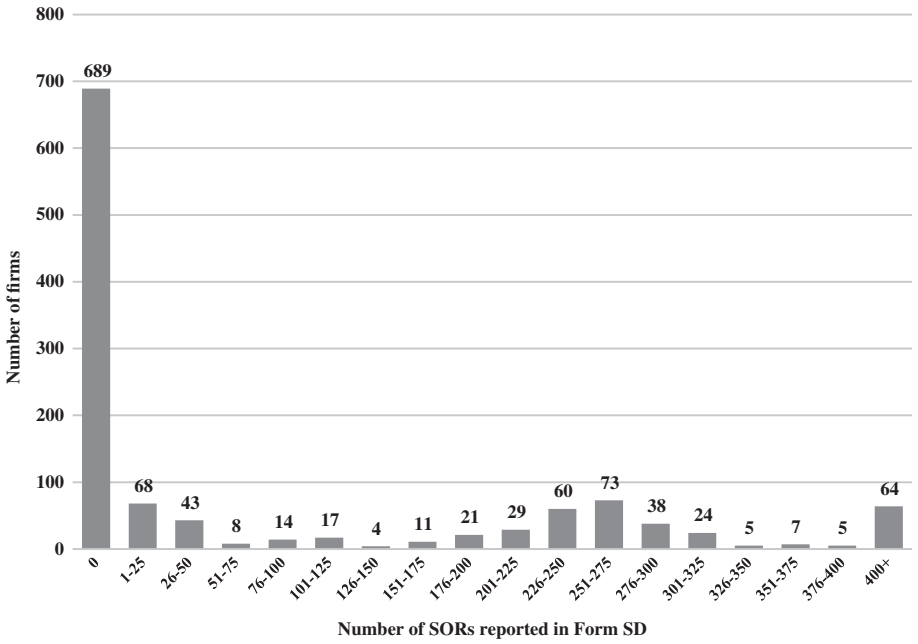

FIGURE 2 Number of SORs reported in 2014 Forms SD

public of a firm's level of SCV. A firm that takes conflict minerals reporting seriously indicates that it cares about corporate social responsibility (Dalla Via & Perego, 2018). Therefore, a firm that has high SCV becomes more attractive to responsibility-conscious consumers, thus increasing revenues from this market segment. Additionally, a firm disclosing that it has high SCV also signals that is has higher control over its upstream operations and lower supply risk. As a result, it may win more business and increased sales from organizations (other businesses, governments, NGOs, etc.) that want to contract with firms that have demonstrably better upstream visibility.

In the case of Tobin's Q, the early improvements in performance indicate that investors are reacting not only to the disclosure of superior visibility, but also to high-SCV firms' improvements in profitability. Corbett et al. (2005) observe a similar phenomenon when firms are preparing for ISO 9000 certification. They believe that the stock market is rewarding the better-managed, higher-performing firms. This is consistent with Bartlett and Partnoy's (2018) assessment that firms with more intangible assets tend to have higher values of Tobin's Q. If we consider higher SCV, better management, and lower supply risk to be intangible assets, it follows that these firms would also have higher market value. Additionally, Fu, Singhal, and Parkash (2016) show that higher Tobin's Q values are associated with improvements in ROS. This is consistent with our results.

One challenge that is common in studies using secondary data is establishing causality. But, our study design and results both provide evidence that link performance improvements to SCV. First, the study design controls for salient differences between the high- and low-SCV groups by comparing firms that are similar in size, performance, and industry prior to the passage of the Dodd-Frank Act. Thus, we mitigate potential bias from self-selection of high-performance firms into the high-SCV category. Second, the patterns of our results support the notion that improving SCV is the causal mechanism for performance improvements. In our results, the first significant annual differences in performance occur from 2010–2011. We test for any significant differences in the high- and low-SCV groups prior to Dodd-Frank (i.e., 2008–2009 and 2009–2010) and find that they are following similar trends in performance before this regulation is introduced. Third, by using multiple matching methods and robustness tests, we show that our results hold across a number of specifications.

Limitations of our study could be addressed in future research. First, we did not directly observe how firms improved their SCV. It would be interesting to understand what specific steps firms take to improve SCV and analyze how each contributes to improved operating performance. This will help create a richer understanding of the mechanisms that link SCV and performance improvements. Second, while we do observe significant patterns of improvement in COGS/sales and SG&A/sales, we did not obtain the actual costs incurred by firms related to assessing SCV. This is because firms are often reluctant to share such information publicly. A future avenue for research could be to obtain detailed cost information to evaluate the returns for investing in SCV. Third, we measure a firm's SCV based on what we observe in its Form SD, which could lead to potential misclassifications. For example, if a firm knows its SORs but does not report this information in its disclosure, it would have been categorized into the low-SCV group. However, this case would only serve to make our results more conservative. Any improvements the misclassified firm has realized due to its superior SCV would inflate the mean and median performance of the low-SCV group. Fourth, while our matching process follows well-established procedures from the operating performance literature, this may not be the most apt approach for our study. Because we address supply chain issues, using supply chain-specific matching characteristics such as supply chain complexity and number of supplier tiers could enhance the rigor of the analysis. However, we do not have such measures available for our data. We believe that the exploration between supply chain characteristics and SCV could be a fruitful avenue for future research.

Finally, our investigation of SCV is limited to the context of conflict minerals disclosures. We take advantage of this unique setting to expand the current understanding of overall supply chain visibility. While a useful first step, conflict minerals disclosures are merely one tool for gaining insight into supply chain visibility. It remains to be seen whether benefits from improving visibility are also realized in other settings. As visibility and supply chain issues become more critical, we expect and encourage more research into the implications of visibility.

ENDNOTES

[1] While Dodd-Frank §1502 mainly applies to manufacturing firms, it also covers any firm that contracts to manufacture. Therefore, this provision also applies to a significant number of retailers, wholesalers, service providers, or holding companies that contract to manufacture goods to sell. See Table 1 for a breakdown of the industries in our study that are affected by conflict minerals reporting.

[2] The conflict-free status of an SOR is usually audited and verified by a third party. For example, organizations such as the Responsible Minerals Initiative (formerly called the Conflict-Free Sourcing Initiative) audit and maintain databases of verified conflict-free SORs to assist firms in their reporting.

[3] Please see Section 7.1 for a discussion of alternate ways we attempted to operationalize the information disclosed in Form SD.

[4] For brevity, we do not include all four sets of Test 2 results for ROA in the main text. Test 2 results for ROA using the *performance-size-industry (SIC3)* method are shown in Table 6. Supporting results

tables for the remaining three methods can be found in Table B3 of the Supporting Information Appendix.

ORCID

V. Daniel R. Guide Jr. https://orcid.org/0000-0002-4458-8219

REFERENCES

Anner, M. (2018). CSR participation committees, wildcat strikes and the sourcing squeeze in global supply chains. *British Journal of Industrial Relations*, *56*(1), 75–98.

Arikan, O., Reinecke, J., Spence, C., & Morrell, K. (2017). Signposts or weathervanes? The curious case of corporate social responsibility and conflict minerals. *Journal of Business Ethics*, *146*(3), 469–484

Bales, K. (2016). *Blood and earth: Modern slavery, ecocide, and the secret to saving the world*. New York, NY: Spiegel & Grau.

Barber, B. M., & Lyon, J. D. (1996). Detecting abnormal operating performance: The empirical power and specification of test statistics. *Journal of Financial Economics*, *41*(3), 359–399.

Bartlett, R. P. & Partnoy, F. (2018). The misuse of Tobin's Q. UC Berkeley Public Law Research Paper. Retrieved from https://ssrn.com/abstract=3118020.

Bayer, C. N. (2014). Dodd-Frank section 1502: Post-filing survey 2014. Payson Center for International Development, Tulane University. Retrieved from http://payson.tulane.edu/sites/default/files/content/files/TulanePaysonS1502PostFilingSurvey.pdf.

Bendoly, E., Rosenzweig, E. D., & Stratman, J. K. (2009). The efficient use of enterprise information for strategic advantage: A data envelopment analysis. *Journal of Operations Management*, *27*(4), 310–323.

Caro, F., Chintapalli, P., Rajaram, K., & Tang, C. S. (2018). Improving supplier compliance through joint and shared audits with collective penalty. *Manufacturing & Service Operations Management*, *20*(2), 363–380.

Chen, S., Zhang, Q., & Zhou, Y. (2018). Impact of supply chain transparency on sustainability under NGO scrutiny. *Production and Operations Management*, forthcoming.

Cheng, B., Ioannou, I., & Serafeim, G. (2014). Corporate social responsibility and access to finance. *Strategic Management Journal*, *35*(1), 1–23.

Chopra, S., & Sodhi, M. S. (2014). Reducing the risk of supply chain disruptions. *MIT Sloan Management Review*, *55*(3), 72–80.

Chung, K. H., & Pruitt, S. W. (1994). A simple approximation of Tobin's q. *Financial Management*, *23*, 70–74.

Corbett, C. J., & Klassen, R. D. (2006). Extending the horizons: Environmental excellence as key to improving operations. *Manufacturing & Service Operations Management*, *8*(1), 5–22.

Corbett, C. J., Montes-Sancho, M. J., & Kirsch, D. A. (2005). The financial impact of ISO 9000 certification in the United States: An empirical analysis. *Management Science*, *51*(7), 1046–1059.

Cowan, A. R. (1992). Nonparametric event study tests. *Review of Quantitative Finance and Accounting*, *2*(4), 343–358.

Dalla Via, N., & Perego, P. (2018). Determinants of conflict minerals disclosure under the Dodd–frank act. *Business Strategy and the Environment*, *27*(6), 773–788.

De Pelsmacker, P., Driesen, L., & Rayp, G. (2005). Do consumers care about ethics? Willingness to pay for fair-trade coffee. *Journal of Consumer Affairs*, *39*(2), 363–385.

Dhanorkar, S., Donohue, K., & Linderman, K. (2015). Repurposing materials and waste through online exchanges: Overcoming the last hurdle. *Production and Operations Management*, *24*(9), 1473–1493.

Digging for Transparency. (2015.) Retrieved from https://www.globalwitness.org/en/campaigns/conflict-minerals/digging-transparency/.

Dimitrov, V., Palia, D., & Tang, L. (2015). Impact of the Dodd-frank act on credit ratings. *Journal of Financial Economics*, *115*(3), 505–520.

Distelhorst, G., Locke, R. M., Pal, T., & Samel, H. (2015). Production goes global, compliance stays local: Private regulation in the global electronics industry. *Regulation & Governance*, *9*(3), 224–242.

Doorey, D. J. (2011). The transparent supply chain: From resistance to implementation at Nike and Levi-Strauss. *Journal of Business Ethics*, *103*(4), 587–603.

Egels-Zandén, N., Hulthén, K., & Wulff, G. (2015). Trade-offs in supply chain transparency: The case of nudie jeans co. *Journal of Cleaner Production*, *107*, 95–104.

Epstein, M. J., & Yuthas, K. (2011). Conflict minerals: Managing an emerging supply chain problem. *Environmental Quality Management*, *21*(2), 13–25.

Ferretti, L. R. (2015). IBM project executive for environmental compliance & supply chain social responsibility. Personal communication on August 27, 2015.

Flammer, C. (2015). Does corporate social responsibility lead to superior financial performance? A regression discontinuity approach. *Management Science*, *61*(11), 2549–2568.

Flammer, C. (2018). Competing for government procurement contracts: The role of corporate social responsibility. *Strategic Management Journal*, *39*(5), 1299–1324.

Fletcher, N. (2013). Horse meat scandal wipes £300m off Tesco's market value. Retrieved from https://www.theguardian.com/business/marketforceslive/2013/jan/16/horse-meat-tesco-market-value-shares.

Fu, L., Singhal, R., & Parkash, M. (2016). Tobin's q ratio and firm performance. *International Research Journal of Applied Finance*, *7*(4), 1–10.

Fu, W., Kalkanci, B., & Subramanian, R. (2018). Are hazardous substance rankings effective? An empirical investigation of information dissemination about the relative hazards of chemicals and emissions reductions. *Manufacturing & Service Operations Management*, forthcoming.

Gray, J. V., Siemsen, E., & Vasudeva, G. (2015). Colocation still matters: Conformance quality and the interdependence of R&D and manufacturing in the pharmaceutical industry. *Management Science*, *61*(11), 2760–2781.

Griffin, P. A., Lont, D. H., & Sun, Y. (2014). Supply chain sustainability: Evidence on conflict minerals. *Pacific Accounting Review*, *26*(1/2), 28–53.

Gualandris, J., Klassen, R. D., Vachon, S., & Kalchschmidt, M. (2015). Sustainable evaluation and verification in supply chains: Aligning and leveraging accountability to stakeholders. *Journal of Operations Management*, *38*, 1–13.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (1998). *Multivariate data analysis*. Upper Saddle River, NJ: Prentice Hall.

Hartmann, J., & Moeller, S. (2014). Chain liability in multitier supply chains? Responsibility attributions for unsustainable supplier behavior. *Journal of Operations Management*, *32*(5), 281–294.

Healy, P. M., & Palepu, K. G. (2001). Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature. *Journal of Accounting and Economics*, *31*(1–3), 405–440.

Hendricks, K. B., Hora, M., & Singhal, V. R. (2014). An empirical investigation on the appointments of supply chain and operations management executives. *Management Science*, *61*(7), 1562–1583.

Hendricks, K. B., & Singhal, V. R. (1997). Does implementing an effective TQM program actually improve operating performance? Empirical evidence from firms that have won quality awards. *Management Science*, *43*(9), 1258–1274.

Hendricks, K. B., & Singhal, V. R. (2001). The long-run stock price performance of firms with effective TQM programs. *Management Science*, *47*(3), 359–368.

Hendricks, K. B., & Singhal, V. R. (2003). The effect of supply chain glitches on shareholder wealth. *Journal of Operations Management*, *21*(5), 501–522.

Hendricks, K. B., & Singhal, V. R. (2005). Association between supply chain glitches and operating performance. *Management Science*, *51*(5), 695–711.

Hendricks, K. B., & Singhal, V. R. (2008). The effect of product introduction delays on operating performance. *Management Science*, *54* (5), 878–892.

Hendricks, K. B., Singhal, V. R., & Stratman, J. K. (2007). The impact of enterprise systems on corporate performance: A study of ERP, SCM, and CRM system implementations. *Journal of Operations Management*, *25*(1), 65–82.

Hofmann, H., Schleper, M. C., & Blome, C. (2018). Conflict minerals and supply chain due diligence: An exploratory study of multi-tier supply chains. *Journal of Business Ethics*, *147*(1), 115–141.

Hoyt, D., Lee, H. L., & Tseng, M. M. (2008). *Unsafe for children: Mattel's toy recalls and supply chain management*. Case No. GS63. Stanford, CA: Graduate School of Business, Stanford University.

Jacobs, B. W., Kraude, R., & Narayanan, S. (2016). Operational productivity, corporate social performance, financial performance, and risk in manufacturing firms. *Production and Operations Management*, *25*(12), 2065–2085.

Jacobs, B. W., Singhal, V. R., & Subramanian, R. (2010). An empirical investigation of environmental performance and the market value of the firm. *Journal of Operations Management*, *28*(5), 430–441.

Kalkanci, B., Ang, E., & Plambeck, E. L. (2016). Strategic disclosure of social and environmental impacts in a supply chain. In A. Atasu (Ed.), *Environmentally responsible supply chains* (pp. 223–239). Cham, Switzerland: Springer International Publishing.

Kelly, K., & Seow, J. L. (2016). Investor reactions to company disclosure of high CEO pay and high CEO-to-employee pay ratio: An experimental investigation. *Journal of Management Accounting Research*, *28*(1), 107–125.

Kim, Y. H., & Davis, G. F. (2016). Challenges for global supply chain sustainability: Evidence from conflict minerals reports. *Academy of Management Journal*, *59*(6), 1896–1916.

Kim, Y. H. & Davis G. F. (2017). 80% of companies don't know if their products contain conflict minerals. Retrieved from https://hbr.org/2017/01/80-of-companies-dont-know-if-their-products-contain-conflict-minerals/.

Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science*, *42* (8), 1199–1214.

Kleindorfer, P. R., & Van Wassenhove, L. N. (2004). Managing risk in global supply chains. In H. Gatignon, J. R. Kimberly, & R. E. Gunther (Eds.), *The INSEAD-Wharton Alliance on globalizing*. Cambridge, UK: Cambridge University Press.

Kraft, T., Valdés, L., & Zheng, Y. (2018). Supply chain visibility and social responsibility: Investigating consumers' behaviors and motives. *Manufacturing & Service Operations Management*, *20* (4), 617–636.

Lamming, R., Caldwell, N., & Phillips, W. (2006). A conceptual model of value-transparency in supply. *European Management Journal*, *24*(2), 206–213.

Lamming, R., Caldwell, N., Phillips, W., & Harrison, D. (2005). Sharing sensitive information in supply relationships: The flaws in one-way open-book negotiation and the need for transparency. *European Management Journal*, *23*(5), 554–563.

Lee, H. L., & Rammohan, S. V. (2017). Improving social and environmental performance in global supply chains. In Y. Bouchery, C. J. Corbett, J. C. Fransoo, & T. Tan (Eds.), *Sustainable supply chains* (pp. 439–464). Cham, Switzerland: Springer International Publishing.

Littenberg, M.R., Damania, F.F., & Matos, A. (2014). Conflict minerals reporting. Retrieved from http://www.conflictfreesourcing.org/srz-conflict-minerals-reporting-2014/.

Lo, C. K., Pagell, M., Fan, D., Wiengarten, F., & Yeung, A. C. (2014). OHSAS 18001 certification and operating performance: The role of complexity and coupling. *Journal of Operations Management*, *32* (5), 268–280.

Loon, Y. C., & Zhong, Z. K. (2016). Does Dodd-frank affect OTC transaction costs and liquidity? Evidence from real-time CDS trade reports. *Journal of Financial Economics*, *119*(3), 645–672.

Marshall, D., McCarthy, L., McGrath, P., & Harrigan, F. (2016). What's your strategy for supply chain disclosure? *MIT Sloan Management Review*, *57*(2), 37.

Marucheck, A., Greis, N., Mena, C., & Cai, L. (2011). Product safety and security in the global supply chain: Issues, challenges and research opportunities. *Journal of Operations Management*, *29*(7), 707–720.

McCrudden, C. (2007). *Buying social justice: Equality, government procurement, & legal change*. Oxford, UK: Oxford University Press.

Mol, A. P. (2015). Transparency and value chain sustainability. *Journal of Cleaner Production*, *107*, 154–161.

Mueller, M., Dos Santos, V. G., & Seuring, S. (2009). The contribution of environmental and social standards towards ensuring legitimacy in supply chain governance. *Journal of Business Ethics*, *89*(4), 509–523.

New, S. (2010). The transparent supply chain. *Harvard Business Review*, *88*, 1–5.

OECD (Ed.). (2016). *OECD due diligence guidance for responsible supply chains of minerals from conflict-affected and high-risk areas* (3rd ed.). Paris, France: OECD Publishing.

Pettit, T. J., Croxton, K. L., & Fiksel, J. (2013). Ensuring supply chain resilience: Development and implementation of an assessment tool. *Journal of Business Logistics*, *34*(1), 46–76.

Pigors, M., & Rockenbach, B. (2016). Consumer social responsibility. *Management Science*, *62*(11), 3123–3137.

Plambeck, E. L. (2013). OM forum—Operations management challenges for some "cleantech" firms. *Manufacturing & Service Operations Management*, *15*(4), 527–536.

Porteous, A. H., Rammohan, S. V., & Lee, H. L. (2015). Carrots or sticks? Improving social and environmental compliance at suppliers through incentives and penalties. *Production and Operations Management*, *24*(9), 1402–1413.

Preuss, L. (2007). Buying into our future: Sustainability initiatives in local government procurement. *Business Strategy and the Environment*, *16*(5), 354–365.

RBA Code of Conduct. (2018). Retrieved from http://www.responsiblebusiness.org/media/docs/RBACodeofConduct6.0_English.pdf.

Schwartz, J. (2016). The conflict minerals experiment. *Harvard Business Law Review*, *6*, 129–184.

Seay, L. 2012. What's wrong with Dodd-Frank 1502? Conflict minerals, civilian livelihoods, and the unintended consequences of western advocacy. Retrieved from https://www.cgdev.org/sites/default/files/1425843_file_Seay_Dodd_Frank_FINAL.pdf.

SEC Final Rule: Conflict Minerals. (2012). Retrieved from https://www.sec.gov/rules/final/2012/34-67716.pdf.

Shafer, S. M., & Moeller, S. B. (2012). The effects of six sigma on corporate performance: An empirical investigation. *Journal of Operations Management*, *30*(7–8), 521–532.

Sodhi, M. S., & Tang, C. S. (2012). *Managing supply chain risk (international series in operations research & management science)*. New York, NY: Springer-Verlag.

Swink, M., & Jacobs, B. W. (2012). Six sigma adoption: Operating performance impacts and contextual drivers of success. *Journal of Operations Management*, *30*(6), 437–453.

Taylor, C. R. (2012). Conflict minerals and SEC disclosure regulation. *Harvard Business Law Review Online*, *2*, 105–120.

The Responsible Minerals Initiative. (2015). Five practical steps to support SEC conflict minerals disclosure. Retrieved from http://www.responsiblemineralsinitiative.org/media/docs/CFSI%20White%20Paper-Conflict%20Minerals%20Disclosure-Feb%202015.pdf.

Verrecchia, R. E. (2001). Essays on disclosure. *Journal of Accounting and Economics*, *32*(1–3), 97–180.

Vogel, C., & Raeymaekers, T. (2016). Terr (it) or (ies) of peace? The Congolese mining frontier and the fight against "conflict minerals". *Antipode*, *48*(4), 1102–1121.

Walker, R., & Merkley, G. (2017). *Chipotle Mexican grill: Food with integrity?* Case KEL979. Evanston, IL: Kellogg School of Management, Northwestern University.

Young, S. B. (2018). Responsible sourcing of metals: Certification approaches for conflict minerals and conflict-free metals. *The International Journal of Life Cycle Assessment*, *23*(7), 1429–1447

Zhang, H., Aydin, G., & Heese, H. S. (2017). Curbing the usage of conflict minerals: A supply network perspective. Retrieved from https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2980369.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of this article.

How to cite this article: Swift C, Guide Jr. VDR, Muthulingam S. Does supply chain visibility affect operating performance? Evidence from conflict minerals disclosures. *J Oper Manag*. 2019;65: 406–429. https://doi.org/10.1002/joom.1021