Blockchain in the Role of Emancipatory Technology

Jordana J. George  
_Mays Business School at Texas A&M University, jgeorge@mays.tamu.edu_

G. Dwayne Whitten  
_Texas A&M, dwhitten@mays.tamu.edu_

Follow this and additional works at: https://aisel.aisnet.org/amcis2020

**Recommended Citation**

George, Jordana J. and Whitten, G. Dwayne, "Blockchain in the Role of Emancipatory Technology" (2020).  
https://aisel.aisnet.org/amcis2020/global_dev/global_dev/8

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2020 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.
Blockchain in the Role of Emancipatory Technology

Completed Research

Jordana George
Mays Business School
Texas A&M University
jgeorge@mays.tamu.edu

G. Dwayne Whitten
Mays Business School
Texas A&M University
dwhitten@mays.tamu.edu

Abstract

Historically, women miners have been at a disadvantage in the mining industries due to factors outside of their control. This has caused them problems related to less income and worse working conditions as compared to their male counterparts. This research demonstrates how blockchain can be used as an emancipatory technology that can help improve the economic and ultimately social impact of these marginalized workers. Specifically, the paper demonstrates how mediating economic opportunity through an emancipatory technology such as blockchain can reduce negative influences of gender bias, ASM involvement, poor market conditions, and ethical consumption and ultimately provide greater benefits for women miners.

Keywords

Blockchain, mining, women miners, controversial minerals, Everledger

Introduction

Mining is an ancient male-dominated profession that depends on manual labor, heavy equipment, logistics to move the ore, and markets for buying and selling to distributors, middlemen, and retailers (World Bank 2001). It is also a common profession where economic opportunities are limited, such as in the rural areas of lesser developed countries (LDCs) (World Bank 2001). Mining wages are generally better than agriculture wages, are not limited by growing seasons, droughts, or insects, and don’t require time-sensitive harvests and delivery to markets. While mining is often thought of as one of the last male-dominated professions, millions of women miners also participate in the industry (Weldegiorgis et al. 2018). Women miners often share similar motivations with men, such as needing to earn money and escaping poverty, but they also have other priorities such as family responsibilities or may be widowed or divorced in a male dominated society that provides no safety net (Brottem and Ba 2019). Women miners also experience gender discrimination that manifests in inaccessible labor markets, poorer task assignments, lower comparable wages, and vulnerability to dealers and middlemen who offer below-market prices for their goods. Compared to the alternatives, mining can still provide a good living for many women despite these challenges (Weldegiorgis et al. 2018). One element of mining impacts all miners, regardless of gender, and that is the market for their goods. While gemstone and mineral markets have always been impacted by economic factors, more recently another variable has entered the picture, that of the ethical consumption movement. Mined goods, especially those from LDCs that may be economically poor and politically unstable, are often associated with conflict minerals. The terms conflict minerals and blood diamonds describe mined resources that fund armed hostilities and violence, damage the environment and local communities through poor mine management, defraud governments out of taxes through smuggling, and exploit workers such as child laborers (Financial Action Task Force and Egmont Group 2013; Human Rights Watch 2009; Moraes et al. 2017). A recent technology solution for addressing conflict minerals is the advent of blockchain based provenance systems that can track a particular stone from mine to market (Bates 2020; Roberts 2017). While such systems can be expensive and are often aimed at large global mining concerns, they can become accessible for artisanal and small (ASM) mines, as well. In this study we ask how
Blockchain in the Role of Emancipatory Technology

Using Critical Theory, we examine how blockchain-based gemstone provenance serves as an emancipatory technology that improves outcomes for women miners through the verification of stone origin, export/import movement, pricing, and authentication that ultimately impacts earnings. This work contributes to the Information Systems literature on blockchain by demonstrating how it can be used as an emancipatory technology. The paper also contributes to research on social inclusion by demonstrating how a marginalized group uses information systems to level the playing field. Global development research is another area of contribution, as this study focuses on economic opportunities in LDCs. Last, this paper contributes to the literature on ethical consumption and how information systems can be used to verify the ethical claims of goods.

Background and Literature Review

Women in Mining

It comes as no surprise, given the amount of recent press and research on the topic, that women in general face greater hurdles in the workplace than men (Witz 2013). From technology firms to medicine and from engineering to construction, women routinely earn less than their male counterparts, are subject to inhospitable treatment, and are denied promotions and advancement (Jaffee 1989). Women in mining are no exception. When people think of mining, a man in a hardhat digging away is what typically comes to mind. However, women have participated in both above and below ground mines for centuries (Yoshida and Miyauchi 2006). Women participate in mining because it can be a lucrative job in communities with poor economic prospects other than agriculture. Mining can provide women with economic independence and greater personal power (Brottem 2018). Despite a robust history, women miners have not only been invisible but have suffered gender inequality as their traditional roles (mother, wife) conflicted with economically necessary roles (worker, miner) (World Bank 2018; Yoshida and Miyauchi 2006). In Sub-Saharan Africa in particular, women mined long before European colonialism and continue to mine in the 21st century. Often beset with harassment from male miners, patriarchal laws, limitations on the jobs they are allowed to perform, childcare duties, homemaker chores, poverty, and limited education, these women often struggle to make ends meet and provide a safe home for their families while working in remote locations (Brottem and Ba 2019; International Women in Mining 2020; Yoshida and Miyauchi 2006). One example is Pili Hussein, a Tanzanian woman who went from working mines dressed as a man to owning her own mines with 70 employees and 150 acres. Her true identity was not revealed until she was accused of rape (McDermott 2017; UN Women 2018). ASMs make up a small portion of the diamond and gold mining industries and are generally at a disadvantage compared to large mining concerns (Moyo Gemstones 2020). However, colored gemstone production relies heavily on ASMs (Everledger 2019; Pact 2019). Women miners are commonly found at ASM mines, with an estimated workforce at 30%-50% female (Weldegiorgis et al. 2018; World Bank 2018). However, working at an ASM doesn’t guarantee equal rights with men. Women are still limited to certain roles such as carrying buckets of ore instead of digging or building scaffolding (Brottem and Ba 2019). Women miners may also receive lower prices for their stones because of lack of education in mineralogy or access to trading networks (World Bank 2001). Yet even with these challenges, ASMs provide relatively good economic opportunities for women (Brottem 2018). Connecting with others and finding strength in numbers is one way to increase opportunities for women in mining (Weldegiorgis et al. 2018). The International Women in Mining association (IWM), founded in 2006, has nearly 10,000 members in more than 100 countries. The association focuses on improving the lives of women miners, increasing opportunities, and influencing policy and law to equalize the work environment (International Women in Mining 2020). IWM is networked with over 45 regional mining groups around the world, some of which originated a decade earlier, such as the Tanzania Women Miners Association (TAWOMA). ASMs in general, and women miners especially because they are more likely to be working in ASMs, struggle from stigmas surrounding gemstone mining and the impact of ethical consumption. This is one of the problems that women’s mining organizations try to address.

The Ethical Consumption Movement and Conflict Minerals

Ethical consumption is the intentional purchase of goods that come from ethical sources that match consumers’ social and personal values, and may include the avoidance of products that violate consumer ethics (Bucic et al., 2012; Harrison, et al. 2005). Identified in the early 2000s as a growing movement that influenced purchasing decisions, ethical consumption continues to appeal to consumers almost twenty
Blockchain in the Role of Emancipatory Technology

years later (Carrigan et al. 2004; Govind et al. 2019). The common issues that ethical consumers care about include products that don’t damage the environment (ecological motives), don’t fund wars or conflicts (political motives), support fair trade and labor practices (social equality motives), and are healthy and safe for both consumers and producers, such as organic, non-GMO, or antibiotic-free foods (health motives) (Carrigan et al. 2004; Honkanen et al. 2006; Papaoikonomou et al. 2012). A key element of ethical goods is the verification of whatever assertions the product is claiming (Gualandris et al. 2015). Minerals and especially gemstones have a dark history that includes financing armed conflict, destroying the environment, abusing human rights, laundering money, and exploiting laborers, including child labor (Human Rights Watch 2009; Moraes et al. 2017). Terms such as blood diamonds and conflict minerals began to be used by the general public. Governments began to regulate against conflict minerals, such as the 2012 Dodd-Frank Act in the US and EU regulations from 2016 (Lewis 2016). As consumers became more aware of the legacy of controversial minerals, they began to avoid these tainted goods for ethical alternatives and the market for many of these stones began to slow (Biesheuvel and Bloomberg 2019; Gladstone 2019; Moraes et al. 2017; Wexler 2019). However, gemstone suppliers believed that they could ameliorate some of the market decline with supply chain transparency and by adding provenance. Provenance refers to the history of an item, including its origin and its physical journey through multiple stages of the supply chain and locations, along with any modifications that may have been made to it. The first attempt at demonstrating supply chain transparency was the 2003 Kimberley Process, a certification protocol managed and audited by firms and nations in the diamond business - miners, cutters, jewelers, traders, importing countries, etc. While the Kimberley Process was originally hailed as a way to halt the trade of conflict minerals, it was impotent to enforce non-compliance and fraud (Financial Action Task Force and Egmont Group 2013; Human Rights Watch 2016; Kimberley Process 2020; US Customs & Border Protection 2019). The failure of the Kimberley Process to ensure provenance led to greater efforts by big diamond firms such as DeBeers to create more rigorous and secure methods (Shabalala 2018). Tracking gemstones from mine to market could inform ethical consumers about the source of a stone, what country it was exported to, where it was cut, who placed it in a particular piece of jewelry, and where it was finally sold (Morris 2018). Such tracking not only provided provenance but also authenticity. One of the technologies that has recently gained traction in the gemstone supply chain is blockchain.

Blockchain and its Use in Gemstone Supply Chains

Blockchain is a distributed public ledger system for digital records, first developed as the digital currency Bitcoin in 2008 by the pseudonym Satoshi Nakamoto (Swan 2015). Cryptocurrencies are considered Blockchain 1.0, the first evolution of the technology, which quickly grew to Blockchain 2.0 (applications for finance, contracts, real estate, and general markets), and Blockchain 3.0 (new applications in healthcare, supply chains, government, art, and other areas) (Karamitsos et al. 2018; Swan 2015). In the context of supply chains, blockchain is particularly well suited to providing provenance because of the transparency of transactions and the “distributed trust” that comes from the blockchain network (Francisco and Swanson 2018; Loebbecke et al. 2018). In the latter half of the 2010s, gemstone and gold mining companies began to explore blockchain opportunities. Several technology startups hit the market, led by Everledger in 2015, and were accelerated by partnerships between tech firms and suppliers. The main players in this arena include Tracr, Everledger, the Russian government, and Clara (Bates 2020; Roberts 2017). To summarize, diamonds can have over 200 distinct characteristics that can be used to identify it. New technologies have evolved to put a physical identifier on stones, as well, hidden deep inside a stone and visible only with a microscope (Islam 2019). Such marks cannot be removed or changed and thus lend themselves to blockchain ledgers. Blockchain is still in its infancy and new uses for it are being discovered regularly, including how to employ it as an emancipatory technology for social welfare.

Emancipatory Technology

Emancipatory technology (ET) is an information and communications technology (ICT) or information system that provides social benefits implicitly or explicitly. ET requires an understanding of social marginal benefits that may have no apparent economic value yet provide positive spillovers for society (Joseph 2002; Kanungo 2004; Lleras 1996). Past ET research often focused on the digital divide and aiding people in lesser developed countries, rural areas, and marginalized populations (Cecchini and Scott 2003; Joseph 2002; Kanungo 2004; Lleras 1996). While some studies focused on technical skills in these populations, others focused on physical barriers that limit access, such as building infrastructure in inhospitable terrain or
smartphone vs. computer usage (George and Leidner 2018; Young 2017). The extant research has identified a number of benefits that emancipatory technologies can address. We focus on the main advantages of ET, which include economics, health, education, and social wellbeing. Poverty can be reduced through systems that provide access to business and work opportunities, improved efficiency and cost reductions, microfinance, and improved access to government and business services (Cecchini and Scott 2003; Ebbers et al. 2016; Henry et al. 2017). Healthcare can be improved through access to health information, improved communications, and management of health initiatives (Cecchini and Scott 2003; Henry et al. 2017). Education can be extended through access to diverse learning resources (Cecchini and Scott 2003; Pagani et al. 2016). Education can also lead to emancipatory pedagogy which enlightens outsiders about a marginalized group and their culture, thus engendering outsider interest and empathy (Young 2017). ET can improve access to government services which provide easier routes for filing paperwork, paying taxes, understanding laws and regulations, and taking advantage of government social benefits and opportunities (Ebbers et al. 2016; Kanungo 2004). ET has also improved conditions through information about comparative wages and rents in an area, availability of insurance or even directories for emergency veterinary services to save livestock (Kanungo 2004; Venkatesh and Sykes 2013). Last, while much of the literature on ET and the digital divide focuses on user skills and how the lack of technical skills impacts technology usage (Joseph 2002; Pagani et al. 2016), other studies have determined that people who have access will find a way to utilize digital services regardless of their skill level (Ebbers et al. 2016).

**Theoretical Lens: Critical Theory**

We employ critical theory for the research lens in this study. Critical theory is a form of qualitative research that aims to tease out the conditions that promote and maintain inequality and identify the means for change (Myers & Klein, 2011). There are several aspects to critical theory; insight into the phenomenon, problems and the institutions that can mitigate them, and potential solutions to the problems identified (Alvesson & Willmott 2002; Myers & Klein, 2011). In regard to women miners in Sub-Saharan Africa, the issues include 1) women miners struggling to overcome gender bias; 2) ASM miners struggling to compete with large competitors; and 3) gemstone markets impacted by controversial supply chains and ethical consumption trends. The institutions that can impact these issues include the gemstone supply chain, buyers, exporters, stone cutters, and distributors, as well as governments that oversee and enforce regulations. Last, we examine one particular solution for these issues; blockchain technology that provides product provenance and enhances transparency in supply chains. We demonstrate how this solution may improve conditions for women miners.

**Method**

This study uses a conceptual and qualitative approach to pose practical and theoretically relevant questions and propositions. For this study, an iterative approach was used to first investigate the phenomenon, gather the literature relevant to that topic, and then return to the phenomenon with new insights. Several iterations took place, resulting in the breakdown of the phenomenon into subtopics, including Women in Mining, the Ethical Consumption Movement, Conflict Minerals, Blockchain in Gemstone Supply Chains, and Emancipatory Technology. TAWOMA was selected as a representative case because of the relative wealth of information available about the organization, its members, and its partners. After identifying each topic, examples were then searched and appropriate participants identified for additional data. Each subtopic was then used as a focus to search out personal stories, news, speeches, blogs, social media, interviews, and other sources of qualitative insights. Additional questions were posed via email and social media to women miners, their business partners, and advocates.

**Case: Tanzania Women Miners Association**

Tanzania is blessed with a variety of natural resources, including diamonds and colored gemstones, minerals, gold, copper, uranium, and gas (Mushokolwa 2019; Suedi 2018). Taking the diamond industry as an example, Tanzania’s mining economy has had its ups and downs. Since 2014, Tanzania has shown significant growth in the volume of diamonds, the overall value of the diamonds, and the price per carat of Tanzanian diamonds. These statistics mean that not only is Tanzanian diamond production growing but prices for Tanzanian diamonds have grown faster than global diamond prices, indicating an increase in quality and value (The Global Economy 2019) that is likely due to improved access to modern techniques.
and equipment and education in mineralogy and recognizing quality. Despite the growth, Tanzania’s attempts to benefit from their mineral resources have often been damaged by smuggling, fraud, and tax evasion, commonly perpetrated by some artisanal and small miners who operate under the radar. In response, greater regulation and oversight has been instituted by a government attempting to gain control of mineral supply chains (Mushokolwa 2019; Suedi 2018). One of the more extreme measures included building a literal wall around Tanzanite mines (Ng’wanakilala et al. 2017). Environmental problems have cropped up as well, as some mine operations damage water resources and impact nearby communities. The government has stepped up to address these challenges, even closing mines until problems are fixed. “The life of even one Tanzanian is worth more than their gold mining activities,” stated Doto Biteko, the Tanzanian Minister for Minerals (Ng’wanakilala and Shabalala 2019). Many workers in these ASM mines are women who are attracted by relatively high wages paid to miners (although women’s wages are generally lower than men’s) and the independence and escape from poverty that accompanies increased incomes (Weldegiorgis et al. 2018). Women miners also experience discrimination, unfair labor practices, limited advancement, intolerance of familial duties, patriarchal laws regarding property rights, and unsafe working and living conditions. Fatuma, a miner speaking to Pact representatives, shared that “...since I don’t get enough minerals to sell directly to the market, instead I sell them to small brokers. I have to accept whatever price the broker offers,” (Pact 2019). To combat these challenges, TAWOMA was formed in 1997. TAWOMA has a diverse set of priorities that are particularly relevant for women:

The main objective of the Association is to address problems of disorganized mining, including mining related activities, economic hardships, poverty alleviation, and prevention of diseases affecting Tanzania society in general, and Women Miners and children in particular. Much has been done by the Association, in terms of organizing Women Miners, and educating them on the hazards of indiscriminate mining, and its effect to the environment. But, it has become apparent that Women Miners, need to be empowered, through economic means as well. (TAWOMA 2020)

The vision for the organization provides a concise goal: “To have in existence, a mining sector, where gender imbalances do not exist, and access to resources for sustainable development of mining, have no limits,” (TAWOMA 2020). While mainstream mining industry associations are often more concerned with economic matters than social issues, it is interesting to note that TAWOMA specifically calls out gender imbalance, the environment, children, health, and poverty issues, reinforcing the concept that women perceive their mining roles differently than miners in general (Brottem and Ba 2019). TAWOMA has had new challenges, as well, as markets for gemstones and diamonds evolve and diminish (Wexler 2019). There are negative forecasts in gemstone mining in particular because of shrinking markets. A major theme impacting these markets is changing consumer tastes that result from ethical consumption values. In short, younger consumers have a tendency to eschew mined gemstones because of the products’ ties to armed conflicts and violence and the destructive impact on the environment (Lewis 2016; Shabalala 2018). TAWOMA has attempted to address these challenges through offering workshops and education, lobbying for regulation and policy change, improving relationships between large and ASM enterprises, supporting workers’ rights, and representing a positive image to the international diamond community (TAWOMA 2020). Education on mineralogy, for example, led to increases in the value of output as women miners were better able to identify quality stones and negotiate fairer prices for them (Hill 2019). One of TAWOMA’s recent endeavors focuses on the impact of ethical consumers. TAWOMA has embraced ethical consumption values because they closely mirror their own in terms of protection of the environment where they live, health and safety, safeguarding communities from armed conflict, and eradication of poverty. In seeking a way to improve their share in uncertain markets, the organization realized that new blockchain provenance technologies could provide solutions to some of the problems plaguing their output of gemstones. Not everyone embraced the technology, however (Brugger 2019). "Technologies like Blockchain can give providence to the mine site but it doesn’t fix any adverse conditions that may exist there,” suggested Anand Giridharadas, (Chicago Responsible Jewelry Conference 2019). Still, most TAWOMA members were positive about the benefits of the blockchain system, as were jewelry makers and buyers. "By buying into something that benefits everyone in the supply chain, they honour the work of the women who do the most dangerous part of the process – those actually pulling the gems out of the ground,” offered Cristina Villegas, a Scottish jeweler involved in the ethical jewelry movement (McEachern 2020). In 2017 the organization began to work with the nonprofit international development organization Pact, jewelry partners ANZA Gems and Nineteen48, the Gübelin Gem Lab, and blockchain provenance developer Everledger. The collaboration was called Moyo Gemstones and hit the market in the spring of 2019.
By allowing the gemstones mined by TAWOMA to be securely traced all the way from miner to market, our solution provides an unalterable record of where a gemstone has been, how it has been processed, and the legacy it leaves behind. It increases transparency throughout the supply chain, empowering the female miners in TAWOMA to work safely, mine better and improve financial security. Additionally, this programme is kindly funded by the House of Gübelin, with no cost to participating mining communities. (Everledger 2019)

Since Moyo Gemstones was introduced, women miners have praised it, citing greater confidence in gemstone pricing run through a controlled and transparent environment (Nineteen48 2019). Moyo Gemstones estimates that their women miners retain 95% of the export price of their stones because of transparency, a far cry from the opaque pricing that was formerly used (Moyo Gemstones 2019). More money for their efforts has also translated into better equipment and training, expanded operations, additional workers, and greater assets owned by women. The system has also opened new doors for TAWOMA members, such as participation in industry trade shows that focus on ethical gems (Elliott 2020).

Discussion and Propositions

In this study, we examine the plight of women miners through the case of the women miners of Tanzania, the antecedents of their situation, and how blockchain serves as an emancipatory technology. If we look at impact on women miners as our dependent variable, their economic opportunity is the variable with a direct impact upon them. The variables that influence economic opportunity include gender bias, ASM involvement, market conditions, and ethical consumption trends. We also posit that the interaction of these independent variables contributes to a magnified impact on the economic opportunity for women miners. The themes derived from the case and literature are summarized in Table 1.

Table 1. Drivers of Economic Opportunity

<table>
<thead>
<tr>
<th>Influence</th>
<th>Example</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender bias</td>
<td>“I was told that women were not allowed to enter the mines.”</td>
<td>Pili Hussein, (UN Women 2018)</td>
</tr>
<tr>
<td></td>
<td>“One of the most important reasons why women have remained invisible is</td>
<td>(Weldegiorgis et al. 2018)</td>
</tr>
<tr>
<td></td>
<td>that the literature has historically focused, to a large extent, on digging practices, ... excluding women who are mostly engaged in such nondigging activities as crashing, sluicing, washing, panning, sieving, sorting, transporting, mercury-gold amalgamation, amalgam decomposition, cleaning and food vending.”</td>
<td></td>
</tr>
<tr>
<td>ASM involvement</td>
<td>“I don’t get enough minerals to sell directly to the market, instead I sell them to small brokers. I have to accept whatever price the broker offers”</td>
<td>Fatuma (Miner), (Pact 2019)</td>
</tr>
<tr>
<td>Declining market</td>
<td>“The open market price for rough diamonds (is) falling by about 9% year-to-date.”</td>
<td>Edward Sterck, (Biesheuvel and Bloomberg 2019)</td>
</tr>
<tr>
<td>Ethical consumption</td>
<td>“Sourcing ethical precious metals and gemstones is hugely important to me as it is the only way to guarantee the products that I am buying have come from a fully traceable and sustainable supply chain.”</td>
<td>Sally Grant, (McEacher, 2020)</td>
</tr>
<tr>
<td>Combined effects</td>
<td>“Women working in small scale mines face discrimination at multiple levels whereby men control and benefit from most resources including access to land for mining, incomes, credit, mining and household commodities. Women have limited access to health care, contraception and sexual and reproductive health and rights (SRHR) education thus limiting their opportunities to engage in economic activity and improve their status....Women in the small scale mines are subjected to sexual harassment, Sexual and Gender Based Violence and transactional sex making them more vulnerable to unwanted pregnancies, sexually transmitted infections and maternal death.”</td>
<td>(Golden Line, 2020)</td>
</tr>
</tbody>
</table>

While gender bias is difficult to endure under any circumstances, it is particularly challenging in male-dominated professions such as mining where women are discriminated against, denied advancement, and
often made to feel invisible (Jaffee 1989; Tawoma 2011; Yoshida and Miyauchi 2006). We, therefore, suggest the following proposition:

**P1: Gender bias negatively impacts the economic opportunity of women miners.**

The mined minerals industry is marked by oligopoly, where a few enormous global companies command the lion’s share of production (Gladstone 2019; Wexler 2019). Yet among these behemoths, ASMs attempt to make a living from the resources of their own land, especially in colored gemstones. Making up a small percentage of mining firms, ASMs are home to many of those denied equal job access in large firms or need consideration for other responsibilities such as child or elder care (Gladstone 2019; Wexler 2019). ASMs have had a poor reputation, as well, with accusations of fraud and smuggling (Evans 2019). They may often operate outside of the legal frameworks and are frequently excluded from mainstream markets, making a difficult situation even worse for ASM members who are attempting to operate legally but have been marginalized (Evans 2019; Kyatusiimire 2018). ASMs may also find it difficult to handle burdensome paperwork such as that required for Kimberley Process certificates, in contrast to large producers with entire departments of administrators. Women make up 30% - 50% of ASMs and are particularly impacted by participation in ASMs. We, therefore, suggest the following proposition:

**P2: ASM involvement negatively impacts the economic opportunity of women miners.**

Miners of all stripes and in all sized organizations are subject to markets. The diamond market in particular has been beset with challenges ranging from an excess of inventory to an increase in competitors (Linde et al. 2018; Moraes et al. 2017; Wexler 2019). While the market influences all mining operations, we suggest that women miners are especially challenged when markets decline because of their precarious position in the industry. We, therefore, offer the following proposition:

**P3: Declining market conditions negatively impacts the economic opportunity of women miners more than male miners.**

Markets are driven by supply or demand, and occasionally both at the same time. Currently, there is an excess of raw diamonds in the market at a time when consumers are avoiding tainted goods such as conflict minerals that fund wars or mined minerals that destroy the environment. Other problems such as child labor and labor exploitation create an image of certain products as unethical and something to be avoided. The ethical consumption movement has had a direct influence on the sale and movement of conflict minerals, from the creation of the Kimberley Process nearly 20 years ago to the growth of lab-created gemstone sales with no ties to mining (Moyo Gemstones 2020). In light of these influences, we suggest the following proposition:

**P4: Ethical consumption negatively impacts the economic opportunity of women miners.**

In reviewing propositions 1 through 4, we note that these variables influence each other as well as economic opportunity. Ethical consumption impacts market conditions, causing markets to rise or fall. Market conditions also influence ASM members as poor markets compound the difficulties that ASMs face in selling their goods. When markets are poor and inventory is high, excess labor is often laid off, exacerbating gender bias issues when women are more likely to lose jobs. Therefore, we posit the following proposition:

**P5: The combined interactions of P1-P4 magnify the individual effects on the economic opportunity of women miners.**

Last, we look at how emancipatory technology can relieve some of the challenges facing marginalized people. In particular, blockchain technology can effectively enable mineral provenance and offer the following benefits: 1) Prove that products were mined ethically through mine location data; 2) Prove that products were sold and exported ethically through transaction ledgers; 3) Provide legal evidence that a mining firm has operated within the law and is not party to money laundering, fraud, or smuggling, as demonstrated by transaction ledgers; and 4) Permanently identify physical gemstones with interior-stone markings that link it to its blockchain provenance data. These actions can address ethical consumption concerns, somewhat level the playing field for ASMs, help protect mining jobs for women, equalize pricing for goods, and improve market conditions. Thus, we posit that when economic opportunity is mediated through ET, the negative impacts of gender bias, ASM involvement, market conditions, and ethical consumption are reduced. This is stated in the following proposition:

**P6: Mediating economic opportunity through ET reduces the negative impacts of P1-P5.
Implications

There are several implications to be drawn from this research. For researchers, the study of ET is expanded to practical technologies in traditional industries. This paper focuses on the physical and dangerous industry of mining, whose workers and firms can be aided through emancipatory technology. For practitioners, we address the implications for ET in general and for blockchain in mining in particular. ET can improve the lot of millions of marginalized people if the social benefits of such systems are given the same priority as economic or organizational objectives. We also show how communities can embrace ET and how it is especially beneficial for communities dependent on industries such as mining. Utilizing blockchain to establish mineral provenance provides evidence to counteract slurs against ASMs, suspicions about blood diamonds and conflict minerals, worries about authenticity, and concerns about the environments, communities, and workers involved. Blockchain also offers new marketing opportunities if producers capitalize on each stone’s story and highlight the woman who mined it and how her work impacts her family and community.

Conclusion

This paper demonstrates how blockchain can serve as an emancipatory technology that improves the economic opportunities for marginalized groups. Using the backdrop of Sub-Saharan Africa and the women miners of Tanzania, the study illustrates how gender bias, ASM involvement, poor market conditions, and ethical consumption combine to negatively impact the economic opportunities of women miners. At the same time, the paper demonstrates how mediating economic opportunity through an emancipatory technology such as blockchain reduces negative influences and provides greater benefits for women miners. Limitations in this paper include a reliance on mostly secondary data, which, while insightful, could be problematic because it reveals only what the publishers desire. In extending this research, additional primary data would enrich this work. Future research would also benefit from a mixed methods approach which may provide unique insights to the phenomenon. In conclusion, the use of blockchain as an emancipatory technology has a promising future. When technologies improve both social welfare and organizational success, everyone wins.

References


