BENEFIT OF CRYPTO MINING: THE CASE OF ETHIOPIA

A THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY SCHOOL OF COMMERCE, GRADUATE STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTERS OF SCIENCE IN CORPORATE FINANCE WITH A SPECIALIZATION IN INVESTMENT MANAGEMENT

BY: TIGIST KEBEDE

ADVISER: MENGISTU BOGALE (PhD)

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE

JUNE, 2025

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DECLARATION

I declared that this thesis, which I submit to Addis Ababa University on consideration of the award of a higher degree in Masters of science in Corporate Finance with a specialization in Investment Management, is my own personal effort. This work has not been submitted for any other degree or processional qualification in any university or other tertiary institution except as specified. In addition, to the best of my knowledge and belief, it contains no material previously published or written by another person, except where due reference has been made in the text. Furthermore, I took reasonable care to ensure that the work is original.

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THESIS SUBMISSION APPROVAL FORM

This is to certify that the thesis entitled "The Benefit of Crypto mining: In the case of Ethiopia" has been carried out by Tigist Kebede Bayabil under my supervision. This thesis is submitted for the fulfillment of the requirements for the Master of science in Corporate Finance with a specialization in Investment Management, program at Addis Ababa University. I confirm that the candidate has met the necessary academic requirements and recommend the thesis for submission and defense.

Name of Advisor: Mengistu Bogale (PHD)

Signature:_____

Date:_____

STATEMENT OF CERTIFICATION

This is to certify that the thesis prepared by Tigist Kebede Bayabil, entitled the Benefit of crypto mining': the case of Ethiopia, was submitted in partial fulfillment of the requirements for the degree of Master of science in Corporate Finance with a specialization in Investment Management, it complies with the regulations of the University and meets the accepted standards of with respect to originality and quality.

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Abbreviations and Acronyms

ASIC- Application-specific integrated circuit

AML -The Anti-Money Laundering

CBECI- Cambridge Bitcoin Electricity Consumption Index

PoW - Proof-of-Work

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Abstract

This study examines the potential benefits of cryptocurrency mining in the context of Ethiopia. Using an exploratory research design and a qualitative approach, the study focused on the experiences and economic contributions of all foreign companies officially registered for crypto mining in the country. Both primary and secondary data were collected through semi-structured interviews and document analysis. The research was conducted throughout 2024, following the official launch of crypto mining operations in Ethiopia.

Data were analyzed using content narrative methods to capture the emerging themes and lived experiences of company representatives. The findings revealed that crypto mining has begun to play a significant role in the Ethiopian economy by attracting foreign direct investment, creating job opportunities, and stimulating infrastructure development, particularly in the energy and digital sectors. Several companies reported efficient use of surplus hydroelectric power, while others highlighted challenges such as policy uncertainty, internet connectivity issues, and logistical constraints.

Overall, the study concluded that while crypto mining in Ethiopia is still in its early stages, it holds considerable potential to contribute to national development goals if supported by clear regulations, public private collaboration, and sustainable energy practices.

Keywords: Bitcoin, Cryptocurrency, Crypto mining

CHAPTER ONE

1. Introduction

1.1 Background of the Study

Cryptocurrency mining has evolved from a niche hobby into a significant industry, characterized by rapid technological advancements and large-scale operations. Initially, mining could be done on personal computers, but as competition intensified and the difficulty of mining increased, more specialized hardware and substantial energy resources became necessary. Today, large mining farms, equipped with powerful ASICs (Application-Specific Integrated Circuits), dominate the landscape. The environmental impact of such operations, coupled with regulatory scrutiny, presents ongoing challenges. Nevertheless, crypto mining remains a critical component of blockchain networks, ensuring their security and functionality through decentralized consensus mechanisms (IMF, 2021).

In Ethiopia, crypto mining is regulated under INSA's framework established by proclamation No.808/2013(August 2022). Operators must register, obtain licenses and ensure their hardware and software comply with INSA's technical and cybersecurity standards. INSA also conducts audits and requires regular reporting to ensure data privacy, transaction integrity and overall compliance.

Give the high energy demand of mining and in line with INSA regulation, Ethiopian Electric Power (EEP) Provides a dedicated power sales contract for licensed. Crypto miners, supplying electricity under regulated terms to support secure and sustainable operations. Since 2024, EEP has allocated approximately 600 MW of power to mining companies at a rate of $0.003 per kilowatt-hour, enabling cost-effective and large-scale mining activity within the country (INSA,2022; EEP,2024)

Cryptocurrency mining in Ethiopia is still in its early stages, influenced by the country's evolving digital landscape and regulatory environment. The potential for growth is significant, given Ethiopia's increasing internet penetration and interest in digital currencies. However, the industry faces challenges such as limited access to high-performance mining hardware, unreliable electricity supply, and the need for clear regulatory frameworks. Despite these hurdles, there is a growing interest among tech-savvy individuals and small groups who see mining as an opportunity to participate in the global digital economy (Ishada and yoshada, 2024). The purpose of this paper is to clarify the viability and possible advantages of cryptocurrency mining in Ethiopia. This study

will provide valuable insights into the prospects of cryptocurrency mining in Ethiopia, and contributing to informed policy-making and responsible industry development

1.2 Statement of the problem

In Ethiopia, the trading of Bitcoin and other Cryptocurrency remains mostly as an unregulated activity. Unlike many African counterparts the National Bank of Ethiopia completely disregard the existence of this innovative form of money. In essence the point is that Ethiopians, buying and selling Bitcoin are doing so at their own risk & more so punishable by law. The Bitcoin cryptocurrency is not recognized as legal tender by the Ethiopian government and the central bank does not regulate the operations of Bitcoin (Messay, 2021). Therefore, this study will assess the benefits of cryptocurrency mining for the Ethiopian economy. Furthermore, it will focus on how cryptocurrency can reduce dependence on foreign currency and optimize energy utilization.

Crypto mining presents an opportunity for Ethiopia to tap into the global cryptocurrency market, potentially contributing to economic growth, technological innovation, and job creation. There are limited literature reviews related to crypto mining for example: The study draws on theories and concepts related to cryptocurrency, blockchain technology, and their impact on financial systems Tapscott & Tapscott, (2016), The study considers theories of economic development, technological innovation, and the potential role of crypto mining in driving economic growth and diversification (Romer, 1990) and The study incorporates concepts of environmental sustainability, energy efficiency, and renewable energy sources to assess the potential environmental impacts of crypto mining (Stern, 2006; IPCC, 2021).

Ethiopia may emerge as a major participant in the cryptocurrency mining industry. Though cryptocurrency mining has been popular in a number of nations, its potential in Ethiopia has not yet been investigated. The purpose of this study is to clarify the viability and possible advantages of cryptocurrency mining in Ethiopia. Ethiopia may rise to prominence in the bitcoin mining industry if regulatory and infrastructure conditions improve. Although cryptocurrency mining has been popular in a number of nations, its potential in Ethiopia is yet unknown.

Overall, as far as the researcher knowledge is concerned the existing literature review highlights several knowledge gaps on the prospects of crypto-mining in the case Ethiopia. This is to mean that there is no empirical work available that specifically investigates, also the above researchers most studies focus on related in assessment of power consumption, environmental impact, and Legal control. A comprehensive assessment of the prospect of crypto mining within the unique

Ethiopian context is lacking (there are no extensive empirical studies concerning to prospects of crypto mining in Ethiopia). Therefore, this research gap hinders the development of the effective policies and strategies to improve the prospects of crypto mining. By having this, in this study, the researcher tried to fill the gap, by describe and explain prospects of crypto mining in Ethiopia.

This study aims to identify the benefit of crypto mining, and policy recommendations for promoting crypto mining and exploration its concepts, advantages, and implications for Ethiopia and provides a foundation for understanding the potential or prospects associated with this emerging technology. And also, it aimed at bridging the existing knowledge gap and giving more insight on the prospects of crypto mining in Ethiopia.

1.3 Objective of The Study

1.3.1 General Objective

The general objective of the study was to assess the benefits of cryptocurrency mining in Ethiopia, analyze its potential economic advantages and environmental implications, and provide insights into the feasibility of developing a sustainable crypto mining industry in the country.

Since there is little to no research on this topic in Ethiopia, as the industry is still very new, the researcher formulated the objectives and specific aims based on practical work experience and direct interactions with companies involved in the sector.

1.3.2 Specific Objectives

- To explore Economic importance of crypto mining.
- To explore of crypto miner in creation of opportunities and knowledge transfer.
- To analyze Importance of crypto miner in infrastructure development and technology transfer.

1.4 Research Question

- What is the economic importance of crypto mining?
- How is the crypto mining creating job opportunities and knowledge transfer?
- How is crypto mining contribution infrastructure development and technology transfer?

1.5 Significance of the Study

This study contributed to the existing body of knowledge on the benefits of cryptocurrency mining in developing countries. The findings of the study will be useful for government, policymakers, investor, and researchers in designing and implementing strategies to improve crypto mining and

promote monetary independency in Ethiopia. Specifically, this study can help country policy makes, decision makers to examine the major factors that may assess the benefit of crypto mining at large. Government may want to know how the crypto mine is operated well regarding the assessment of the benefit of crypto mining performance and in order to take necessary actions for minimizing financial crises in the country.

1.6 Scope of the Study

The scope of this study is limited to exploring and demonstrating the potential benefits of crypto mining in Ethiopia. The study be limited to the period from 2024 due to the lifting of the government policy prohibition. Additionally, all companies included in the study.

1.7 Limitations of the study

One of the main limitations of this study was related to confidentiality concerns and language barriers. During the research period, all active cryptocurrency mining companies operating in the area were owned and managed by Chinese investors. Due to the generally cautious attitude of Chinese businesses toward outsiders, along with differences in language and communication culture, it was initially difficult to access detailed data or conduct open discussions. However, the researcher's fluency in the Chinese language and prior working relationships with some of the companies helped overcome these challenges. These connections enabled the researcher to build trust and gain access to relevant information despite the initial barriers.

1.8 Organization of the study

This study is organized into five chapters. The first chapter provides an introduction, while the second chapter presents a detailed theoretical review of perspectives on cryptocurrency mining in Ethiopia. The third chapter is all about research design and methodology. Therefore, the author described issues such as the study area, research design, description of the research target population, sample size and sampling technique, sources of data, methods of data collection and analysis, validity and reliability of the research instrument, and finally, ethical considerations. The fourth chapter of the final paper will have the results and discussion. The researcher will close the study by having fifth chapter that going to contains conclusion and recommendations.

CHAPTER TWO

2. Literature Review

2.1 Theoretical Perspective

2.1.1Utilization of Unused Power Resources

Cryptocurrency mining effectively monetizes otherwise wasted energy. such as stranded hydro, solar, or geothermal power by converting it into digital assets. Countries like Ethiopia, Iceland, and Paraguay use mining to utilize surplus energy and promote digital growth. In Ethiopia, underutilized hydropower can be redirected to mining, generating revenue while stabilizing the energy grid (Cambridge Centre for Alternative Finance, 2023).

Nations with excess renewable energy and favorable climates, like Iceland and Canada, have built robust crypto mining sectors. El Salvador uses geothermal energy for national mining efforts, and Paraguay converts unused hydropower into export value, proving that sustainable energy policies can turn mining into an economic driver (Agu, 2021).

2.1.2 Incentives and Profitability for Miners

Miners earn through block rewards and transaction fees, with Bitcoin currently offering 6.25 BTC per block. Profitability increases when using renewable or cheap electricity, which incentivizes more efficient mining and supports a decentralized security model (Swan, 2015).

Citation: (Swan, 2015)

2.1.3 Economic Opportunity and Foreign Currency Generation

Cryptocurrency mining presents a significant economic opportunity by generating foreign exchange, especially for countries with limited traditional exports. Since digital assets like Bitcoin are globally tradable, mining operations effectively create a form of digital export. For Ethiopia—where foreign currency shortages are a recurring challenge mining can help improve trade balance and financial stability. Countries such as Kazakhstan, Paraguay, and El Salvador have already leveraged crypto mining to attract foreign investment and boost foreign currency inflows by monetizing excess energy and exporting digital assets. Digital *assets mined using local resources can serve as non-traditional exports, increasing national reserves* (Bank of Ethiopia, 2023). Crypto mining creates jobs in several industries, including hardware manufacturing, electricity

provision and infrastructure development. In countries where crypto mining is prominent, mining operation stimulate local economies by creating direct and indirect employment. The demand for high-performance computing devices, such as GPUs (graphics processing units), has led to growth in tech hardware production, positively affecting manufactures and related businesses (Bohme et al., 2015).

2.1.4The state of crypto mining in Ethiopian

Ethiopia's approach to cryptocurrency regulation has evolved from initial skepticism to strategic engagement. While the National Bank of Ethiopia (NBE) reaffirmed the Ethiopian Birr as the sole legal tender and banned crypto transactions in June 2022, the government has distinguished crypto mining from other crypto-related activities. Since 2022, licenses have been issued for both foreign and domestic crypto mining operations. Oversight is shared among institution, including the Information Network Security Agency (INSA), which began registering crypto operators in August 2022 and manages cryptographic products, transactions and hardware import. The Ethiopian Investment Commission (EIC) oversees licensing, while Ethiopian Electric Power (EEP) and Ethiopian Electric Utility (EEU) manage energy distribution (INSA, NBA, EIC, 2024) Foreign crypto miners must establish a local entity, either as a branch or subsidiary and secure an investment permit and commercial registration certificate through the EIC. Crypto mining fall under the category of "data center and cloud services." A minimum capital of USD 200,000 is required for fully foreign-owned investment, while joints ventures with local partners require USD 150.000.A business license must be obtained within two years from the investment permit issuance date (EIC, 2024).

The process to set up crypto mining operation involvement several stages: submitting a detailed application to the EIC, reserving a business name, opening a foreign currency account for capital deposit, securing office space, obtaining a Tax Identification Number (TIN), receiving an investment permit and commercial registration and finally securing a business license. Each of these steps requires compliance with documentation and procedural obligation stipulated by Ethiopian regulatory bodies (EIC, Ministry of Revenues, NBE,2024).

Land in Ethiopia is publicly owned, but foreign investors can access it through lease arrangements. For crypto mining, EEP offers" ancillary services" that include physical space at substations and security, allowing investors to install equipment on EEP premises. These services are billed separately based on the area occupied (EEP,2024).

While Ethiopia lacks specific crypto mining tax guidelines, general tax law applies. Under the income tax proclamation No.979/2016, earnings from mining, including digital asset rewards and subsequent transactions, are taxable. Corporate entitles face a flat 30% income tax, while individuals are taxed repressively. Other applicable tax includes VAT, customs duties, taxes and social welfare levies. Businesses are required to maintain proper accounting and documentation for auditing purpose (MoR,2024)

Crypto mining operations categorized under "data center and cloud services" are eligible for various incentives. Companies based in Addis Ababa qualify for a for-year income tax holiday, extended to five years for operations established outside the capital. Invective also includes duty-free importation of capital goods and spare parts up to 15% of the value of the capital goods over five years, along with refund provisions for locally purchased taxed materials (EIC, MoR,2024).

2.2 Empirical Literature Review

There is limited research specifically focused on the prospects of crypto mining in Ethiopia. Existing studies mainly address the broader context of financial inclusion, digitalization, and the role of technology in development (Gebreyesus, 2019; Mekonnen & Admasu, 2021). And even there are limited papers abroad focused on the prospects of crypto mining. The research papers on the concepts of crypto mining reviewed in this study are as follows:

National Bank of Ethiopia, (2015) has stated that, Ethiopia is striving to improve financial inclusion, and cryptocurrencies could potentially offer alternative payment methods and access to financial services. Grider, 2018; Chen & Liang, (2020) which is about the economic Impact crypto mining: The Studies have shown that crypto mining can contribute to GDP growth, create jobs, and attract foreign investment. Sanderson (2018) noted that blockchain technology has the potential to support the expansion of green bond markets by enhancing transparency and ensuring that each green bond is genuinely linked to environmentally sustainable projects. Similarly, the IPCC (2021) argued that crypto mining is highly energy intensive, raising concerns about carbon emissions and environmental impact.

Brilliantova and Thurner (2018) conducted a study featuring expert interviews on the future of blockchain technology in relation to energy consumption. They explained that, in the short term, blockchain's most significant impact is likely the development of electric vehicles, while in the long term, it will facilitate the implementation of peer-to-peer microgrids to optimize energy

consumption. De Vries, (2018) suggests that blockchain technology, by increasing the number of transactions in a block, could eventually reduce the system's electricity consumption. This aspect directly influences the current debates on the sustainability of Bitcoin and more generally blockchain technology. Indeed, in the current context, the blockchain-based Bitcoin is said to consume the same level of electricity than a country like Denmark, contributing, therefore, significantly to CO2 emissions and e-waste.

Regulation and Policy: Several countries have developed regulations and policies to govern crypto mining, ranging from outright bans to more accommodating frameworks (IMF, 2021). Woodhall (2018) explored how blockchain and smart contracts can facilitate climate change initiatives. Sikorski et al. (2017) examined blockchain's role in optimizing energy consumption in machine-to-machine interactions and improving electricity use in the chemical industry. Additionally, Gore (2018) highlighted how blockchain technology can enhance transparency in energy billing, offering consumers a more accurate tracking system for energy generation and distribution.

Other studies (Green, 2018; Harnett, 2018) explored how blockchain technology can support various initiatives aimed at addressing climate change. In line with this, Gore (2018) examined the first blockchain based peer-to-peer energy system, which enabled Brooklyn (New York) residents to sell surplus solar energy to their neighbors using smart contracts.

Cryptocurrency mining technology spread in emerging markets thought the process diffusion where early adopters showcase its economic benefits and innovation, leading to wider awareness and adoption facilitated by improvising infrastructure, communication, and favorable policy (Rogers, 2003). This diffusion is supported by the resources -based view, which emphasizes the strategic use of underutilized local resource, such as abundant renewable energy sources like hydroelectric power, cooler climates and available technical skill, allowing these markets to develop competitive and cost-efficient mining operation (Barney, 1991). Moreover, sustainable development theory guides the balanced growth of crypto mining by ensuring that economic gains From mining activities do not come at the expense of environmental degradation or social inequality. By integrating renewable energy, creating local job, fostering inclusive economic opportunity, crypto mining can contribution to sustainable economic development that support both environmental; protection and social well-being in emerging market (world commission on environment and development, 1987).

2.3 Definition and Concepts

2.3.1 Crypto Mining

Cryptocurrency is a form of digital currency that relies on cryptographic technology, specifically data encryption. It has no physical form and exists solely in electronic format. Key characteristics of cryptocurrency include anonymity, decentralization, and security (Meynkhard, 2019). Cryptocurrencies are maintained, verified, and secured by network users through blockchain technology. As the name suggests, blockchain is a chain of information linked via 'blocks.' These blocks serve as records stored in a ledger, distributed across thousands of computer nodes and accessible to anyone on the network. Therefore, cryptocurrency is simply a data chain, in which the first link contains information about its origin (mining), and all subsequent on the transition from one owner to another. That means in its economic essence the cryptocurrency is the «bill of exchange», which is accompanied by a number of «transfer inscriptions» endorsements (Sharov, 2018).

Mining is the process of validating computations, adding transaction records to the blockchain a public ledger of past transactions (Nakamoto, 2008). Mining is a process that solves various computational problems during which bitcoins are created. Mining can be done on a home computer, subject to the availability of a powerful GPU a video card, and on special equipment. However, mining requires a significant amount of electricity, including for cooling processors (Meynkhard, 2019).

Cryptocurrency mining is the process of verifying and adding new transactions to a blockchain, the decentralized, public ledger that underpins cryptocurrencies like Bitcoin and Ethereum. Miners use powerful computers to solve complex mathematical problems, competing with other miners to validate transactions and earn rewards in the form of newly created cryptocurrency. Although cryptocurrency is a relatively new form of currency in financial areas, it has become more frequently used in towns and cities around the world in recent years (Zhibin et al., 2018).

Cryptocurrencies are a type of digital assets that can be exchanged in online transactions. These transactions are grouped into blocks and added to a distributed database known as the blockchain. Each block is linked to its previous block. Addition of new blocks to the blockchain is done by voluntary miners. These must compute a cryptographic hash of the block, which includes complex mathematical puzzle known as ‘Proof-of-Work’ (PoW). As a reward, miners receive a certain

amount of the currency. The mining process maintains the integrity of the blockchain and it is at the core of all cryptocurrencies (Zhibin Wu 2018).

The increased value of cryptocurrencies such as Bitcoin or Ethereum leads to the growth of mining farms using specialized hardware known as ASICS. Thus, mining these cryptocurrencies using end-user machines such as laptops or desktop computers was useless. However, in 2014 a new PoW known as Crypto-note required not only CPU power but also memory, turning ASIC-based mining inefficient and thus gaining again the attention of individuals willing to mine with their home machines. Additionally, the mining algorithm changes periodically, thus discouraging ASIC development which is optimized for specific algorithms (Zhibin Wu 2018).

2.3.4 Origins of Crypto mining

Prior to the United States financial crisis of 2008, decentralized cryptocurrencies did not exist. In October 2008, pseudonymous developer or developers Satoshi Nakamoto published a report on cryptography describing the digital currency bitcoin. It was the first currency that eliminated the use of a central bank or administrator. The currency is sent straight from the owner to the receiver. The 2008 Bitcoin whitepaper, authored by the pseudonymous Satoshi Nakamoto, described a digital, decentralized peer-to-peer currency that relies on a hash-based Proof of Work network to secure and validate transactions (Harju2024).

These transactions are stored in a public ledger called the blockchain, which uses past transaction data to generate new blocks and cryptographically link them together, forming a chain of blocks (Nakamoto, 2008). While Bitcoin is generally regarded as the first cryptocurrency, the technology's history dates back several decades, with various aspects described in academic works by multiple authors. Sherman et al. (2018) published research on cryptocurrencies in their paper “On the Origins and Variations of Blockchain Technologies”. Many individuals have stepped forward claiming to be behind the pseudonym Satoshi Nakamoto, yet none have provided convincing evidence. The true author or authors remain anonymous even today, leaving many open questions about the specifics of how the technology was developed and the contributions beyond the references mentioned in the whitepaper.

2.6 Infrastructure Necessary for Crypto mining.

Crypto mining often involves specialized hardware called Application-Specific Integrated Circuits (ASICs), designed specifically for solving cryptographic hashes. These are highly efficient and powerful but require significant upfront investment (World Bank, 2015). Cooling Systems of

Mining generates a lot of heat, so efficient cooling systems are essential to prevent hardware damage and maintain optimal performance (Tapscott & Tapscott, 2016). Crypto mining requires significant infrastructure, including powerful computers, cooling systems, and reliable power sources, to operate effectively and also it requires significant electricity consumption, making reliable and affordable power crucial for its viability. Ethiopia's energy infrastructure and electricity costs will be critical factors. Crypto mining generates substantial heat, requiring efficient cooling systems to prevent equipment damage and maintain optimal performance. Reliable internet connectivity is essential for miners to connect to the blockchain network and receive transaction updates. the Blockchain infrastructure include installing cables and Wi-Fi, buying and shipping mining containers, as well as pursuing strategic business opportunities through lobbying. All these diverse activities make the resources and services afforded by the Blockchain protocol available in various ways while continuously extending and transforming the information infrastructure both digitally and materially. It involves large-scale data centers that require specialized infrastructure and management.

2.7 Electricity (Energy) consumption of crypto mining

Bitcoin mining farms consume large amounts of electricity. Their expenses 30% of the received currency for electricity (An et al., 2020). The reliability, efficiency and performance of mining farms directly depend on the quality of the power they receive. Blockchain already has become one of the leading-edge technologies that provide the highest level of data security through using a cryptographic hashing algorithm where data tempering is almost impossible (Md Rafiqul Islam et al., 2022)

While energy consumption is undeniably high, especially in relation to the number of transactions they handle, PoW blockchains do not significantly threaten the climate. This is mainly because their energy usage does not rise substantially as transaction volume increases. Our contribution demonstrates that the energy consumption of blockchain technology varies significantly depending on design choices. Consequently, it is an important factor to consider when designing a blockchain-based IT solution. (Kannengießer et al. 2019).

The Bitcoin block size, hash rate in the Bitcoin network, and the number of Bitcoin transactions are three mining-specific variables that are positively correlated and significantly contribute to Bitcoin-based energy consumption (CBECI). On the other hand, the Crypto Market Index (CIX200) and Ethereum prices significantly impact Bitcoin-based electricity consumption. While

the crypto market index and CBECI are positively correlated, Ethereum negatively affects energy consumption in the short run but plays a positive role in the long run by reducing Bitcoin-based electricity consumption as its price declines. This aligns with the Theory of Cross Elasticity of Demand for substitute goods (Atkinson & Miller, 2005).

The mining performance of different devices was compared by mining efficiencies. Garcia et al., 2014 used an average mining efficiency of 2 MH/J to estimate a fundamental value of one Bitcoin. Later, technologists developed Application Specific Integrated Circuit (ASIC) miners to increase the mining efficiency. Hayes. AS, 2017, estimated the cost of electricity was close to the market value of Bitcoin with an assumed number in 2017. However, the ASIC miners have side-effects. Because of the outstanding hash rate, ASIC miners decreased the decentralization of Bitcoin by making 51% attack possible (Zhibin Wu 2018). The estimation of overall electricity used for Bitcoin mining is enormous. Behind the growing cryptocurrency market is the massive energy consumption. In the meantime, studies and investments have started applying blockchain to develop renewable energy because of its ability to accumulate and manage resources. There are several challenges when estimating electricity usage. This uncertainty makes it extremely difficult to acknowledge the status of the mining activity (Zhibin Wu 2018).

More energy efficient and environmentally friendly algorithms are needed in developing cryptocurrencies. Energy consumed when mining is exhausted as heat into the indoor environment, which increases the cooling load of cooling systems (Zhibin Wu 2018) Bitcoin is not quite at that level yet, but it is starting to use a significant amount of energy which has become a topic of discussion (Andrew Miller et al,2016). The electrical energy consumption will be a fact of life for Bitcoin miners forever. Generally, the energy used to cool off mining equipment will also be in the form of electricity. Andrew Miller et al,2016.

In cryptocurrency, Proof-of-Work is a system that uses computational power by calculating algorithms to verify functions and limit misuse. Globally, mining consumes more energy than several countries alone each year. Within the economy, this increase in energy consumption could create a new market for utility companies within the economy. Currently, the general population purchases application-specific integrated circuit (ASIC) which is an integrated circuit customized for individual mining use. Data centers that mine from cryptocurrency produce vast amounts of heat. Not only does mining need the computational power for solving complex algorithms, but data centers need energy to cool off their servers. In early 2017, Venezuelan authorities shut down

a mining operation that had 11,000 computers allegedly running on power siphoned illegally. The power usage caused severe repercussions for the country, including electricity shortages (Fairley, 2017).

According to the CBECI best-guess estimate, the Bitcoin network consumed approximately 98 TWh of electricity in January 2022 and 85 TWh in January 2023. Notably, the difference between the upper and lower bound estimates remains considerable ranging from 38-215 TWh in January 2022 and 47-135 TWh in January 2023. Stoll et al. (2019) reported similar figures at the time, estimating that the Bitcoin network consumed between 35.0 and 72.7 TWh in November 2018.

2.8 Environmental impact of Crypto mining

But the consumption of computing power is the major challenge to adopting this technology for mining cryptocurrency and other sectors. Due to the consumption of enormous energy, carbon dioxide emission becomes very high which ultimately pollutes the environment. An alternative solution like Proof-of-Stake consensus protocols has been proposed to use instead of the Proof-of-Work algorithm for mining cryptocurrencies. Not only can that, but the use of renewable energy also be an alternate option to use the Proof-of-Work algorithm for mining cryptocurrencies which is environment friendly. Blockchain technology might be more useful in different sectors if the high energy consumption is addressed properly which will be able to build a secure blockchain network and save the transactional cost as well. Md Rafiqul Islam ET AL., 2022 Crypto mining has created an ever-increasing carbon footprint because of the intensive Proof-of-Work technology.

Emerging technologies, despite their potentially revolutionary applications, are not exempt from scrutiny. The energy consumption of cryptocurrencies, particularly crypto mining, has been a topic of discussion since the technology was first introduced. Even the author of the Bitcoin whitepaper acknowledged that energy usage could become a point of contention as the network matures. Given the regulatory pressure and the broader push toward more sustainable technologies, the environmental perspective is becoming increasingly important in understanding the dynamics of cryptocurrencies in the modern landscape. Various aspects of the environmental impact of cryptocurrencies are periodically highlighted by media outlets as significant hurdles for the technology’s future. Estimates vary, with some extreme research suggesting that the Bitcoin network alone could push global warming beyond current targets (Mora et al., 2018).

The primary environmental impact of the Bitcoin network is largely attributed to the electricity consumption of mining, which introduces additional concerns. The environmental consequences of electricity usage depend on the method of power generation. Although research has been conducted on the emissions from various methods of electricity generation, some uncertainty remains regarding the accuracy of these estimates. Additionally, a key challenge especially for renewable energy is that seasonal variability can impact the resulting emissions. These challenges are not specific to crypto mining but apply to certain forms of renewable electricity, regardless of usage. (Zhibin,et al 2018).

Many studies on electricity consumption also attempt to estimate the overall carbon footprint, but this introduces additional uncertainties. While miners can be geographically located using publicly available IP address data, and regional electricity generation capacity is often known, exact figures on the specific methods of electricity generation for the power used remain unavailable. Furthermore, carbon emissions from electricity generation can vary significantly depending on the time of year (de Vries, 2019). Given the overall goal of this thesis, a deeper analysis of carbon emissions was deemed unnecessary, as the focus is not on evaluating the accuracy of emission estimates. Instead, the electricity consumption of mining provides sufficient insight into its environmental impact.

The environmental impact of the Proof-of-Work (PoW) protocol primarily consists of two components: the electricity consumption of mining equipment and the e-waste generated by retired hardware. While electricity consumption remains the dominant contributor to Bitcoin's environmental footprint, e-waste has also been recognized as a significant driver of emissions (CBECI), 2024).

The impact of other contributors in a blockchain network, such as non-mining full nodes, is minimal compared to mining, as demonstrated by the comparison between Proof-of-Work (PoW) and less computationally intensive solutions like Proof-of-Stake (PoS). While e-waste generation has been recognized as a source of additional emissions in several studies, research on the topic remains limited. De Vries & Stoll (2021) estimate Bitcoin's e-waste generation using CBECI data, finding that Bitcoin mining produces approximately 30,700 metric tons of e-waste annually (Delgado-Mohatar et al., 2019).

Blockchain technology, despite its innovative potential, is intriguingly linked to one of the world’s most pressing challenges: climate change (Harris, 2018). Change (2017) highlights how

blockchain can play a crucial role in combating climate change by (i) optimizing carbon emission trading, (ii) facilitating clean energy exchanges, and (iii) improving climate finance flows (Green, 2018). According to Sanderson (2018), while green bond markets are expanding in size and complexity, verification and reporting standards have struggled to keep pace. Blockchain could serve as a powerful tool to enhance market credibility by ensuring transparency in carbon emission reductions for both issuers and investors. Ultimately, by strengthening the integrity and effectiveness of green bond markets, blockchain could contribute significantly to global climate strategies (Zhibin Wu et al., 2018).

Duchenne (2018) added that smart contracts and blockchains are important in helping to remove significant friction in the attempts to tackle climate change. However, this author also emphasized that "this comes at a cost of understanding the real impacts of the disruption this new technology brings, both on the financing side of renewable energy projects, climate finance in general, and the various legislative scheme supporting same." Furthermore, Harris (2018) emphasized the importance of the potential solutions offered by blockchains to improve environmental issues in accordance with the objectives of the Paris climate agreement.

Environmental considerations: Climate change has prompted regulatory bodies to impose increasingly stringent requirements on various industries, compelling businesses to adapt to the evolving environmental landscape. Environmental regulations have evolved from mere guidelines into strict requirements, reinforced by heavy sanctions as deterrents, as regulators work to address the climate debt accumulated over years and decades. Changes in regulatory policy have transformed the environmental impact of operations from a moral consideration into a financial factor with potentially significant effects on the bottom line, compelling businesses to integrate environmental considerations into their daily operations. With vital industries like the automotive sector facing increasing pressure over emissions, it is no surprise that the IT sector is also under scrutiny for potential regulatory action. As digitization continues to move existing services online while enabling entirely new ones, the sector as a whole has been recognized as a key driver of global emissions and increasing energy consumption. (Zhibin Wu,et al 2018).

2.9 Economic Benefits of Crypt mining

Bitcoin mining revenue is well understood and accurately calculated based on block times, block rewards, transaction fees, and the price of Bitcoin. According to Blockchain data, the industry consistently generates monthly revenues exceeding 1 billion USD. (Lassi Harju2024). Taxation is

a vital function of the economy, providing funding for government operations, healthcare programs, social security, transportation infrastructure, education initiatives, and more. The cryptocurrency market is huge and there is an immense amount of money to be made by taxing cryptocurrency revenue. Digital currencies are taxable by United States law. The Internal Revenue Service issued Notice 2014-21 on cryptocurrencies: For U.S. tax purposes, transactions using virtual currency must be reported in U.S. dollars. Therefore, taxpayers will be required to determine the fair market value of virtual currency in U.S. dollars as of the date of payment or receipt. A taxpayer has to recognize a capital gain or loss if exchanged for digital currency. If the fair market value of property received in exchange for virtual currency exceeds the taxpayer's adjusted basis of the virtual currency, the taxpayer has taxable gain. (United States Treasury, 2014) Digital currencies should essentially be treated as securities, stocks, houses, and bonds for taxing purposes. Regular brokerage firms provide 1099-Bs to investors that list their gains and losses for their transactions throughout the year. Coinbase, a digital currency exchange, only sends 1099-Ks to investors if they have a realized gain of $20,000 off of virtual currency or completed 200 transactions within the current year (Coinbase, 2018). This is a standard for all companies that issue 1099-Ks. Investors under the 1099-K threshold are responsible for keeping track of their basis for each cryptocurrency transaction they might have and the resulting gain or loss. Moreover, many investors still do not report earnings and losses on Schedule D when completing taxes. The Internal Revenue Service successfully sued Coinbase for access to customer records when only 802 citizens reported gains or losses on cryptocurrencies. Over 14,000 investors had cryptocurrency transactions that impacted IRS standards through Coinbase. This resulted in a huge tax liability towards the United States government (Wieczner, 2018).

Cryptocurrency offers many benefits to the economy: it is convenient and efficient, there are no intermediary regulations, it reduces the time of exchange within a global market, has high security through its proof-of-work system, and ICOs raise capital for companies. As explained in the beginning of the report, cryptocurrencies reduce the need for intermediaries and increase the efficiency of transactions. For example, when purchasing a house, it typically involves a time-consuming process of assessing credit, transferring finances, and signing paperwork between third parties and consumer. While there is an initial delay to transfer one's fiat currency into cryptocurrency on different platforms, exchanging cryptocurrencies is efficient. Within the economy, this decreases the need for third-parties. According to the current Chairman of BitPay,

the largest bitcoin checkout processor globally: Bitcoin's blockchain is like a large property rights database. Bitcoin contracts, also known as smart contracts, can be programmed to streamline transactions by removing or incorporating third-party approvals, referencing external data, or executing actions at predetermined dates or times all with significantly lower costs and faster processing than conventional financial systems (Rosic, 2016). Therefore, such technological turn creates a lot of business opportunities bringing innovative solutions in several important societal issues: intellectual property; land property; fight against the global warming; etc. For instance, blockchain technology contributed to not only the development of peer-to-peer clean energy-based trade but also the facilitation of transactions to improve carbon emission trading (Andoni et al., 2019).

In Ethiopia, crypto mining is regulated under INSA's framework established by proclamation No.808/2013(August 2022). Operators must register, obtain licenses and ensure their hardware and software comply with INSA's technical and cybersecurity standards. INSA also conducts audits and requires regular reporting to ensure data privacy, transaction integrity and overall compliance.

Give the high energy demand of mining and in line with INSA regulation, Ethiopian Electric Power (EEP) Provides a dedicated power sales contract for licensed. Crypto miners, supplying electricity under regulated terms to support secure and sustainable operations. Since 2024, EEP has allocated approximately 600 MW of power to mining companies at a rate of $0.003 per kilowatt-hour, enabling cost-effective and large-scale mining activity within the country (INSA,2022; EEP,2024)

2.10 Challenges on Crypto mining Companies in Ethiopia.

Crypto currency mining in Ethiopia faces several challenges despite its potential benefits. One major obstacle is the limited and sometimes unreliable internet connectivity, which is crucial for continuous mining operations. Additionally, while renewable energy is abundant, infrastructure constraints and inconsistent power supply in some areas can disrupt mining activities. Regulatory due to unclear long-term legal frameworks. Moreover, the high initial investment costs for mining hardware and technical expertise requirement limit accessibility for many local entrepreneurs. Finally, concerns about environmental impact in place (INSA, 2022; World Bank.2021)

2.11 Conceptual framework of Crypto mining in Ethiopian.

crypto mining in Ethiopia is supported by several factors, including access to low-cost, renewable hydroelectric power that reduces energy expenses and environmental impact. The country's

moderate climate helps minimize cooling costs for mining equipment, while an increasing number of skilled professional in IT and engineering provide the necessary technical expertise. Furthermore, Ethiopian's ongoing investment in digital infrastructure and evolving regulatory framework foster a conducive environment for cryptocurrency mining development and innovation. Additionally, government initiatives to improve internet connectivity and promote technology adoption further enhance the potential for successful crypto mining ventures in the country (International Energy Agency,2023; African Development Bank, 2022; World Bank, 2022 Ethiopian Ministry of Innovation and Technology,2012)

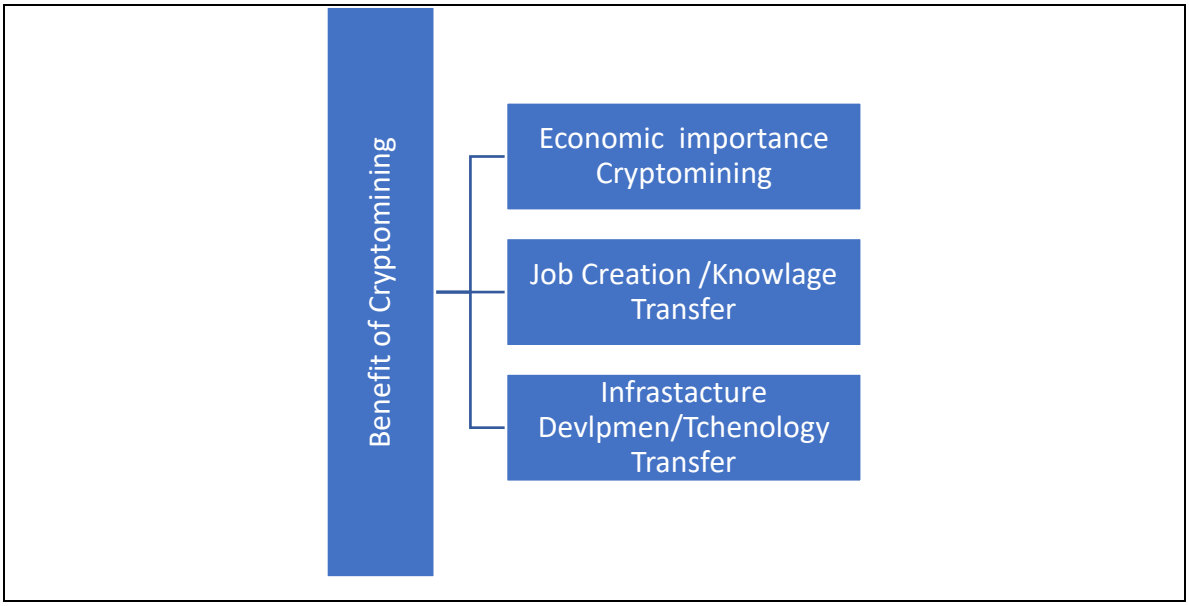

Figure 1: Conceptual Framework.

CHAPTER THREE

3. Research Methodology

3.1 Introduction

This section of the research aims to highlight the general methodological problems of the thesis that were addressed in the investigation. There are several subsections in the methods sections: these include the research design, target population, the sampling strategy and its rational, the research approach, the data collection and interpretation tools, the data source, and the description of the data and interpretation process.

3.2 Research Design

A research design is the entire strategy, conceptual framework, and systematic methodology that a scientist will employ to carry out a scientific investigation. It is the comprehensive coordination of identified elements and data that yields a plausible conclusion (Yousaf, 2021). Research design is essential because it makes the many research activities run more smoothly, making research as efficient as feasible and producing the most information with the least amount of time, money, and effort (Kothari, 2004**).**

This study adopts an **exploratory research design**, which is particularly suited for investigating new or poorly understood topics, such as cryptocurrency mining in Ethiopia. Exploratory research allows for the in-depth exploration of human experiences, behaviors, and contextual factors. It is characterized by flexibility, open-ended inquiry, and the ability to generate insights or hypotheses for future studies especially when dealing with complex or sensitive issues (Creswell & Poth, 2018). Given that cryptocurrency mining is a relatively new and underexplored concept in Ethiopia, this study utilizes an exploratory approach to examine its potential benefits for the country.

3.3 Research Approach

Research approaches simply refer to a way of doing research that require reasoning which is a process of utilizing present knowledge for making predictions, outlining conclusions or developing explanations. This study employed under the general **qualitative research approach**.

The qualitative research approach is usually used for the investigation of social phenomena, or in other words, situations in which people are involved and different kinds of processes in which what we want to learn about environments, situations and processes. It is non-numerical and

descriptive, applies reasoning, and uses words to convey meaning, emotions, and describe the situation. This method is used to assess people's knowledge, attitudes, behaviors, and opinions, depending on the research topic (S. Goundar, 2012) On the other hand, qualitative research is concerned with qualitative phenomena meaning occurrences related to or involving quality or type. It is designed to explore how people feel or what they think about a particular subject or institution (S. Goundar, 2012). Therefore, the major data collection methods in this approach are document analysis (secondary sources) and observation and personal interview (primary sources). Hence, the selection of the qualitative approach is due to its easy applicability to the research problem and suitability of the data collection methods which is relevant to the nature of the study. Based on this, the researcher tried to describe and explain the prospects of crypto mining in Ethiopia. Finally, this qualitative method will help the researcher to analyze the existing and potential findings from those described and explained data in the form of theme analysis.

3.4 Target Population

The target population of this study comprises all **22 Bitcoin mining companies** that were operational and legally registered in Ethiopia during the year **2024**. These companies represent the full spectrum of licensed entities actively engaged in cryptocurrency mining activities under the regulatory oversight of the Information Network Security Administration (INSA)**.** The population includes companies primarily owned and managed by foreign investors, particularly from **China**, by studying the entire population, this research aims to capture comprehensive insights into the operational dynamics, regulatory experiences, and economic contributions of the crypto mining sector in Ethiopia.

3.5 Sampling Technique

In this study, the participants were selected using **expert (purposive) sampling**, which is designed to gather information from individuals who possess the necessary status, experience, or knowledge in the crypto mining sector. This method is appropriate for obtaining relevant data directly from professionals actively working with current mining technologies and operations. The number of participants was determined based on their **expertise and involvement** in the industry and within the Ethiopian context.

Purposive sampling, also called judgmental or selective sampling, is a non-probability sampling method where the researcher intentionally selects participants based on specific characteristics or knowledge relevant to the study. It is commonly used in qualitative and exploratory research where the goal is to gather detailed and meaningful data from individuals who are especially familiar with the topic (Etikan, Musa, & Alkassim, 2016).

This technique is especially useful when the population is small, specialized, or hard to access. Palinkas et al. (2015) explain that purposive sampling enables researchers to identify and select individuals or organizations that are particularly knowledgeable or experienced about the topic being studied. This makes it suitable for studies involving expert opinions or emerging industries, such as cryptocurrency mining. (Palinkas et al., 2015)

Creswell and Poth (2018) further emphasize that purposive sampling allows researchers to focus on information-rich cases, which is crucial when conducting qualitative research where depth of understanding is more important than generalizability. However, they also acknowledge the limitations particularly selection bias and limited ability to generalize results to a wider population. (Creswell & Poth, 2018)

3.6 Sample Size

In research, the sample **s**ize refers to the number of subjects or units selected from the target population for participation in a study. When the sample size is equal to the population, it is referred to as a census. A census approach is typically used when the total population is small, accessible, and highly relevant, making it feasible and meaningful to include every unit in the study (Taherdoost, 2016).

According to Creswell and Poth (2018), including the entire population in a study allows for maximum data accuracy and eliminates sampling error, as every relevant unit is directly observed or surveyed. This approach is particularly effective in qualitative or exploratory research when the total number of subjects is limited and the research focus is on gathering comprehensive insights rather than generalizing to a broader group.

In this study, a **sample size equal to the total population** all Bitcoin mining companies operating in Ethiopia was used. This decision was based on the manageable size of the population and the need to capture a complete picture of the industry. By involving all companies, the study ensures full coverage, increasing the reliability and completeness of the data (Marshall et al., 2013).

3.7 Methods of Data Collection

This research utilized **primary data** from form 22 companies in 2024. The primary data refers to the data originated by the researcher for the first time which are directly collected from the research participants using interview, observation. In this research primary data collected methods were used to ensure a comprehensive understanding of the Bitcoin mining industry in Ethiopia.

Primary data refers to original data collected directly by the researcher for the specific purpose of the study. It is first-hand information obtained through direct interaction with participants.
In this research, primary data was collected through semi-structured interviews, observations, and focus group discussions with key stakeholders, such as managers, technicians, and staff from selected Bitcoin mining companies.
According to Hox and Boeije (2005), primary data is especially valuable when the research seeks to explore new or specific issues that are not well-documented in existing literature. It allows the researcher to ask tailored questions and gather context-specific insights.

3.8 Data Collection Tools

Data collection is the process of gathering and evaluating information on variables of interest in a systematic manner, enabling researchers to answer stated research questions, test hypotheses, and assess outcomes. This component of research is common across all fields of study, including physical and social sciences, humanities, and business. While methods vary by discipline, the emphasis on ensuring accurate and ethical data collection remains consistent (Sajjad Kabir, 2016).
In this research interview, observation analysis data collection tools used to explore the existing crypto mining system.

3.8.1 Interview

Interviews are a qualitative data collection technique where the researcher directly engages with participants to obtain detailed information, perspectives, and experiences related to the research topic. Interviews are particularly useful for understanding the story behind a participant's experiences. They allow the interviewer to explore in-depth information on a topic, helping to further investigate their responses. Typically, open-ended questions are asked during interviews to encourage detailed and thoughtful answers (Kvale & Brinkmann, 2009).

In this research, **face-to-face semi-structured interviews** were selected. This approach was chosen to understands and provides more flexibility than to other interview methods. It also allows for the discovery or elaboration of information important to participants. The interview questions focused on areas such as participants' experience and opinions on using existing technology in Bitcoin mining. Data was gathered from both employee and owners.

3.8.2 Semi Structured Interviews

A semi-structured interview uses a pre-determined set of open-ended questions as a guide, but also allows the interviewer to explore new topics that emerge during the conversation. This method balances structure and flexibility, ensuring key topics are covered while giving participants the freedom to express their views in their own words (Gill, Stewart, Treasure, & Chadwick, 2008).
Semi-structured interviews are particularly useful for understanding complex behaviors, opinions, or experiences, enabling rich, nuanced data collection while maintaining some consistency across interviews.

3.9 Data Analysis Method

In this study, the researcher used **content analysis and narration** to analyze the qualitative data collected from Bitcoin mining companies in Ethiopia. These two methods are commonly employed in qualitative research to interpret non-numerical data such as interview transcripts, company documents, and written reports.

3. 10.1 Content Analysis

Content analysis is a systematic and objective technique for analyzing textual data. It involves coding and categorizing data into themes or patterns to uncover the underlying meanings, trends, and relationships within the text (Krippendorff, 2018). According to Elo and Kyngäs (2008), content analysis allows researchers to organize and interpret large volumes of qualitative data in a meaningful and structured way. It is especially useful for identifying repeated ideas, key terms, and thematic structures across different interviews or documents.
In this research, content analysis was used to classify and summarize responses from various Bitcoin mining companies, focusing on operational challenges, legal issues, and their experiences with infrastructure and regulation.

3.10.2 Narrative Analysis

Narrative analysis focuses on how people construct meaning through storytelling. It helps researchers explore how individuals or organizations describe experiences, actions, and events over time (Riessman, 2008). Narrative analysis is particularly effective when the goal is to understand lived experiences, motivations, and perspectives as expressed through stories or detailed accounts.

In this study, narrative analysis helped the researcher interpret the company histories, personal stories from management staff, and their reflections on entering and operating in Ethiopia's cryptocurrency mining industry. This method allowed the study to capture the depth and richness of their experiences beyond simple facts.

3.11 Research Validity and Reliability

3.11.1 Validity

Validity refers to the extent to which a test measures what it is supposed to measure and how truthful the research results. In this research the validity tested trough by **triangulating** the data through observation, interview and document the interview process, including the participants, questions asked, and key themes identified, to enhance transparency and allow for critical evaluation.

3.10.2 Reliability

Reliability is concerned with the ability of an instrument to measure consistently and the extent to which results are consistent over time. Preparing an oral interview guide is one of the best ways to ensure consistence in qualitative research. It helps ensure that all participant is asked similar questions, enhancing the reliability and comparability of the data collected (Patton, 2015). To ensure reliability in this research, the researcher used a **pre plan interview question** to helps ensure that all participant is asked similar questions, enhancing the reliability and comparability of the data collected.

CHAPTER FOUR
4.RESULTS AND DISCUSTION

This chapter focuses on analyzing the research results and the research question using a qualitative approach, utilizing interviews from responsible bodies and various sources. The research deeply discusses and analyzes the economic importance of cryptocurrency companies in Ethiopia, the job opportunities created by cryptocurrency, its contribution to energy development, its role in technological transformation, and its impact on generating hard currency. These aspects are analyzed and discussed in detail, highlighting the benefits of crypto mining in Ethiopia.

4.1 Response Rate

Out of the 22 companies approached for participation in the study, 19 provided responses, resulting in a high response rate. This level of participation not only demonstrates the relevance and timeliness of the research topic but also enhances the credibility and generalizability of the findings. The high response rate may also reflect the willingness of industry stakeholders to engage in discussions related to the subject matter, thereby contributing valuable insights to the study.

4.1.1 Demographic Profile of the Respondents

Among the 19 respondents, 18 were male and 1 was female, indicating that the majority of the participants were male. Regarding age, 2 respondents were between 31 and 35 years old, while the remaining 17 were above 36, suggesting that the majority were mature and potentially experienced individuals in the crypto mining sector.

In terms of educational background, 1 respondent held PhD specialized in technology and crypto mining, 3 held an MSc and the remaining respondents had BSc degrees. This highlights that the industry is led by highly educated and technically skilled professionals.

All respondents had prior experience with crypto mining companies. Furthermore, while all of them had worked in Ethiopia for at least over year, many had also accumulated international work experience ranging from 3 to 10 years outside of Ethiopia

4.2 The Economic Benefit

Cryptocurrency mining presents Ethiopia with significant economic and technological opportunities, leveraging the nation's abundant renewable energy resources. By transforming surplus hydro-power into digital assets, Ethiopia can stimulate economic growth and technological advancement. Experts estimate that Bitcoin mining could contribute up to $4 billion to Ethiopia's GDP, providing a significant boost to the national economy (Bitkern, 2024). Ethiopia's vast hydro-power potential allows for the conversion of excess electricity into valuable cryptocurrencies, maximizing the utilization of renewable energy while generating substantial revenue (AIcoin, 2024). The Ethiopian government also benefits from foreign currency inflows as mining companies pay for electricity consumption in foreign currency, thus enhancing the nation's foreign exchange reserves and supporting economic stability (Forbes, 2024). Furthermore, engaging in cryptocurrency mining encourages technological innovation and infrastructure development, positioning Ethiopia as a leader in block-chain technology (Forbes, 2024). Active government support of the cryptocurrency mining industry has led to significant revenue generation, with the government earning more than $55 million from agreements with mining companies over a ten-month period (Dig.watch, 2024). In summary, cryptocurrency mining offers Ethiopia a multifaceted avenue for economic development, technological progress, and enhanced foreign exchange earnings, capitalizing on its renewable energy resources and strategic positioning in the digital economy.

Cryptocurrency mining presents significant economic opportunities for Ethiopia, particularly in terms of power sales, foreign investments, licensing fees, and other income streams. By capitalizing on its vast renewable energy resources, Ethiopia can establish itself as a regional hub for cryptocurrency mining and leverage this industry to drive economic growth.

4.2.1 Revenue from Power Sales

Ethiopia has an abundant supply of renewable energy, primarily from hydro-power. This is a key advantage for cryptocurrency mining operations, which consume large amounts of electricity. By attracting mining operations, Ethiopia could generate substantial revenue from the sale of electricity. Cryptocurrency miners would pay for the electricity they use to power their data centers and mining farms, providing a direct income stream for the Ethiopian Electric Power Corporation (EEPCo). With a growing demand for electricity from mining companies, Ethiopia could also

negotiate favorable contracts that ensure long-term revenue from these operations. By harnessing its surplus hydroelectric power, Ethiopia can meet the energy needs of the mining industry while boosting government revenue (CoinDesk, 2022).

Cryptocurrency mining has emerged as a significant economic activity in Ethiopia, leveraging the nation's abundant and affordable hydroelectric power. The Ethiopian Electric Power (EEP) has reported generating approximately $55 million over the past ten months through power purchase agreements with Bitcoin mining companies (The Africa Report).

According to a key respondent at Ethiopian Electric Power (EEP), currently 22 companies are applying for cryptocurrency mining and have secured power purchase agreements to buy electricity at a rate of $0.03 per kilowatt. Some of these companies have already started operations" (Ethiopian Electric Power Authority, 2025)

4.2.2 Licensing Fees and Regulatory Revenue

As cryptocurrency mining grows, Ethiopia can generate significant income through licensing fees and regulatory frameworks. Countries worldwide are increasingly implementing systems for regulating and taxing cryptocurrency activities, and Ethiopia could follow suit. By establishing clear regulations for mining operations, the government could charge licensing fees for companies wishing to mine cryptocurrency within the country. These licensing fees could be tiered depending on the size and scale of the operations. Additionally, Ethiopia could implement a tax structure on the profits generated by these mining operations, adding another revenue stream for the government. As mining continues to expand, this could become a steady source of income that supports various public services (Investopedia, 2023).

According to a key person at the Investment Agency, there are currently 22 companies registered in data mining, cryptocurrency mining, and other digital banking financial services. To register as a foreign company, they are required to deposit a minimum of $200,000 (Investment Agency, 2025).

4.2.3 Local Economic Growth

Ethiopia could see an increase in local entrepreneurship, as businesses emerge to serve the needs of mining operations, such as equipment suppliers, logistics companies, and service providers

(Reuters, 2021). The growth of this sector could lead to greater economic diversification and increased income for local communities.

As some crypto company's respondent admitted they are buying huge amounts of power-related, water-related, network, and telecom-related materials and machines from local importers and government offices.

4.2.4. Boosting Tech Tourism and International Interest

Cryptocurrency mining can also indirectly stimulate tourism and attract international visitors to Ethiopia. As the country develops its reputation as a crypto-friendly destination, it could host events such as cryptocurrency conferences, mining tournaments, and block-chain technology seminars. This would not only attract cryptocurrency enthusiasts but also business leaders, investors, and innovators from around the world, generating income from tourism-related activities. Additionally, Ethiopia could become a destination for tech entrepreneurs looking to invest in the country's growing cryptocurrency sector. This could further boost local hospitality businesses, including hotels, restaurants, and transportation services, creating another important source of income (Reuters, 2021).

4.2.5 Creating Job Opportunities

As the researcher observed Cryptocurrency mining companies has the potential to create significant job opportunities in Ethiopia especially hydroelectric power, which makes it an attractive location for cryptocurrency mining. As mining operations grow, they create a variety of jobs, including positions in:

- Mining operation management
- Hardware maintenance
- Security and network management
- Electrical engineering
- Other professional roles, such as law, finance, and logistics

According to responds in cryptocurrency companies report higher salaries, along with benefits such as food and shelter, compared to other industries. Additionally, companies are offering training in cryptocurrency mining and other technologies, as well as general training about cryptocurrency mining. Employees in some cryptocurrency companies report high levels of job satisfaction, appreciating both the work and the benefits provided by their positions.

4.3. Contribution to Energy Development

Cryptocurrency has a global reputation for attracting significant investment. By establishing a favorable regulatory environment, Ethiopia could attract international investors looking to set up mining operations. These investments could bring in advanced technologies and practices that could help modernize Ethiopia's energy sector, leading to more efficient energy distribution, storage, and management systems (Cryptocurrency and Energy in Africa, 2020).

Furthermore, international interest in cryptocurrency mining might incentivize the government to build more robust and scalable energy infrastructure, especially in underdeveloped regions. This could open up opportunities for rural electrification projects that rely on clean, renewable sources (Cryptocurrency and Energy in Africa, 2020).

4.3.1 Stimulating Investments in Energy Infrastructure

One of the most promising aspects of cryptocurrency mining is its potential to stimulate investments in energy infrastructure. Mining operations are energy-intensive, and to keep them running efficiently, significant investments in energy grids, generation plants, and transmission networks are often required. In Ethiopia, where the electricity grid has historically faced challenges, cryptocurrency mining could drive necessary improvements to power generation and transmission systems.

Cryptocurrency mining requires high-performance hardware, which demands uninterrupted power supply. To meet this demand, it may incentivize investments in renewable energy generation, storage systems, and grid stabilization technologies. These investments could benefit Ethiopia's energy sector by accelerating the adoption of innovative technologies that improve the country's overall energy infrastructure and reliability (Cryptocurrency and Environmental Sustainability, 2021).

In addition, cryptocurrency companies are increasingly partnering with governments and local businesses to build the infrastructure needed to support energy-intensive mining operations. These partnerships often include the construction of new power plants, the expansion of the national grid, and the development of renewable energy sources. By attracting major cryptocurrency companies to Ethiopia, the government could see a boost in infrastructure investments that benefit both the mining sector and the general population (Cryptocurrency and Energy in Africa, 2020).

As cryptocurrency mining grows, the need for advanced power distribution systems will also increase. By partnering with international energy companies, Ethiopia could attract funding to expand and modernize the national grid, providing better access to electricity for both mining and domestic consumption. Furthermore, cryptocurrency mining operations could contribute to the creation of local energy markets, where energy is distributed more efficiently to meet both national needs and industry demands (Cryptocurrency and Environmental Sustainability, 2021).

According to key persons at Ethiopian Electric Power, many crypto companies are using unused substations. EEP is also rethinking the implementation of new rules that would require cryptocurrency companies to build their own substations and transmission lines, which would benefit the locals and improve power infrastructure. Cryptocurrency companies would make use of unused resources to put them to work in building the grid and transmission lines.

4.4. Importance of Cryptocurrency in Technology Transformation

Crypto mining companies are playing a pivotal role in Ethiopia's technological transformation by leveraging the country's abundant renewable energy resources to establish large-scale data centers and mining operations. These companies bring the latest and most advanced mining equipment, introducing cutting-edge infrastructure and state-of-the-art technologies to the local market. By integrating high-performance hardware and efficient mining rigs, they not only boost the scale and effectiveness of crypto mining operations but also introduce Ethiopia to the latest global advancements in blockchain technology. This new technology infrastructure will help create a competitive edge in the global mining industry and accelerate digital innovation in Ethiopia.

In addition to infrastructure, crypto mining companies also contribute to the development of local expertise by training Ethiopians in advanced mining techniques, blockchain management, and data analytics. These educational opportunities enable local professionals to acquire skills in areas such as system optimization, cryptocurrency security, and energy-efficient mining practices. As these

companies establish a presence, they will also create opportunities for Ethiopians to develop specialized knowledge that can be applied across various tech industries, fostering a culture of innovation and entrepreneurship. According to Bitkern (2024), the introduction of new equipment and advanced training programs will transform Ethiopia into a tech hub for digital industries, with local talent benefiting from the global expertise shared by these crypto companies.

4. 5 Crypto Mining in Ethiopia and Environmental Concerns.

As the key respondent mention that cryptocurrency mining is often considered harmful to the environment due to its high energy consummation, carbon emission and the stain it places on water and land resource. However, in the case of Ethiopia, the situation is somewhat different. The country relies heavily on renewable hydroelectric energy, which significantly reduce the carbon footprint of minimizing the need of energy intensive cooling system reducing water consumption and operational cost. Importantly, Ethiopian often uses excuse or excess or otherwise unused energy for cryptocurrency mining helping to optimized energy production without diverting power from essential public service.

The Ethiopian government has established he regulatory framework to manage energy allocation and ensure that mining activity do not disrupt local communities while promoting opportunities for local miners to participate in this emerging sector .these regulation aim to balance economic growth with environmental protection , encouraging local entrepreneurship and job creation in crypto mining , as a result, cryptocurrency mining in Ethiopia can be seen as more environmentally and economically viable compared to many other regions , provided that energy access for local communities is safeguarded (coinMarketCap, 2023; Ethiopian ministry finance, 2024)

CHAPTER FIVE
5. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the data with cryptocurrency mining companies, the research also highlights, crypto mining industry is contributing significantly to Ethiopia's financial growth. Within just 10 months, the country has earned a substantial amount of foreign currency from this sector, primarily through the sale of renewable and environmentally friendly energy. This makes the industry highly attractive to private mining firms. Ethiopia's vast, untapped renewable energy resources offer the potential for even greater economic gains in the future. In recognition of this opportunity, the government has recently allocated an additional 600 megawatts (MW) of power specifically to support the cryptocurrency mining industry.

However, the research concludes that despite Ethiopia's surplus energy and environmental advantages, several challenges remain. Chief among these is the **lack of a clear, coherent, and enforceable legal framework**, which has created confusion and delays in processes such as power purchase agreements and the importation of mining equipment. Additionally, while the economic benefits are promising, the industry remains **largely untaxed** due to low technical capacity and structural limitations, reducing the country's overall fiscal gains. Addressing these issues could enable Ethiopia to realize even greater economic benefits from its growing crypto mining industry.

Regarding job creation, the researcher found that the cryptocurrency mining industry has provided numerous new job opportunities. Interviewees reported that these positions offer high salaries and extensive training in fields such as mining machine maintenance, electrical engineering, networking, IT, and other technical areas essential for the mining process. Additionally, there has been hiring in non-technical roles, such as lawyers, accountants, logisticians, and other professionals.

Concerning energy development, the researcher discovered from interviewees that cryptocurrency mining has led to the utilization of previously unused substations, which are now being repurposed for the mining industry. Many resources related to power grid transmission lines, copper cables,

and other unused or degraded infrastructure are now being used to expand the energy infrastructure to support cryptocurrency mining. This expansion also benefits local power consumption. According to key officials from the Ethiopian Electric Power Office, new regulations are being introduced, which will require cryptocurrency companies to build their own infrastructure, such as substations and transmission lines, specifically for mining purposes.

Lastly, the researcher found that cryptocurrency companies are contributing to the transfer of the latest data center and cloud service technologies to Ethiopia. This includes the construction of energy-efficient power-saving plants, the provision of fast internet, and the supply of advanced communication and networking equipment.

5.2 Recommendation

In light of the study's findings and conclusions, the researcher proposes the following recommendations to the stakeholders of the cryptocurrency mining sector.

The National Bank of Ethiopia (NBE) should take the lead in formulating a clear, comprehensive, and coherent regulatory framework for the cryptocurrency mining sector. Given the fast-evolving and sensitive nature of digital assets and blockchain-based industries, this framework should establish well-defined operational, financial, and legal standards for crypto mining companies. A robust regulatory system will foster responsible investment, attract foreign capital, and ensure that Ethiopia benefits sustainably from its abundant renewable energy resources.

Ethiopian Electric Power (EEP), which is currently focused primarily on electricity sales, is advised to establish a specialized department dedicated to overseeing energy usage within the crypto mining sector. This department should: Monitor power distribution to crypto miners and evaluate consumption efficiency, Balance national electricity demands to avoid negatively affecting public supply, collaborate with relevant agencies to ensure long-term sustainability and strategic energy allocation. By proactively managing crypto-related energy consumption, EEP can protect the public interest and maintain national energy stability while supporting industrial growth.

The Information Network Security Agency (INSA), due to the cybersecurity implications of the crypto mining industry, is encouraged to: Collaborate with regulatory and taxation authorities to develop secure systems for monitoring crypto mining operations, Provide technical expertise in digital asset tracking, particularly in cooperation with the Tax Authority. INSA's involvement is crucial for maintaining national security while enabling the sector to grow within a secure and well-regulated digital environment.

The research highlights that the cryptocurrency mining sector in Ethiopia remains largely untaxed due to technical and structural limitations. It is recommended that the Ethiopian Revenue and Customs Authority (ERCA): Design and implement a clear, enforceable, and taxation framework in collaboration with INSA and NBE, set tax rates that encourage compliance without discouraging investment. A proper taxation structure will not only generate substantial national revenue but also promote fairness for crypto mining operators.

Future Research

This study primarily adopts a qualitative approach to examine the emerging benefits of cryptocurrency mining in Ethiopia. However, future research should aim to quantify these benefits including employment generation, foreign exchange earnings, and GDP contributions using empirical data and economic modeling.

Additionally, given that the industry is still in its early stages and the Ethiopian government has only issued a general proclamation assigning regulatory authority to the Information Network Security Agency (INSA), there remains a lack of a detailed and enforceable legal framework. Future studies should therefore also explore comparative legal frameworks, develop recommendations for comprehensive and adaptive regulation, and assess appropriate taxation models to ensure fair revenue generation while supporting industry growth.

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Appendix

I am a graduate student at Addis Ababa University. This in interview questions is intended to serve as primary data for my Master's thesis in Corporate Finance at Addis Ababa University, prospects of cryptocurrency mining in Ethiopia, analyzing its potential economic benefits, and environmental implications, and providing insights into the feasibility of developing a sustainable crypto mining industry in the country. Your participation in this study is highly valuable and greatly appreciated. I assure you that all information gathered will be treated with the utmost confidentiality and will be used solely for the purposes of this research.

The interview questions were developed based on the objectives of the research, the researcher's working experience of the industry, the interaction with the companies, and the researcher's knowledge of the subject matter. This approach facilitated a flexible and responsive interview process, allowing for a deeper exploration of relevant themes as they emerged.

General Instructions

Company Position: ----------

- In all cases where answer options are available, please make tick mark (√) in the appropriate box where the choice is appropriate for you.

PARTI: Demographic characteristics

1. Gender: 1. Male ☐ 2. Female ☐

☐ ☐ ☐

2. Age: 1. Below 25 [ ] 2.26-30 3.31-35 4. above36

3. Education level: 1. Bellow Greade12 2. Fist degree [ ] 3. Master's degree

4. PhD and Above 1, Yes [ ] 2, No [ ]

5. Do you have Experience related with crypto mining? 1, Yes [ ] 2, No [ ]

6. How many years working in Ethiopia ----------?? 1, 1- 5 [ ] 2, above 5 [ ]

7. How many years working in abroad----------?? 1, 1- 5 [ ] 2, above 5 [ ]

1. **How is Ethiopia benefiting economically from cryptocurrency companies?**
   - What kind of revenue are cryptocurrency companies, bringing to Ethiopia?

   Interviewer's Opinion/Comments:

2. **Since most of the cryptocurrency companies are foreign, what kind of revenue is generated in terms of foreign direct investment (FDI) or USD for Ethiopia?**

   Interviewer's Opinion/Comments:

3. **How is the Ethiopian government earning from electricity sales and direct investments or deposits from cryptocurrency companies like?**
   - How are these revenues helping the country's overall economy and development?

   Interviewer's Opinion/Comments:

4. **How are cryptocurrency companies driving improvements in power and infrastructure?**
    - What kind of power lines and substations are being built to support cryptocurrency companies, and how do these improvements benefit local communities?

      Interviewer's Opinion/Comments:

5. **How can the new revenue generated from cryptocurrency companies help the Ethiopian government push for better internet, power, and water infrastructure development?**

   Interviewer's Opinion/Comments:

6. **How can Ethiopia benefit from its renewable energy resources to increase income from the cryptocurrency world, particularly in terms of mining operations?**

   Interviewer's Opinion/Comments:

7. **what do you think about the environmental concerns that crypto mining supposed to create in Ethiopian situation and how do will you take responsibility?**

8. **Do you have any additional points or options to share about the role of cryptocurrency companies in Ethiopia's development?**

- Is there anything else you think could help Ethiopia maximize the benefits of the crypto industry?
  Interviewer's Opinion/Comments: