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REVIEW ARTICLE

Cryptocurrencies and money laundering: a comparative analysis of risks and regulations

Criptomonedas y lavado de activos: un análisis comparativo de riesgos y regulaciones

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Abstract The present study examines the impact of cryptocurrencies on money laundering and evaluates the regulatory strategies implemented in various jurisdictions. Utilizing a qualitative approach, it conducts a comparative analysis and case studies focusing on the United States, China, and Colombia, chosen for their contrasting regulatory frameworks. The study identifies legal risks, including the anonymity and decentralization of cryptocurrencies, which facilitate illicit activities, as well as regulatory gaps that hinder effective oversight. Among the findings, the United States employs robust Know Your Customer (KYC) and Anti-Money Laundering (AML) standards, while China's stringent prohibitions drive clandestine markets, and Colombia faces significant challenges due to the absence of specific regulatory frameworks. The results underscore the necessity of harmonizing regulatory measures at an international level, promoting global cooperation, and advancing the development of sophisticated blockchain analytics technologies. The study concludes that although cryptocurrencies offer substantial opportunities for financial inclusion and technological innovation, it is imperative to balance these advantages with adequate legal frameworks to curtail their misuse and foster a secure and compliant financial ecosystem.

Keywords legal framework, comparative análisis, blockchain, financial inclusion.

Resumen El presente estudio analiza el impacto de las criptomonedas en el lavado de activos y evalúa las estrategias regulatorias implementadas en diferentes países. A partir de un enfoque cualitativo, se realiza un análisis comparativo y un estudio de casos centrado en Estados Unidos, China y Colombia, seleccionados por sus enfoques regulatorios contrastantes. Se identifican riesgos como el anonimato y la descentralización de las criptomonedas, que facilitan actividades ilícitas, junto con vacíos regulatorios que complican su supervisión. Entre los hallazgos, se destaca que, mientras Estados Unidos implementa estándares KYC y AML efectivos, China opta por restricciones severas que generan mercados clandestinos, y Colombia enfrenta desafíos por la falta de regulación específica. Los resultados subrayan la necesidad de armonizar las normativas a nivel internacional, fomentar la cooperación global y desarrollar tecnologías avanzadas para la trazabilidad de transacciones. Se concluye que, aunque las criptomonedas ofrecen oportunidades significativas para la inclusión financiera y la innovación, es crucial equilibrar estos beneficios con regulaciones adecuadas para minimizar su uso indebido y promover un ecosistema financiero seguro.

Palabras clave marco jurídico, análisis comparativo, blockchain, inclusión financiera.

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PUBLIS EDITORIAL

Introduction

The emergence of cryptocurrencies has revolutionized global finance, transforming traditional transaction methods and the economic and social paradigms underpinning them. Since the introduction of Bitcoin in 2009, these digital currencies have experienced exponential growth, positioning themselves as alternatives to the traditional financial system (Iyidogan, 2020). Their distinctive features, such as decentralization, anonymity, and advanced cryptography, enable secure and rapid transactions in a globalized environment (Carrera-López et al., 2020). However, these same characteristics have raised concerns about their potential use for illicit activities, including money laundering and terrorism financing (Szmigielski, 2016).

Decentralization, one of the most prominent attributes of cryptocurrencies, eliminates the need for transaction intermediaries, making them appealing to those seeking alternatives to traditional financial systems. Nonetheless, this lack of oversight also renders them a vehicle for illicit activities (Centro de Estudios Financieros [CEF], 2018). In particular, exchange platforms and digital wallets offer a high degree of anonymity, complicating the traceability of financial operations (Carrera-López et al., 2020). These risks have been exacerbated by the proliferation of over 10,000 cryptocurrencies, many of which lack specific regulations to limit their misuse (Samperio Valdivieso, 2022).

On an international level, some countries have chosen to implement specific regulations. For instance, El Salvador has recognized Bitcoin as legal tender, while others, such as China, have imposed strict restrictions on its use (Martín Fernández, 2022). In Panama, Bill No. 782 was approved to regulate its use as a payment method and to establish a regulatory framework aimed at mitigating associated risks. These differences reflect the lack of global consensus and underscore the need for a coordinated international regulatory framework that can harness the benefits of cryptocurrencies while mitigating the risks linked to their misuse (Vélez et al., 2022).

Beyond their impact on the global economy, cryptocurrencies have sparked new debates on financial sovereignty and economic security. Governments face the challenge of regulating a system that operates beyond the traditional bounds of state control, where transactions are conducted directly between users without intermediaries (Centro de Estudios Financieros [CEF], 2018). This phenomenon has driven increased cryptocurrency adoption, both as an investment and as a payment method, with developed and developing countries progressively integrating them into their economies (Carrera-López et al., 2020; Martín Fernández, 2022).

The advancement of blockchain technology and its integration into various sectors have expanded the scope of cryptocurrencies beyond finance (World Bank, 2022). From their use in smart contracts to the creation of non-fungible tokens (NFTs), this underlying technology has demonstrated its potential to transform entire industries (Zúñiga Segura, 2022). However, the rapid adoption of cryptocurrencies and blockchain has outpaced the ability of governments and institutions to implement adequate regulations, creating an environment susceptible to misuse. This highlights the urgent need for international cooperation to address the challenges associated with these emerging technologies (Vélez et al., 2022).

The purpose of this study is to analyze the impact of cryptocurrencies on money laundering and to evaluate the regulatory strategies implemented in different countries. Through a comparative analysis and a focus on specific cases, the study aims to understand how technological advances have outpaced the regulatory capabilities of many governments, fostering an environment conducive to the misuse of these digital assets. The primary objective is to provide recommendations that balance technological innovation with financial security, promoting the legitimate use of cryptocurrencies on a global scale.

Cryptocurrencies are decentralized digital currencies designed to function as a medium of exchange, utilizing blockchain technology and advanced cryptography to ensure secure and transparent transactions. Among the most well-known cryptocurrencies is Bitcoin, created in 2009, which marked the beginning of this new form of digital money. Blockchain, or the block chain, is the underlying technology that enables the operation of cryptocurrencies. It is a distributed and secure ledger that records all transactions, ensuring they cannot be altered or tampered with (Carrera-López et al., 2020).

An important distinction lies between virtual currencies and digital currencies. While digital currencies are electronic representations of fiat money and are typically regulated by financial institutions, virtual currencies, such as cryptocurrencies, lack centralized regulation and rely solely on their technological protocols (Vélez et al., 2022). This absence of intermediaries in cryptocurrencies is one of their greatest strengths, but it also poses challenges in terms of oversight and regulation.

Bitcoin, created by an individual or group under the pseudonym Satoshi Nakamoto, was the first cryptocurrency to introduce the concept of blockchain. Since then, more than 10,000 cryptocurrencies have been created, serving various purposes, ranging from investments to specific technological solutions (Vélez et al., 2022).

Globally, the use of cryptocurrencies has grown exponentially, particularly in developing countries seeking alternatives to traditional banking systems. The popularity of Bitcoin paved the way for other projects, such as Ethereum, which introduced the functionality of smart contracts, enabling

applications beyond financial transactions (Carrera-López et al., 2020).

Money laundering is the process of transforming illicit gains into seemingly legitimate funds. This process consists of three main stages:

Placement: This involves introducing funds obtained from illicit activities into the financial system. With cryptocurrencies, this stage can include the purchase of digital assets using untraceable cash (FATF, 2021).

Layering: Funds are separated from their illicit origin through complex transactions and frequent movements. Cryptocurrencies are ideal for this stage due to their capability for fast, cross-border transfers without the need for intermediaries (FATF, 2021).

Integration: The funds are reintroduced into the economic system as legal assets, facilitating their use in legitimate investments. For instance, cryptocurrencies can be used to invest in real estate or businesses (United Nations Office on Drugs and Crime, 2004).

Relevant Doctrines

Mexican Context: Highlights the importance of a regulatory framework that enables the identification of the origin of funds and the control of cryptocurrency exchange platforms. It advocates for the use of financial intelligence and advanced technology to track digital transactions (Carrera-López et al., 2020).

International Context: Stresses the need for harmonized regulations, emphasizing that cryptocurrencies should be subject to the same standards as traditional financial systems (FATF, 2021).

The growing use of cryptocurrencies in illicit activities has prompted the adoption of international regulatory frameworks. The FATF (2019) has developed specific recommendations to include cryptocurrencies within anti-money laundering (AML) standards. Among its guidelines, it emphasizes the need to identify users in digital transactions and regulate exchange platforms (FATF, 2021).

Furthermore, the Palermo Convention, an international treaty against organized crime, underscores the importance of preventing and penalizing money laundering as a key measure to combat organized crime. Although the convention does not explicitly mention cryptocurrencies, their integration into global financial systems has led signatory countries to adopt specific regulations for these digital assets (United Nations Office on Drugs and Crime, 2004).

The lack of global consensus on how to regulate cryptocurrencies poses a significant challenge. While some countries adopt restrictive approaches, such as China, others like El Salvador have legalized their use, promoting financial inclusion and technological innovation (Vélez et al., 2022).

Cryptocurrencies are decentralized digital currencies that use blockchain technology and advanced cryptography to enable secure, fast, and anonymous transactions in a globalized environment. Among the most well-known is Bitcoin, created in 2009, which marked a turning point in the financial system by introducing the concept of blockchain. This technology, a distributed ledger, records all transactions, ensuring their integrity and preventing manipulation (Carrera-López et al., 2020).

The key difference between digital currencies and virtual currencies lies in their regulation and oversight. Digital currencies, such as those issued by central banks, are backed by fiat currencies and regulated by financial institutions. Cryptocurrencies, on the other hand, operate autonomously and without central oversight, offering opportunities but also presenting significant risks (Vélez et al., 2022).

The development of cryptocurrencies began with Bitcoin, designed as a decentralized alternative to fiat money. Since then, thousands of cryptocurrencies have emerged, such as Ethereum, which expanded their functionality through smart contracts—applications that allow automated and secure operations without intermediaries (Carrera-López et al., 2020).

The development of cryptocurrencies began with Bitcoin, designed as a decentralized alternative to fiat money. Since then, thousands of cryptocurrencies have emerged, including Ethereum, which expanded their utility through smart contracts—applications that enable automated and secure operations without intermediaries (Carrera-López et al., 2020).

The rapid adoption of cryptocurrencies is driven by factors such as the pursuit of financial independence, distrust in traditional institutions, and the adoption of advanced technologies like blockchain. Although their use has surpassed the regulatory capabilities of many governments, countries like El Salvador have adopted Bitcoin as legal tender, aiming to foster financial inclusion and attract foreign investment (FATF, 2021).

Moreover, the evolution of blockchain has led to the development of new versions of this technology, such as private and hybrid blockchains. These allow companies and governments greater control over their networks, broadening their application beyond the financial sector. Examples include pilot projects for central bank digital currencies (CBDCs) backed by central banks (Vélez et al., 2022).

Cryptocurrencies have introduced a significant shift in global economic dynamics. On the one hand, they have created new opportunities for investment and portfolio diversification, attracting both institutional and retail investors. On the other hand, their extreme volatility has posed challenges for both users and regulators. For example, Bitcoin reached a value of nearly $69,000 in 2021 but subsequently experien-

ced drastic declines, underscoring the risks inherent in this market (Carrera-López et al., 2020).

One of the most significant applications in emerging economies is the potential to reduce costs and time for international remittances. Cryptocurrencies like Stellar and Ripple have enabled users to transfer money almost instantly and at lower costs, generating a positive impact in countries such as the Philippines and Mexico, where remittances constitute a substantial portion of GDP (Vélez et al., 2022).

Money Laundering and Cryptocurrencies

Money laundering is the process of concealing the illicit origin of funds by transforming them into seemingly legitimate assets. This process consists of three stages:

Placement: Introducing illicit funds into the financial system, often by purchasing cryptocurrencies with untraceable cash. The anonymity provided by cryptocurrencies facilitates this initial stage (FATF, 2021).

Layering: Transferring funds across multiple accounts or jurisdictions to make tracing more difficult. Cryptocurrencies like Monero, designed to prioritize anonymity, are key tools in this phase (United Nations Office on Drugs and Crime, 2004).

Integration: Reintroducing the funds into the economy as legitimate assets through investments in real estate, businesses, or other financial products.

Emerging Methods and Challenges

New methods, such as cryptocurrency mixers (coin mixers) and the use of online games and NFTs, have emerged as mechanisms to obscure the traceability of illicit transactions (Martín Palla, 2022). These methods pose significant challenges for authorities and underscore the need for advanced blockchain analysis technologies (FATF, 2021).

The growing use of cryptocurrencies in illicit activities has prompted international organizations such as the FATF

Table 1. Relevant Laws, Supervision Levels, and Main Risks in the United States, China, and Colombia Regarding Cryptocurrencies

Country	Relevant Laws	Supervision Levels	Main Risks Detected
United States	**Bank Secrecy Act:** Implementation of KYC and AML measures by FinCEN and SEC.	**High:** Active supervision of exchanges and related activities.	Use of cryptocurrencies for money laundering and terrorism financing.
	Securities Act of 1933: Oversight of token offerings and ICOs.	**Active** supervision of compliance.	Fraud in ICOs and market manipulation.
	Commodity Exchange Act: CFTC regulation of derivatives markets.	**High:** Regulatory framework for commodities.	Potential abuse of cryptocurrency derivatives markets.
China	**2017 ICO and Exchange Ban:** Total prohibition of cryptocurrency exchanges.	**Very High:** Strict monitoring and enforcement actions.	Underground mining and cryptocurrency trading operations.
	2021 Mining Restrictions: Ban on mining due to environmental concerns.	**Constant monitoring** and crackdowns on illegal activity.	Displacement of activities to unregulated markets or foreign jurisdictions.
Colombia	**No specific regulation for cryptocurrencies:** Informative circulars by the SFC warning about risks.	**Low:** Lack of direct oversight on cryptocurrency activities.	Use of cryptocurrencies for money laundering and tax evasion.
	Financial Superintendency Circulars: Focused on risks and recommendations.	**Limited:** Supervision based on warnings and guidance.	Vulnerability to fraud and scams due to unclear regulations.

to issue specific recommendations. These include requiring exchange platforms to implement Know Your Customer (KYC) measures and report suspicious activities. Additionally, traceability of transactions is mandated to ensure cryptocurrencies are not used for unlawful purposes (FATF, 2021).

International Frameworks and Efforts

The Palermo Convention, while not specifically addressing cryptocurrencies, provides a framework for preventing money laundering in the fight against transnational organized crime. Several countries have adapted their national legislation to include provisions for digital assets, aligning with the general guidelines of this convention (United Nations Office on Drugs and Crime, 2004).

Despite clear guidelines from organizations like the FATF, the lack of harmonization among national legislations remains a significant obstacle. Countries such as China have chosen to ban cryptocurrencies outright, whereas the European Union has progressed with the implementation of the Markets in Crypto-Assets Regulation (MiCA), aiming to standardize rules across member states. In Latin America, Mexico and Brazil are leading efforts to integrate cryptocurrencies into their financial systems (United Nations Office on Drugs and Crime, 2004).

The mining process, used to validate transactions and ensure blockchain network security, has faced criticism for its high energy consumption. Initiatives like Ethereum 2.0 are reshaping this landscape through the adoption of Proof of Stake, which significantly reduces energy consumption while enhancing the network's scalability (FATF, 2021).

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Materials and Methods

This study employs a qualitative approach based on comparative analysis and case studies to evaluate regulatory strategies and the impact of cryptocurrencies on money laundering across different legal and social contexts. Three countries with contrasting regulatory approaches were selected: the United States, China, and Colombia. These cases enable an analysis of how variations in regulations influence the supervision and control of illicit activities involving cryptocurrencies.

Selected Countries

As one of the largest cryptocurrency markets, the United States has implemented specific regulations through agencies such as the Financial Crimes Enforcement Network (FinCEN). These include Know Your Customer (KYC) measures and mandatory reporting of suspicious transactions. The U.S. regulatory framework is notable for its focus on balancing technological innovation with financial security.

China has taken a restrictive approach, banning cryptocurrency trading and related activities such as mining. The Chinese government's stance reflects concerns over financial stability and environmental impact. However, this approach also presents challenges by pushing these activities into unregulated markets.

In Colombia, cryptocurrencies are not recognized as legal tender, but their use is not prohibited. The country faces significant challenges related to money laundering due to narcotrafficking. In this context, cryptocurrencies have emerged as an alternative method for transferring illicit funds, underscoring the need for clearer and more effective regulations.

Analysis Criteria

Comparative Regulation of Cryptocurrencies in the United States, China, and Colombia

Cryptocurrency regulation in the United States is characterized by a fragmented approach, involving multiple federal and state agencies based on their jurisdiction:

Financial Crimes Enforcement Network (FinCEN): Since 2013, FinCEN has classified cryptocurrency exchanges as "money transmitters," requiring them to register and comply with Anti-Money Laundering (AML) and Know Your Customer (KYC) regulations.

Securities and Exchange Commission (SEC): The SEC classifies certain tokens as "securities" under the Securities Act of 1933, applying relevant regulations to Initial Coin Offerings (ICOs).

Commodity Futures Trading Commission (CFTC): The CFTC recognizes cryptocurrencies as "commodities," overseeing related futures and derivatives markets.

The U.S. regulatory structure has made significant progress in supervising cryptocurrency-related activities. AML and KYC measures have strengthened the detection and prevention of illicit activities. However, the lack of a unified framework poses challenges for consistent enforcement, creating uncertainty for businesses and users.

Regulation has fostered an environment where cryptocurrency companies strive to comply with legal requirements to operate legitimately. Nevertheless, the complexity and variability of state and federal laws have led some companies to limit services in certain jurisdictions. Furthermore, the classification of certain tokens as securities has influenced how businesses structure their offerings and operations.

China has adopted a restrictive stance toward cryptocurrencies:

ICO and Exchange Ban: In 2017, the People's Bank of China banned Initial Coin Offerings (ICOs) and shut down

domestic cryptocurrency exchanges.

In 2021, authorities intensified restrictions by prohibiting cryptocurrency mining due to environmental and financial concerns.

These stringent measures have significantly reduced cryptocurrency-related activities within China. However, restrictions have driven mining and trading operations to unregulated markets or foreign jurisdictions, complicating oversight and control.

The ban has forced businesses and users to cease operations or relocate to other jurisdictions. Additionally, it has influenced the global cryptocurrency market due to China's significant role in mining and trading these assets.

In Colombia, cryptocurrencies are not recognized as legal tender, but their use is not prohibited:

The Financial Superintendency of Colombia (SFC) has issued circulars warning about the risks of cryptocurrencies and prohibiting financial institutions from offering related services (Triana Espitia, 2022).

Colombia's regulatory approach focuses on raising awareness of risks while preventing the involvement of traditional financial institutions. However, the lack of explicit regulations has left a gap in addressing the use of cryptocurrencies for illicit purposes, such as money laundering linked to narcotrafficking.

While cryptocurrency use continues to grow, the absence of clear and enforceable regulations has limited the government's ability to supervise and control illicit activities. This underscores the need for a more robust regulatory framework to address the unique challenges posed by digital assets.

Proposed Legislation (2021): A bill was introduced to regulate cryptocurrency exchange platforms, establishing registration requirements and compliance with AML and KYC measures.

The absence of specific regulation has created a legal vacuum, hindering the oversight and control of illicit activities associated with cryptocurrencies. While warnings issued by the Financial Superintendency of Colombia (SFC) aim to protect users, the lack of a clear legal framework limits the effectiveness of anti-money laundering efforts.

Regulatory uncertainty has deterred some companies from operating in Colombia, while others function without adequate oversight. This has created an environment prone to user risks and has hampered the implementation of effective measures against money laundering.

Case Studies: The Use of Cryptocurrencies in Illicit Activities

The anonymity and decentralization offered by cryptocurrencies have made them a tool of choice for illicit activities. Below are documented cases from different jurisdictions that illustrate these challenges, along with regulatory responses and their implications.

Case 1: Use of Cryptocurrency Mixers in the United States

U.S. authorities, in collaboration with international agencies, dismantled ChipMixer, a cryptocurrency mixing service operating since 2017. The service facilitated anonymity by combining transactions from multiple users, obscuring the origin and destination of funds. According to the Department of Justice, ChipMixer processed over $3 billion in illicit cryptocurrencies, originating from crimes such as ransomware attacks and drug trafficking.

Regulatory Response: The case underscored the importance of Know Your Customer (KYC) measures and Suspicious Activity Reports (SARs), implemented by the Financial Crimes Enforcement Network (FinCEN).

Challenges: Despite these measures, the case highlighted the limitations of current regulations in addressing advanced technologies specifically designed to evade oversight.

Case 2: Clandestine Mining in China

Despite China's ban on cryptocurrencies since 2021, clandestine mining operations continue to thrive in remote regions. These operations exploit illegal electrical connections or bribe local officials to evade detection. A recent report detailed how the Sichuan province, one of the most affected regions, has experienced massive power outages as a countermeasure to combat illegal mining activities.

• Regulatory Response: The Chinese government has escalated efforts to shut down illegal mining operations, confiscating equipment and imposing heavy fines.

• Challenges: Many mining operations have relocated abroad or transitioned to more decentralized networks, complicating oversight and creating parallel markets.

• Implications: This case demonstrates that outright prohibition is not always the most effective strategy, particularly when the underlying technologies can be quickly adapted.

Case 3: Cryptocurrencies and Drug Trafficking in Colombia

In 2020, Europol published a report highlighting how criminal organizations in Colombia used cryptocurrencies to launder proceeds from drug trafficking. These networks transferred illicit funds through international cryptocurrency exchanges, making it difficult for local authorities to trace the transactions.

• Regulatory Gaps: The case underscored the lack of specific cryptocurrency regulation in Colombia. While cryptocurrencies are not illegal, they are not strictly regulated either. Efforts by the Financial Superintendency of Colombia (Mo-

reto Trujillo & Quintero Duque, 2022), such as issuing informational circulars on the risks associated with cryptocurrencies, have not been sufficient to address these challenges.

• Recommendations: Europol emphasized the need for greater international cooperation and the development of advanced tracking technologies to combat this issue (Europol, 2020).

Case Analysis

All the cases demonstrate the use of cryptocurrencies to circumvent traditional financial systems, leveraging their anonymity and ability to facilitate rapid cross-border transactions. Advanced technologies, such as mixers and decentralized networks, present significant challenges for regulation and oversight.

• United States: KYC and AML measures have proven effective tools but require constant updates to address emerging technologies like mixers.

• China: The prohibition of cryptocurrencies has led to the rise of parallel markets, suggesting that extreme restrictive approaches can be counterproductive.

• Colombia: The absence of a robust regulatory framework has allowed cryptocurrencies to be exploited by criminal networks, emphasizing the need for clear legislation.

Key Takeaways

International cooperation is essential to tackle transnational crimes involving cryptocurrencies. Regulatory strategies must strike a balance between fostering technological innovation and ensuring financial security to prevent illicit activities from shifting to unregulated markets.

Results and discussion

In Colombia, drug trafficking organizations have increasingly adopted the use of cryptocurrencies, particularly Bitcoin, to facilitate money laundering and evade traditional financial controls. According to a report by the National Police, these organizations utilize cryptocurrency exchange platforms to convert illicit proceeds into digital assets, which are subsequently transferred to foreign accounts, complicating traceability. The lack of specific regulation in the country has allowed these activities to flourish, underscoring the need for a robust legal framework to oversee and control the use of cryptocurrencies in illicit activities.

In Asian countries such as Japan and South Korea, the use of decentralized exchange platforms (DEXs) for money laundering has been detected. These platforms, which operate without a central authority, allow users to trade cryptocurrencies anonymously. Studies reveal that criminal groups have exploited these platforms to move large amounts of illicit funds, taking advantage of the absence of Know Your Customer (KYC) and Anti-Money Laundering (AML) measures on certain DEXs. Authorities have responded by implementing stricter regulations and collaborating with other nations to monitor and control these activities.

The European Union has made significant strides in regulating crypto-asset markets with the adoption of the Markets in Crypto-Assets Regulation (MiCA). This legal framework establishes clear requirements for crypto-asset service providers, including measures for transparency, consumer protection, and anti-money laundering. MiCA's implementation seeks to harmonize regulations across member states, providing legal certainty and fostering innovation within the sector. This regulation is expected to mitigate risks associated with cryptocurrencies and strengthen trust in the European market.

Cryptocurrencies and Financial Inclusion

Cryptocurrencies have enabled millions of people to access the global financial system. In Nigeria, more than 32% of the population has adopted cryptocurrencies to facilitate cross-border transactions, avoid the high fees associated with traditional remittance services, and protect against the devaluation of the local currency (Vargas Osorno, 2022). Additionally, platforms like Ethereum have fostered the creation of smart contracts, which automate processes such as insurance payments and property transfers, reducing bureaucracy and increasing transparency.

Challenges: Cryptocurrency Volatility and Illicit Activities

The volatility of cryptocurrencies remains a significant challenge. In 2022, the collapse of Terra USD and Luna wiped out over $40 billion from the market within days, impacting both retail and institutional investors.

Regarding illicit activities, it is estimated that 0.24% of cryptocurrency transactions in 2022 were linked to criminal activities, amounting to approximately $20 billion (González, 2022).

United States: A Leader in Specific Regulations

The implementation of the Bank Secrecy Act and FinCEN's regulations has positioned the United States as a leader in cryptocurrency regulation. By 2023, over 90% of major cryptocurrency exchanges operated under KYC/AML standards, significantly reducing the use of these platforms for illicit activities.

However, the rise of decentralized platforms poses a new challenge, as these platforms do not require user registration or identification, creating a regulatory gap that authorities must address.

China: The Impact of a Total Ban

Although China's ban on cryptocurrencies has drastically reduced their visible use, reports suggest that clandestine activities related to mining and trading have shifted to unregulated markets. This demonstrates that strict prohibitions, while effective in the short term, can lead to unintended consequences, such as the growth of black markets.

MiCA Regulation: A Milestone in EU Cryptocurrency Oversight

Approved in 2023, the Markets in Crypto-Assets Regulation (MiCA) is regarded as a landmark in cryptocurrency regulation within the European Union. It incentivizes the creation of fintech startups by providing regulatory clarity and has enhanced consumer confidence through the enforcement of strict measures on transparency and data protection. According to the European Commission, over 40% of crypto-asset companies planned to expand their operations in Europe due to these regulations (Aguilar & Padilla, 2022).

Blockchain Analysis Tools

The development of blockchain analysis tools, as noted by Grandury González (2022), will enable authorities to identify suspicious transactions with greater accuracy. For example, such technologies have been instrumental in dismantling money laundering networks on platforms like Binance, highlighting their potential to improve oversight.

Central Bank Digital Currencies (CBDCs)

The anticipated launch of central bank-backed digital currencies, such as the digital yuan in China or the digital euro in the European Union, is expected to partially displace private cryptocurrencies. These CBDCs promise to deliver the benefits of cryptocurrencies—speed and low transaction costs—while maintaining the security and stability of traditional currencies.

Decentralization, which eliminates the need for traditional financial intermediaries, allows cryptocurrencies to operate without centralized regulations. This facilitates transactions in jurisdictions with weak or nonexistent controls, promoting global trade but leaving gaps that can be exploited for illicit activities. Additionally, global accessibility enables users, including illegal actors, to participate in international markets without restrictions. This is evident in cases such as drug trafficking in Colombia, where cryptocurrencies have been used to transfer illicit profits abroad without detection by local financial authorities.

Academic literature provides a nuanced view of the effectiveness of current cryptocurrency regulations. In the United States, studies highlight how the implementation of KYC and AML standards has significantly reduced illicit use on regulated platforms. For instance, González (2022) notes that although the total volume of illicit cryptocurrency transactions was relatively low (0.24% in 2022), effective tracking of illegal activities is primarily achieved on platforms compliant with these standards. However, the adaptability of criminals, who migrate to decentralized platforms, remains an unresolved challenge.

Conversely, the European Union has been recognized as a model of progressive regulation with its Markets in Crypto-Assets Regulation (MiCA). This framework provides a unified approach that harmonizes standards across member states, fostering investor confidence and promoting responsible innovation. Nonetheless, researchers have criticized MiCA for insufficiently addressing decentralized platforms and cryptocurrencies designed for extreme anonymity, leaving these areas as potential hubs for illicit activities.

In contrast, the literature also highlights the inadequacy of measures in countries like Colombia, where the lack of specific regulations allows cryptocurrencies to be used for illegal purposes without effective oversight (Palacios Rodríguez, 2021).

Regulatory Priorities for Decentralized Platforms (DEXs)

The development of specific regulatory frameworks for decentralized platforms (DEXs) is a pressing priority. These platforms, which operate without intermediaries, must be regulated to ensure th e implementation of measures such as Know Your Customer (KYC) and Anti-Money Laundering (AML).

• Smart Contracts for Identity Verification: This can be achieved through smart contracts that automate identity verification without compromising user privacy.

• Advanced Traceability Technologies: Governments should incentivize the adoption of advanced traceability tools, as highlighted by González (2022), to track suspicious transactions in real-time. These tools have proven effective in detecting patterns of money laundering and terrorist financing.

Tackling Cryptocurrency-Related Scams

Cryptocurrency-related scams remain a significant issue, particularly in unregulated markets.

1. Educational Campaigns: Governments should implement initiatives to educate consumers about the risks associated with cryptocurrency investments.

2. Legislative Requirements for Transparency: Regulations must compel platforms to provide clear and transparent information about the digital assets they offer. This would help mitigate the impact of fraudulent schemes, such as unregistered Initial Coin Offerings (ICOs).

A Global Approach to Regulation

The cross-border nature of cryptocurrencies necessitates a global regulatory approach. FATF Standards: The Financial Action Task Force (Fetsyak Senkiv, 2022) has established international standards promoting intergovernmental cooperation, but adoption remains inconsistent. International Information Networks: Strengthening global information-sharing networks, such as INTERPOL and Europol, is essential for tracking and prosecuting illicit activities involving cryptocurrencies. Multilateral Agreements: International agreements must focus on closing legal loopholes that allow criminals to operate in jurisdictions with weak or nonexistent regulations. By fostering cooperation and standardizing regulations, these measures aim to address the challenges posed by the transnational nature of cryptocurrency-related crimes.

Results and discussion

In Colombia, drug trafficking organizations have increasingly adopted the use of cryptocurrencies, particularly Bitcoin, to facilitate money laundering and evade traditional financial controls. According to a report by the National Police, these organizations utilize cryptocurrency exchange platforms to convert illicit proceeds into digital assets, which are subsequently transferred to foreign accounts, complicating traceability. The lack of specific regulation in the country has allowed these activities to flourish, underscoring the need for a robust legal framework to oversee and control the use of cryptocurrencies in illicit activities.

Conclusions

The analysis in this study reveals the dual nature of cryptocurrencies: while they provide significant opportunities for financial inclusion and technological innovation, they also pose substantial risks due to their anonymity, decentralization, and global accessibility. These features, while advantageous in legitimate contexts, make cryptocurrencies highly vulnerable to misuse.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Author contributions

Patricia A. Cozzo Villafañe and Marcel Antonio Díaz Ramírez: Conceptualization, data curation, formal analysis, investigation, methodology, supervision, validation, visualization, drafting the original manuscript and writing, review, and editing.

Data availability statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Statement on the use of AI

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