

Unbacked Cryptomoney, Fiscal Evasion and Environment Tax: Some Policy Recommendations in Europe

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Abstract

In a 2019 *New York Times* article, Paul Krugman declared himself a “crypto skeptic” and shared his pessimistic predictions for cryptocurrencies. Nevertheless, unbacked cryptomoney is now very important in our societies and has revolutionized the monetary and financial landscape as exemplified by the increased pressure from competent regulators to monitor and regulate it. Cryptocurrencies are described by their high volatility that permits regulators to define them as non-safe financial assets when it comes to energy consumption. The anonymous property of cryptocurrencies opens the door to tax evasion, making it especially susceptible to avoiding environment-related taxes aimed at tackling negative impact of climate change. Against this background, the paper sets a twofold aim: to demonstrate that unbacked cryptomoney is volatile and it may pose a threat to financial and fiscal stability; and to develop the idea that, given their different degrees of anonymity and their decentralisation nature, cryptocurrencies could actively participate in the process of tax evasion and therefore incur high costs for countries. Given the general ecological condition and ensuing concerns, it is clear that avoiding eco-taxes represents a serious issue since money from eco-taxation could have been invested in environmental social and governance projects. Therefore, a clear and compelling legal framework should be implemented worldwide to reduce the tax evasion phenomena via cryptomoney channels.

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Introduction

Since the last 2008 crisis, we have witnessed a fundamental transformation of the financial landscape. This evolution has been boosted by the financial innovations and the launch of the unbacked cryptomoney⁵. All these financial innovations aim at metamorphosing money. In 2009, the emergence of a “new money” called Bitcoin based on cryptography and anonymity was primarily perceived as a “joke”. The precursors of such money that protect agents’ identities were DIGI-Cash⁶ and e-Gold⁷ (1996-2009). Earlier, Timothy C. May popularized the underlying idea of cryptography in 1988 with his famous “Crypto Anarchist Manifesto”. The goal of this type of money is twofold. First, Satoshi Nakamoto⁸ has proposed an alternative money assumed to resist the financial turbulences and hence to offset the banking system failure as financial authorities have failed to guarantee to agents a reliable banking system and stable money. The second goal, more global, has been to destroy the present financial system that is in decline and to propose a new decentralized financial order.

Since the creation of cryptomoney, lots of studies have explored their characteristics (Faure, 2016; Yuneline, 2019; Yugandhara, 2023; Shah et al., 2023). Amongst them, three features are dominant: high volatility, anonymity and high energy consumption. Its high volatility constitutes a threat to financial stability. Anonymity is likely a way to feed illicit activities and particularly fiscal fraud. Notice that development of cryptomoney is not in line with 2015 Paris Agreement requirements that exhort countries to converge towards zero CO2 emissions goals (Paris Agreement, n.d.). Indeed, the growth of cryptomoney is accompanied by a rise in energy consumption and damages the planet via CO2 emissions. Hence, it is natural to raise the question about the possible role of a stricter legal framework to prevent fraud and to assign all taxes related to such illicit activities to green projects aiming at protecting environment.

The paper starts by describing the main features of the cryptomoney within a theoretical and econometric scope. Then, we discuss the role of regulators to terminate the avoidance of government duties notwithstanding the difficulties to assess the share of cryptomoney in the total amount of tax evasion. The last section, based on our main results, concludes by offering some provisional regulation recommendations with a particular focus on sustainability issues. It also offers relevant literature for future research.

⁵ In the rest of paper, we use also “cryptomoney” for “unbacked cryptomoney.”

⁶ Digi-cash is an electronic money corporation founded by David Chaum in 1989.

⁷ E-gold was a digital gold currency operated by Gold and Silver Reserve Inc. (G&SR).

⁸ Satoshi Nakamoto is maybe a real name or a pseudonym, and it may represent one person or a group.

Characteristics and challenges to cryptomoney

Being a combination of technological, monetary and design innovation, cryptomoney is often presented as a “revolution.” Cryptocurrencies utilize old technologies improved over time such as Distributed Ledger Technology (DLT). Indeed, DLT is a numerical system, which records asset transactions and their main details. Unlike a database, the DLT does not have a data repository and has no centralized administration. It is useful to note that the block chain is a particular form of DLT. The block chain is assumed to be unfalsifiable since it incorporates a coded summary of the entire preceding chain. Each block is immutable in theory. This mechanism is attractive for investors and increases their trust. Another characteristic of cryptomoney is their decentralization nature. They use an open network. There is no trust between participants and they are anonymous. Besides, there is no financial or monetary intermediary and no lender of last resort. Decentralization is a serious challenge because of the Byzantine Generals Theorem. However, to solve this problem, economic incentives must be introduced so as to adopt common transaction implementations (Nakamoto, 2008; Andrianto and Diputra, 2017; Inci and Lagasse, 2019; Bouri et al., 2019).

It is also useful to underline that most cryptocurrencies define specific rules to control transactions. Indeed, some currencies define ceilings to impose a quota to the total units' number. This is the case of Bitcoin. Ethereum contracts impose growth rate criteria. This point underlines the fact that cryptocurrencies are not always integrated and do not necessarily match each other. However, in periods of financial turbulences, cryptocurrencies behave in a common manner (Borri, 2019; Yan et al., 2022; Song et al., 2022; Tosunoğlu et al., 2023).

Given the abundant literature on this topic, we have chosen to be very concise on the advantages and the drawbacks of the cryptomoney (see Table 1, Appendices), however, there are two characteristics that are central for our analysis and deserve to be developed, here. Indeed, anonymity and energy consumption are decisive for fiscal evasion and the ecological tax definition. According to several studies, the anonymity property is one of the tax evasion factors (Baer et al., 2023; OECD, 2022; OECD, 2023). Regarding energy consumption (see Chart 1 in Appendices) it demonstrates the important amount of energy used by Bitcoins. We notice an impressive decrease since June 2022 that could be explained by a kind of awareness of the climate change agenda proposed by the Paris Agreements. According to De Vries (2022), cryptocurrencies are on the path towards sustainability. Nevertheless, this decreasing trend seems to be provisory. Since January 2023 there has been a consumption recovery. At this stage it is not rational to conclude on the provisory nature of this trend.

From a theoretical and empirical perspective, diverse studies attempt to describe the features of the cryptomoney. The crucial issue is how the cryptomoney fits within the main schools of economic thought. Money has always raised the interest of economists and central bankers. This topic creates cleavages and proposes several reading grids. The crucial question is about monetary theories. Is the theoretical field enough to capture the

complexity of cryptomoney? To answer partially this tricky question, we start with the money functions. Hence, we attempt to demonstrate if this kind of money performs all economic functions of money as defined by mainstream monetary theory, namely medium of exchange, store of value and unit of account. These properties have already been analysed by Harris (1757), Adam Smith (1776) and Jevons (1898), and at first sight, it is possible to assume that cryptomoney does not fulfil all these criteria. By medium of exchange, we mean that the asset is widely accepted for any transactions (Mises, 1949; Mises, 1959). The classical approach underlines the role of money as a transaction vehicle. Cryptomoney does not pay goods or services and not all economic agents conducting transactions accept them as a payment medium. This means that the main functions of the “traditional” money are not performed.

Seldom there are examples of good purchases paid in cryptomoney. According to its opponents, most of transactions are illicit. Silk Road organization could use cryptomoney. However, we have a licit and relevant example. On May 22, 2010, developer Laszlo Hanyecz sought some kind soul who would agree to deliver two pizzas for 10,000 bitcoins. This day is nicknamed the “Bitcoin Pizza Day”, the first time a physical good has been bought via crypto-currency. In 2019, big companies like Microsoft or KFC Canada started accepting Bitcoin and other cryptomoney for purchases. This trend shows that cryptomoney is appropriate for transactions and it is likely to be a general future payment instrument. In November 2019, 159 major firms used Bitcoin for their transactions. The main advantage identified by the users was the rapidity of the transactions. This is a common point with cash. Can cryptomoney replace cash? At present, the answer is negative but we cannot exclude this possibility. However, the Bank of Sweden has oriented its research towards the development of e-money (e-krona) assumed to replace cash since the uses of cash and banknotes have dramatically declined. Other central banks, like Bank of France, have also attempted to develop e-money in the wholesales sector⁹. According to Francois Villeroy de Galhau (2023), digital currency could be applied to the whole economy. Several works promote the development of digital currencies and outline their risks (BIS, 2023, Auer et al., 2024). Nevertheless, this type of money is considered as (backed) digital currency and therefore is not in the scope of our works since there is a lender of last resort, which is not the case for unbacked money, which can be considered a pure speculative/risky asset.

Besides, the degree of acceptance by all users is not reached. According to Gertchev (2013), cryptomoney cannot be treated as real money since it fails to adhere to the universal principle, according to which all actors have to use the same technology. However, the technological development is not uniform (non-homogeneity property), for instance.

In addition, physical support may be more universal than IT support. This point reveals that the use of traditional money will continue to expand for some time to come.

⁹ <https://www.banque-france.fr/en/financial-stability/financial-stability-mandate/supporting-digital-transformation-financial-sector/wholesale-mnbc>

Lastly, the bitcoin's cost is not null. Indeed, the transaction fees are variable and additional costs appear if you want to exchange bitcoin for another currency. This may also work against Bitcoin as means of payment.

Is cryptomoney a store of value? Does money keep the same value over time? To compare money during different periods, we have always used as deflator the interest rate. Based on practice and observation, it is not possible to conclude that these assets retain their value over time. Moreover, several empirical studies show that cryptomoney is highly volatile (Kristoufek, 2023). The inherent process of cryptomoney is founded on a generalized autoregressive conditional heteroscedasticity (GARCH) model. Indeed, if we take for example the Bitcoin (the most cited cryptomoney), it may not contribute to economic growth. On the contrary, it seems to feed speculative activities. Its inherent process is associated to a GARCH-model dynamics (Ardia et al., 2019). This result emphasizes the subjective time and mimicry concepts. Individual faith becomes collective faith thanks to the market (via mimicry (Aglietta and Orléan, 1982)). In the same vein, Antonio Sainz de Vicuña, has developed an 'institutional theory of money'. Trust is the key variable of money. It is reinforced when there is an institutional structure guaranteeing the purchasing capacity, in other words, price stability. Money is a kind of dematerialized "commodity" produced and managed by central banks. Then, money may be a store of value. According to Kiyotaki and Wright (1989), money has "intrinsic" properties such as storability, recognisability and "extrinsic belief".

It is obvious that modern money behaves like a pure speculative investment, which is not the case of "traditional" money measured by monetary aggregates that follow an autoregressive–moving-average (ARMA) process (Fisher et al., 1998). At this step, we can assume that a cryptomoney has a speculative function since such an asset is modelled by GARCH (Generalized Autoregressive Conditional Heteroscedasticity) processes (Chu et al., 2017; Bouri et al., 2017; Stavroyiannis, 2018; Yıldırım and Bekun, 2023; Oprea et al., 2024). This point is very relevant since within Polanyi's point of view, cryptomoney should be specific money since their unique goal is speculation. This idea is reinforced by facts. Indeed, in March 2014, the US Internal Revenue Service (IRS) considered Bitcoins and other cryptomoney as goods and not as money. Hence, cryptomoney holders have to report their financial gains in fiscal documents because they are taxable.

From the previous developments, the most relevant conclusion is that cryptomoney is a speculative asset associated with high volatility; therefore, it should be legally treated as a taxable financial asset. If we add anonymity, this financial asset could easily be the perfect tool to avoid tax duties. Then, it constitutes a loss for each government and prevents them from using this amount of money for the climate change emergency.

It is worth noting that the cryptomoney literature has developed rapidly in a very short period, namely from 2009 until now (Pattnaik et al., 2023); plethoric works are dedicated to the understanding of cryptomoney mechanisms and nature in both theoretical and empirical aspects thanks to bibliometric analysis tools (Almeida and Gonçalves, 2023). However, little attention is paid to tax aspects despite the fundamental role of the tax

authority to fight against fraud and tax evasion. The following section contributes to filling the literature gap in terms of cryptomoney's tax rules and solutions to green economies by applying the principle of "make pay polluters".

Policy recommendations for tax evasion and sustainable regulation

Cryptocurrency is a challenge for tax systems. The definition of tax evasion is not obvious and it is a delicate matter to apprehend this phenomenon. However, it is possible to use the current legal framework that underlines two kinds of tax evasion families (Palil et al., 2016). Evasion of assessment is the intentional attempt to reduce the tax levy by increasing their costs or underestimate their income. Evasion of payment occurs when a person or business intentionally avoids paying their tax liability. It can involve hiding income, using false Social Security Numbers, or associating assets with someone other than themselves. For example, accepting cash payments for goods or services without proper reporting during tax filing can constitute an evasion. Of course, these definitions are questionable since they are highly general; however, for our scope they are relevant and sufficient.

To tax the cryptocurrency, we need to propose an international, harmonized, clear and undeniable legal framework, which is not available today. This point is the cornerstone of the tax cryptomoney concerns. Indeed, cryptomoney's taxes are equivalent to income subject to capital gains; this means that there is no difference between financial volatile assets. This point should be reviewed by regulators given the cryptomoney's attributes. In addition, all European countries do not apply the same rules (Thiemann, 2021). For instance, Slovenia (Dosen, 2022) and Portugal (Gomes, 2023) are considered as cryptomoney-friendly countries. This situation is not appropriate since some European countries enjoy opportunities for free-riding that could be detrimental to European unity and stability. Since May 2023, the European Commission (EC) welcomed a political agreement on new tax transparency rules for all providers of services facilitating transactions in cryptoassets for customers resident in the EU (European Commission, 2023). Nevertheless, it is a preliminary phase and sooner or later, a stricter legal framework should be implemented at both European and world levels.

To start debates, it is also useful to outline some points such as tax categories. Indeed, tax issues should take into account three scopes (value added tax, income tax and wealth or property tax) and these scopes are very delicate to deal with (OECD, 2020). For the value added tax, the Digital Invoice Customs Exchange (DICE) could be useful (Ainsworth and Todorov, 2013). Furthermore, it could be an efficient tool to tackle VAT fraud in CO2 permits (Ainsworth, 2014). According to Europol, cryptomoney is also used in shadowy activities that are developed thanks to payment systems (Europol, 2021). The growth of services encrypting and anonymising online activity is ongoing and contributes to fuelling illegal activities (Europol SOCTA, 2013). Nonetheless, the share of cryptomoney in criminal activities is low compared to other money support, essentially cash since as discussed in the previous section, cryptomoney behaves as a volatile financial asset and consequently

is perceived more as a financial investment. Despite this fact and the difficulties to assess fraud, Europol has calculated the missing trader intra-community (MTIC) fraud to estimate VAT fraud and according to a study commissioned by the European Parliament (2022/a), the amount of VAT fraud (MTIC and carousel fraud¹⁰) stood at about 150 billion euros in 2016 and 1/3 was committed by illegal activity groups through the MTIC scam schemes. In 2021, the MTIC fraud was estimated at about 60 billion on an annual basis (European Parliament, 2021). Annual estimations of VAT gap, which is the difference between the theoretically expected VAT income and the collected amount, have been declining over the years (European Parliament, 2022/a). However, all these estimations should be treated with caution given the nature of the metrics, the nature of the operations (taking place as parallel operations) and the data quality. Income tax and wealth tax evasion are also very complex to assess, nonetheless, some empirical studies have emerged.

Regardless of the complexity to assess the size of tax evasion related to cryptomoney transactions, all literature approaches are welcome since they contribute to our knowledge of cryptocurrency fiscal tools. Once the fiscal framework is implemented, some future research paths could emerge. For instance, the use of cryptocurrencies taxes to green economies could be a fruitful research direction.

According to MacDonald (2015) works based on Buchanan and Faith (1987) secession model, in the case of crypto-secession, agents attempt to evade or reduce the tax burden. Secession literature has seen a huge development (Berkowitz, 1997; Bordignon and Brusco, 2001) and could be an interesting framework for tax fraud of cryptomoney. Moreover, Viswanathan (2018) sheds light on a reduction in tax reporting oversight in a decentralized system compared to the centralized system and the paper shortly exposes bitcoin taxes in US. As cryptocurrency does not provide foreign currency gain or loss, it is legitimate to use the income tax rules for cryptomoney. This solution is debatable because it reduces the analysis possibility of tax evasion. It is useless to bear in mind that tax cryptocurrencies literature covers different disciplinary scopes and conclusions on tax tools are diverse, as show the different approaches selected to deal with cryptomoney fraud tax (Peláez-Repiso et al., 2021; Leuprecht et al., 2022).

There are three types of literature. First, some optimistic works underline that government tax can easily monitor the bitcoin transaction; therefore, tax evasion is not an issue (Sabu, 2020) since information is available. However, it is obvious that these works do not account for the quality of the data and the difficulty to define such assets and the related taxes. Indeed, Sabu (2020) has taken into account only one cryptocurrency (Bitcoin) and one intermediary namely Coinbase. This means that the approach is partial. Moreover, there is no information about the data quality. Besides, in 2023, the Securities and Exchange Commission (SEC) "charged Coinbase for Operating as an Unregistered Securities Exchange,

¹⁰ "Carousel fraud, also known as Missing Trader fraud or VAT carousel fraud is a type of fraudulent scheme related to Value Added Tax (VAT) in the European Union (EU). It involves a series of transactions where goods are repeatedly bought and sold across borders, taking advantage of the EU's VAT rules (VAT fraud)" (VAT IT, 2022).

Broker, and Clearing Agency” (U.S. Securities and Exchange Commission, 2023). It is quite difficult to trust their database and therefore it is tricky to use it for any empirical studies. Disclaimers on data limitations should be provided when researchers use database from private data providers since it is well known that there are risks of lack of transparency and it is impossible to control the quality of their outputs.

The second kind of literature highlights the necessity to develop tools for taxing cryptocurrencies. The idea is to characterize first cryptomoney. Indeed, there are several ways to tax cryptomoney regardless of whether governments consider this asset as a fiat currency or not (Sarfo, 2021).

The third kind of literature is focussed on the characteristics of tax literature. Based on a bibliometric analysis of taxation regulation of block chain and cryptocurrencies approach and Web of Science (WoS) database for the period 2015-2019, Peláez-Repiso et al., (2021) have found out that there is an exponential development of documents related to cryptomoney taxes (+116.88%) and there is a significant acceleration since 2017. In addition, some reviews such as *Computer Law and Security* review, are predominant in this field. Russian authors – followed by Ukrainian researchers – are very prolific and active in such topics. Efforts to describe the literature on cryptomoney taxation are welcome since they provide information on reviews and authors related to this topic. Interesting results have emerged; however, some limitations exist. From a general perspective, there is no information about the way the documents deal with the nature of cryptomoney (fiat money, volatile assets etc.). Moreover, there is no information about the regulation tools to tax cryptomoney, etc.

In terms of methodology, limitations are multiple. Only the WoS is selected, this means that the approach is biased. More sources would have provided richer information and possibly detect some biases related to sources diversity and consequently put the conclusions into perspective. Comparisons and/or compilation between sources could constitute a benefit for such literature. The sample is low (349 works) and there are no sub-periods. It may be relevant to extend the period until 2023 to verify if the Libra project announcement in June 2019 has an impact on the development of crypto tax literature. Introduction of clusters analysis could be relevant. Notwithstanding critics, Peláez-Repiso et al. (2021) works are useful and deserve to be updated since today tax issues are prominent topics. In the same vein, based on a meta-analysis approach (PRISMA-ScR protocol¹¹), Trozze et al. (2022) have used academic studies (391 articles) and grey literature on cryptomoney (394 documents) to detect diverse frauds. They have found that there are 29 kinds of cryptomoney frauds in both academic and grey literature, 32 types, 14 of which are not available in academic literature. Moreover, the Ponzi scheme is the most studied in both literatures. As all works, there are some limitations. The authors have chosen to use only texts written in English – articles, peer-reviews, blog post etc. It is obvious that such an approach offers limited conclusions and does not accurately describe reality since it does not pay attention to

¹¹ Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews

errors in blog posts, for instance. Also, peer reviews even if they enhance the credibility of a manuscript, do not take into consideration all numerous research varieties.

To sum up, frauds and fiscal evasion are huge challenges for all countries and information exchange is fundamental to tackle such practices. However, despite the EU awareness, the legal rules are not enough and the income losses for countries are not negligible.

After having briefly presented the main features of the legal and literature frameworks still in progress, we note that tax cryptomoney's rules are embryonic and prospects to improve rapidly this study field are not optimistic. Challenges and risks are complex and illicit activities are growing in Europe (Europol, 2021; Trozze et al., 2022; Mathias and Wardzynski, 2023; Ross, 2023). Given dangers of using cryptomoney, it is worth highlighting the non-availability of database and information about the users of cryptomoney. Indeed, we have very scarce information about the users, the goals of transactions, etc., therefore, the attempts of measuring the tax revenue are problem-ridden, and their estimation results are underestimated and questionable. We aim, here, to present some examples and expose the main drawbacks of most of empirical works that are seeking to measure the share of cryptomoney tax evasion and mechanisms of frauds.

To begin with, it is extremely important to understand that there is scarce information about cryptocurrency scams, but there are many private information providers and databases that do not reveal the truth. Therefore, it is complex to have an accurate picture of this phenomenon and the database and/or reporting are not reliable. The legal authorities should fix this point before any tax determination. Furthermore, the lack of reliable data and the cost of using private database could be an important obstacle to research on this topic. Amongst the different private providers, we can cite Binance, which have been subject to many claims (La Tribune, 2022; Financial Times, 2022; Financial Times, 2023; The Guardian, 2023). Despite their numerous reports on the cryptomoney statistics, they need to be prudent in their interpretations. Besides, the decentralisation nature of the cryptomoney is an obstacle to the robustness of results and empirical works are logistically complex. Moreover, Elizabeth McCaul, member of the Supervisory Board of the European Central Bank, has exhorted the regulatory organs to monitor cryptomoney platforms, and especially platforms without headquarters as Binance (ECB, 2023). The OECD has proposed a reporting tax document on cryptomoney to improve knowledge and statistical information. This organisation often cited in the related literature has no decision power. Its work is valuable and it has influenced different jurisdictions (Baer et al., 2023). Nevertheless, the OECD is not a regulatory body, hence, its action is limited.

The will to measure cryptomoney tax evasion is dramatically increasing and diverse public and private organisations develop statistics analysis to capture this phenomenon. For illustration, Chainanalysis has proposed a statistical approach to assessing the capital gains of tax invasion related to cryptomoney. It has used diverse data from private web providers to complete its own data. Chainanalysis has started to calculate the total collective gains and distribute the gains and losses per countries for years now. It is easy to admit that Chainanalysis approach is questionable and inaccurate since it has taken into

account wallet level instead of the service level. It also creates a biased yearly cryptomoney indicator since their collection approach has limitations (sample scope, diversity of sources, data quality analysis, private providers, etc.). It could be more relevant to collaborate with the legal tax authorities since more reliable sources crossed with non-reliable sources could be a real value added for the users and improve the data quality by correcting errors and/or omissions. It should be noted that tax transparency is the central issue (European Parliament, 2022/b).

Thiemann (2021) has attempted to assess the evaded amount of taxes by using the Chainalysis disaggregated country-level database despite the lack of reliability of this data provider. According to his simulation, the Bitcoin tax revenue based on capital gains in Europe was 850 million EUR in 2020. This conclusion is based on two different scenarios; the first one assumes a fixed and uniform tax rate (25%) and the other trial presumes diverse EU tax rules. The main limitations are diverse. The data quality is not guaranteed; the coverage is low; it excludes the Virtual Private Networks (VPN) users, for instance, etc. In addition, the Chainalysis, a private provider, does not provide highly disaggregated data that permit to calculate the gains or losses of each entity and control the content by cross-checking tools. As information is partial, it is quite difficult to get an accurate picture of the cryptomoney users. Moreover, private providers are not transparent and therefore there is no possibility to control the quality. Hence, the empirical results using such sources are questionable and not reliable. This conclusion exposes the need to orient all efforts towards statistics dissemination. It becomes obvious that regulators should impose granular reporting survey for all users whatever their size to collect more detailed information on a regular frequency. The quality of data conditioned the results deduced from models and therefore, regulators could define and run timely and adapted policy rules.

Founded on different works on cryptomoney tax evasion, it becomes more obvious that regulatory authorities should monitor and define stricter taxes framework. This difficult task should be accomplished since it is important for governments to appropriate this tax windfall that can be used to make their economies greener. As already outlined, cryptomoney is energy consuming and their development is not in line with the 2015 Paris Agreement that aims to limit CO₂ emissions. The link between the cryptomoney and planet damage is discussed by environmental literature (Pham et al., 2022; Ye et al., 2023). There are numerous works in this field, and they describe accurately the negative consequences of using crypto on the planet but few works provide acceptable solutions. Another type of interesting literature dedicated to CO₂ emissions tax has emerged (Benigno and Rosa, 2023; Gschossmann et al., 2022), some works attempt to determine taxation measures. According to Hebous and Veron (2023), it is necessary to elaborate metrics, like Cryptocarbon, that assess the CO₂ emissions per unit of electricity created by cryptomoney. However, this new literature does not deal with cryptomoney tax evasion and measures towards greener economies as a result of the use of new evasion taxes' tools. Sooner or later, notwithstanding the difficulty to empirically estimate the share of cryptocurrencies in tax evasion, it may be interesting to develop this branch of literature.

Conclusion

Climate change has become an urgent issue at both national and international levels in recent years. Despite Paris Agreements signed in 2015 that exhort countries to limit/annihilate their CO₂ emissions, globally, there has been no improvement in this field and CO₂ emissions are increasing. The development of cryptomoney is impressive and their level in terms of CO₂ emissions is high given their high energy consuming activities and it could have a negative impact on the environment. Cryptocurrencies are often perceived as an alternative financial investment that cannot be ignored. Yet, apart from sectors such as industry, transport, etc., cryptocurrencies can also be used for illegal activities (Europol, 2020, European Parliament, 2022/a). This means that a certain amount of money remains outside the economic chain and avoids tax obligations. In this case, the polluter-pay principle cannot be applied and it is impossible to define a carbon tax to penalize such *brown activities*¹² and reorient economies towards greener activities. The nexus between cryptomoney fraud and environmental concerns needs to be deeply analysed.

Nowadays, the priority is to make a precise analysis of the amount of tax evasion through cryptomoney channels. This task is fundamental and constitutes the preliminary step before the implementation of any related sustainable policy tools. As demonstrated in this paper, reliable harmonised database or metrics are not available. Moreover, the legal framework for such data collection is embryonic and there is no harmonisation between countries. In terms of literature, there are different sources and none deal with cryptomoney fraud tax that could be invested in more sustainable activities. This paper also provides the opportunity to alert to this literature gap. Obstacles of such academic works are now well-known and therefore all efforts should be focussed on how to tackle these obstacles and propose reliable and scientific research papers. All works dedicated to such issues are crucial since they will improve the assessment of crypto tax evasion and therefore actively contribute to containing the development of this kind of fraud. In addition, environment issues are now entrenched firmly enough in the public mind and this potential literature constitutes the cornerstone of the mind-set reforms.

To conclude, this kind of question is not only a research question but also a political issue that would use research approaches and conclusions to identify adequate and timely policies to prevent tax evasion for sustainable purposes. Moreover, the struggle against such practices is the responsibility of international community bodies to develop a clear and harmonised legal framework to avoid free riding behaviour.

¹² *Brown activity* is a concept denoting activities that tend to ignore the need to reduce their negative impact on the environment or their contribution to environmental damage and degradation.

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Appendices

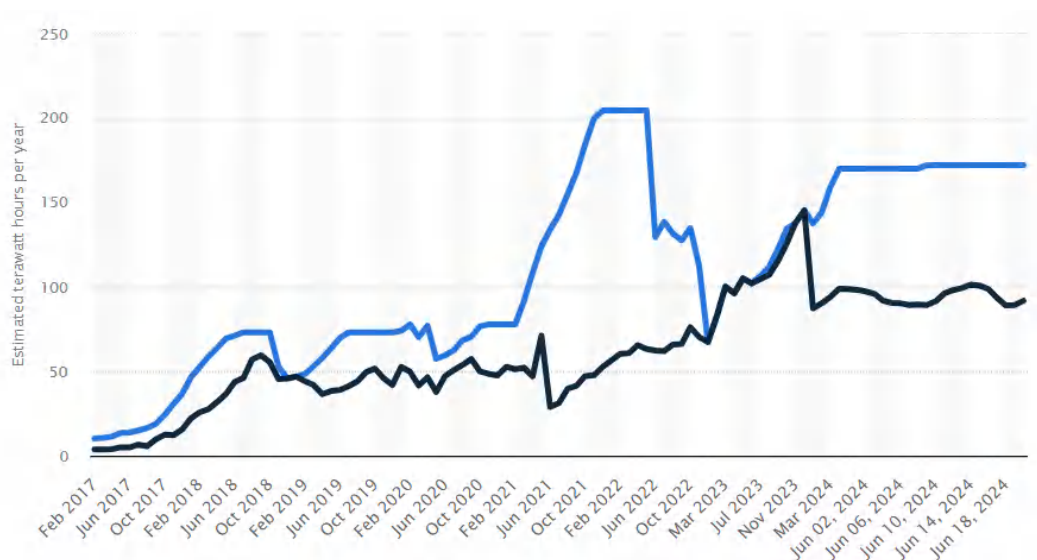


Chart 1. Bitcoin Energy Consumption from 2017 to 2024 (Monthly, TWh per year)

Source: Statista (2024)

Table 1. Cryptomoney: Advantages and Drawbacks

Advantages	Developments	Drawbacks	Developments
Lower costs	These studies analyze empirical transaction costs of Bitcoin and conclude that the transaction cost of Bitcoin is lower than that of retail foreign exchange markets. "Bitcoin markets have, on average, 2% narrower bid-ask spreads than retail foreign exchange markets and, when the U.S. dollar is converted to other currencies via Bitcoin, the resulting exchange rates are, on average, 5% better than the retail foreign exchange rate" (Kim, 2017). In a nutshell, Bitcoin reduces transaction costs (Andrianto and Diputra, 2017).	Risky / Speculative asset	This alternative investment is not without risks since it is decentralized. In case of financial turbulences, investors may lose all the value of their crypto-moneys. Several works demonstrate that virtual moneys are profitable but also risky (Cheah and Fry, 2015; Dyhrberg, 2016; Corbet et al., 2018; Hafner, 2020; Catania and Grassi, 2017). According to Inci and Lagasse (2019), cryptomoney is an alternative financial asset. They permit to diversify investment portfolio. Authors provide a ranking of cryptomoneys based on a Markowitz approach from 2016 to 2017. They find that the best investment was Ripple followed by Bitcoin and Litecoin. Borri (2019) and Bouri et al. (2019) considers the contagion effects amongst virtual moneys. In period of financial stress, crypto moneys have common trajectories evolutions as any risky financial asset.

Rapidity	Cryptomoneys do not involve third part; therefore the transactions are more rapid. Moreover the use of computers may solve many algorithmic problems (Andrianto and Diputra, 2017; Nakamoto, 2008).	Not covered	Given the nature of crypto moneys, this type of financial asset is not guarantee by public institutions. Moreover, there is a lack of regulation and no government protection. There are no liability clauses or insurers. (Cheah and Fry, 2015; Dyhrberg, 2016; Corbet et al., 2018; Hafner, 2020).
Anonymity	Transactions are based on the anonymous principles. All transactions are recorded but the users remain anonymous. In other words, transactions are directly realized from user to user (peer-to-peer) but the users have no information about identities other users. The transactions are also untraceable since they use private keys. No bank account or credit card are required (Andrianto, and Diputra 2017; Pfister, 2017; Geiregat 2018; Nakamoto, 2008).	Uncertain future	As a speculative asset, there is an uncertainty linked to the market. Moreover, there is another risk related to the transaction. Indeed, entrance (purchases) and exit (resale) are not deterministic. (Cheah and Fry, 2015; Dyhrberg, 2016; Corbet et al., 2018; Pfister, 2017; Hafner, 2020). Given the lack of information and the novelty of the crypto-moneys, Burgess (2018) recommend investing only 2% in such financial assets.
Alternative investments	Virtual currencies may provide diversification to investors (Wu and Pandey, 2014; Klabbers, 2017; Andrianto, and Diputra 2017; Anyfantaki et al., 2021; Elendner et al., 2018; Brauneis and Mestel, 2019). This advantage may turn out to be a drawback.	Energy intensive	Electricity costs are significant since the creation of Bitcoins, for instance, requires continuously energy. (Lakomski-Laguerre and Desmedt, 2015) "Between 60 and 80 percent of bitcoin mining revenue goes straight back into paying for electricity". Bitcoin currently consumes 66.7 terawatt-hours per year. (see Chart 1, Appendices). We call Bitcoin and Ether "mining money with megawatts" (Landau and Genais, 2019). Moreover, the Bitcoin is located where the price of electricity is low this signifies that virtual moneys cannot exist without energy.
		Development of illegal activities	Because of the Anonymity principle, virtual moneys might be used for illegal activities such as money laundering and terrorism activities (Foley et al., 2019). Inci and Lagasse (2019) estimate that \$76 billion of illegal transaction involved Bitcoins in 2019.
		Cyber-attacks	Cyber-attacks are one of the most important risks for crypto-moneys investors. Indeed, August 2018, hackers were arrested for stealing around \$87 million in cryptocurrencies (Zhao, 2021). More recently, cybercriminals have stolen about £30 million in Bitcoin from Binance, one of the world's largest digital coin exchanges (Telegraph, 2019). Frequent Cyber-attacks have raised the safety issues.

Source: Created by the authors