CRYPTOCURRENCIES: AN EMPIRICAL VIEW FROM A TAX PERSPECTIVE

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Abstract

This paper investigates the taxation of capital gains from, the economic importance of, and the inherent challenges related to the taxation of cryptocurrencies. Based on novel data from Chainalysis, this paper simulates the revenue potential from taxing Bitcoin capital gains in the European Union (EU). The total estimated Bitcoin capital gains in the European Union in 2020 amounted to €12.7 billion, including €3.6 billion of realised gains. Applying national tax rules for capital gains from shares to capital gains from Bitcoin yielded a simulated tax revenue of about €850 million in 2020. This paper is, to the author's knowledge, the first to empirically assess the tax revenue potential of capital gains from Bitcoin in the European Union using disaggregated country-level data. The findings indicate that revenue from taxing cryptocurrencies is significant and will continue to increase if the cryptocurrency market continues to grow.

Keywords: Capital Gains Taxation, Cryptocurrencies, Bitcoin.
JEL Codes: G19, G23, H24

1.   INTRODUCTION

Bitcoin, the first cryptocurrency (Nakamoto, 2008), experienced a turbulent price rally between 2017 and 2023. Starting with a unit value of less than €1,000 in early 2017, it soared to an all-time peak of €58,000 in November 2021, then declined. On 16 March 2023, one Bitcoin was valued at approximately €23,400. Largely because of the evolution of Bitcoin, the entire cryptocurrencies market also peaked in November 2021, reaching a value of nearly €3 trillion (the equivalent of France's gross domestic product [GDP]) for a brief period.[2] The surging value of cryptocurrencies, coupled with their increasing popularity as financial investments (including by mainstream financial institutions), raises significant policy questions. It challenges the roles of the public sector, including government and central banks, in terms of money supply, the banking system, and tax-raising capacity (Armstrong, 2021).

This paper aims to empirically investigate the importance and inherent challenges of capital gains taxation on cryptocurrencies, with a specific focus on the leading cryptocurrency, Bitcoin. Using the most comprehensive empirical estimate of capital gains from Bitcoin, shared

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[2] For instance, https://coinmarketcap.com/ tracks the evolution of Bitcoin's price and the market size of the entire cryptocurrencies market.

by Chainalysis, a company specialising in blockchain analysis, this paper estimates the tax revenue potential of realised capital gains from Bitcoin within the EU in 2020.

The Financial Action Task Force (FATF, 2019) defines a "virtual asset" as "a digital representation of value that can be digitally traded, or transferred, and can be used for payment or investment purposes" (p. 57; see also Organisation for Economic Co-operation and Development [OECD], 2020). Virtual assets are classified into "payment tokens…utility tokens, and security tokens" (OECD, 2020, p. 9). Security tokens are tradeable assets held for investment purposes, and are classified as security, while utility tokens typically provide access to specific goods and services. Payment tokens, or cryptocurrencies, are most similar to fiat currencies, and are intended to function as units of account and means of payment (OECD, 2020). This paper focusses on cryptocurrencies.

The empirical literature on the taxation of cryptocurrencies is in a nascent stage due to the scarcity of data. Furthermore, taxing income from cryptocurrencies is more challenging than taxing ordinary income. Bal (2015) suggests that tax authorities should provide clear guidance on taxpayers' obligations arising from cryptocurrencies in order to improve tax compliance. One challenge is whether to classify cryptocurrencies as currency or property (OECD, 2020; Ram, 2018; Wiseman, 2016). Most OECD countries "consider crypto-assets to be a form of property for tax purposes" (OECD, 2020, p. 15). The OECD (2020) shows that taxable events are defined substantially differently across OECD countries. For instance, exchanging one cryptoasset for another triggers a taxable event in most OECD countries, but not in France, where only transfers of cryptoassets into fiat money are taxable. In Italy, no tax is due on the realisation of capital gains from cryptocurrencies unless they are deemed to be speculative. The OECD emphasises that countries should provide clear guidelines that explain how cryptocurrencies fit into the existing tax framework (OECD, 2020).

Most empirical research on cryptocurrencies is based on time-series data regarding the price and market capitalisation of cryptocurrencies (see, for instance, Corbet et al., 2019). A notable exception is Makarov and Schoar's (2021) work. The authors empirically analyse Bitcoin's market structure using Bitcoin blockchain data (up to June 2021), which is linked to real entities using a large novel database. They find that Bitcoin ownership is strongly concentrated. Accordingly, the top 1,000 individual investors control about three million Bitcoins and the top 10,000 investors hold around five million Bitcoins, which is roughly about a quarter of all Bitcoins in circulation (Makarov & Schoar, 2021). Despite lacking information about the tax residences of top Bitcoin owners, their findings imply that potential revenue from the taxation of Bitcoin capital gains might also be concentrated (Makarov & Schoar, 2021).

This paper is motivated by the empirical knowledge gap relating to the taxation of capital gains from cryptocurrencies. There is scarce empirical evidence about who truly owns cryptocurrencies, what the related capital gains are, and how these are distributed. The primary contribution of this paper is twofold. First, I discuss the economic magnitude of cryptocurrencies and review the empirical evidence about crypto users. Secondly, I estimate potential revenue from the taxation of capital gains from Bitcoin in 2020 within the EU, using the unique and novel data provided by Chainalysis. In contrast to most empirical research on cryptocurrencies, I do not rely on aggregate time-series data but on disaggregated data regarding the estimated capital gains by country in 2020. Chainalysis estimates capital gains from Bitcoin by allocating transactions recorded on the blockchain according to the web traffic data of each country to the websites of service providers. The novel data has also been used for research such as that recently conducted by the World Bank (Feyen et al., 2022).

To estimate the revenue potential of realised Bitcoin capital gains taxation in 2020, I simulate two scenarios: (A) a uniform tax rate of 25%, and (B) the application of national capital gains tax rates according to capital gains from shares. The simulated tax revenue in the European Union amounts to €900 million (0.0068% of GDP) in scenario (A) and €844 million (0.0063% of GDP) in scenario (B). Expressing the estimates as a percentage of total tax revenue from property taxation in the European Union provides a more intuitive interpretation. In this light, scenario (A) would yield about 0.31% and scenario (B) would yield 0.29%. Given the methodological uncertainties, these estimates should be considered an upper bound. Nevertheless, if the cryptocurrencies market continues to grow, capital gains will rise.

The remainder of this paper is organised as follows. The next section discusses the economic scale of the cryptocurrencies market. Section 3 focusses on empirical evidence regarding cryptocurrency users and distribution of Bitcoins based on public blockchain information, while section 4 estimates the revenue potential of taxing capital gains from Bitcoin in 2020. Section 5 concludes.

2.   THE EVOLUTION OF THE CRYPTOCURRENCIES MARKET

The evolution of the total cryptocurrency market highlights the potential for capital gains taxation, as capital gains mirror the appreciation of a cryptocurrency. Therefore, a growing cryptocurrency market indicates an increasing value of potentially taxable capital gains when investors sell cryptocurrencies and realise capital gains.

In March 2023, there were about 23,000 distinct cryptocurrencies with a market capitalisation of approximately €1 trillion, according to CoinMarketCap.[3] Bitcoin has dominated the cryptocurrency market since its inception in 2009. While Bitcoin constituted more than 75% of the total cryptocurrencies market until 2017, other cryptocurrencies gained in popularity subsequently. As of 16 March 2023, Bitcoin's market share stood at around 42%, with Ethereum's at 19%, and Tether's at 7%. A comparison of the market capitalisation of the world's largest companies on 17 March 2023 showed Bitcoin in 19th position, ahead of Taiwan Semiconductor Manufacturing Company Limited (€434 billion) and behind Berkshire Hathaway Inc. (€504 billion).[4] However, Chainalysis (2020) reports that approximately 20% of total Bitcoins are lost for various reasons.[5]

Cryptocurrencies are known for their extreme volatility. Cryptocurrencies did not hold significant prominence until mid-2017, when their market capitalisation began to surge. It reached its first peak in January 2018 at €600 billion, then declined and stagnated. However, total market capitalisation surged again from mid-2020, reaching a record peak of €2.9 trillion in November 2021 (an amount equivalent to France's GDP). This surge was primarily driven by the substantial increase in the Bitcoin price, which rose from under €10,000 in January 2020 to nearly €58,000 in November 2021. Nonetheless, by March 2023, the market capitalisation of cryptocurrencies had plunged, more than halving to approximately €1 trillion.

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[3] https://coinmarketcap.com (accessed on 17 March 2023). The website provides information about cryptocurrencies, such as prices and market capitalisation. The following figures are based on data from CoinMarketCap.
[4] https://coinmarketcap.com (accessed on 17 March 2023).
[5] Chainalysis (2020) considers any Bitcoin lost if it has not been moved from its current set of addresses in five years or more. Other experts (Ojedokun, 2023) estimate that 3% of all Bitcoins are lost, although without furnishing an empirical basis.

3.   WHO OWNS CRYPTOCURRENCIES?

The taxation of capital gains from Bitcoin and other cryptocurrencies requires tax administrations to obtain information about the incidence and distribution of cryptocurrency ownership. This section aims to summarise the scarce empirical evidence that exists about crypto users and the distribution of cryptoassets, focussing on potential sources: blockchain data, official tax statistics, and other sources, such as survey data.

Blockchain Data

Open or public blockchains, like Bitcoin, provide transparent records of all past transactions (Nascimento et al., 2019). Consequently, each blockchain transaction is public and traceable. While the distribution of Bitcoins across addresses can be inferred from the blockchain data, determining the distribution of Bitcoins at the individual level is challenging because cryptoasset service providers (CASPs), such as Binance or Coinbase, often manage a significant share of addresses and/or coins on behalf of their clients.[6] Given the cryptographic nature of cryptocurrencies, the actual owners of addresses remain unknown unless they share information with the public. Nevertheless, there are several ways to identify address owners ("pseudo-anonymity"). For instance, Bitcoin users can be identified by observing their transactions over time and analysing patterns (Fujiwara & Islam, 2021; Monaco, 2015). Juhász et al. (2019) identify IP addresses and link them to geographical locations. Their probabilistic approach exploits the time duration between messages sent and received by participating network computers. By combining this with publicly announced transactions, they can identify the IP addresses of the entities conducting transactions in the analysed period. Makarov and Schoar (2021) merge the Bitcoin's blockchain data with a novel database of real entities compiled from public and proprietary sources. They also develop algorithms to investigate the behavioural patterns of market participants. Their algorithmic findings suggest an extremely high degree of ownership concentration in relation to Bitcoin distribution. Specifically, the top 1,000 individual investors control around three million Bitcoins, while the top 10,000 investors hold approximately five million Bitcoins. This represents roughly a quarter of all Bitcoins in circulation (Makarov & Schoar, 2021).

Finally, while a public blockchain is a rich data source, it is impossible to capture off-chain transactions since they are not reported on the blockchain but are instead settled "off-chain". This includes transactions of users who hold accounts at the same CASP. A CASP's internal transactions are aggregated and the blockchain is solely used as a settlement mechanism for netting outstanding transfers. This, in turn, reduces the number of transactions that need to be recorded on the blockchain (Rauchs et al., 2018). Available estimates suggest that off-chain transactions significantly exceed on-chain transactions. For instance, in the first half of 2021, the total on-chain transaction volume reached US$2.8 trillion, while the industry estimates for "off-chain" transaction volume during the same period were US$16 trillion (Feyen et al., 2022). Therefore, data about off-chain transactions by CASPs could capture a substantial portion of global taxable capital gains from cryptocurrencies.

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[6] On 24 March 2023, the Binance address 34xp4vRoCGJym3xR7yCVPFHoCNxv4Twseo, for instance, held approximately 1.3% of the total Bitcoin market, as reported on BitInfoCharts (n.d.).

Official Tax Statistics

Public tax statistics regarding taxpayers linked to cryptocurrencies are still scarce. In fact, in 2021, the United States' Internal Revenue Service (IRS) requested information from CASPs about U.S. citizens who held cryptocurrencies through so-called "John Doe summonses".[7] For instance, the IRS filed several John Doe summonses to obtain information about U.S. citizens who conducted cryptocurrency transactions between 2016 and 2020, where the total annual value exceeded $20,000 (Ferreira et al., 2021).

Moreover, the extent to which national tax auditors can request data on transactions involving cryptocurrencies from national service providers determines the quality of the data. For instance, if a national tax authority lacks the legal right to request transaction-by-transaction data from national exchanges, it cannot cross-check declared capital gains from cryptocurrencies by taxpayers holding accounts in national exchanges. Furthermore, individuals can possess multiple accounts on different exchanges located in different tax jurisdictions.

Other Sources

Another source of information is survey data. However, several surveys of cryptocurrency users seem to suffer from selectivity or small sample sizes—see, for instance, Polaski et al. (2015) or Jonker (2018)—raising questions about the extent to which findings can be generalised. A large-scale study conducted on behalf of Binance Research (2021) offers insights based on an online survey involving more than 60,000 crypto users across 178 countries and regions. The survey suggests that most crypto users are male (95%) and young, with an average age of 34 years. Approximately half of the respondents considered crypto investing to be a means of generating income rather than a hobby.

Academic studies using data from established surveys, rather than those specifically designed for crypto users, often face a common challenge. When the survey collects information about crypto, the number of respondents who own crypto remains quite low, which presents statistical difficulties. For example, Bonaparte (2022) relies on the 2019 Survey of Consumer Finance (SCF) for the United States and finds that only about 0.35% of respondents can be classified as crypto owners.

The total number of crypto users may be estimated by considering the total number of CASP clients, yet this estimation presents challenges due to the possibility that an individual may possess multiple accounts (Rauchs et al., 2018). In addition, individuals may use the blockchain payment systems without having a CASP account (Rauchs et al., 2018). Blandin et al. (2020) estimate that the number of ID-verified accounts increased from five million in 2016 to 101 million in Q3 2020, which is argued to be a lower bound estimate (Figure 1). For 2022, the total number of global crypto users is estimated to be 322 million according to Triple A (n.d.), a cryptocurrency payment company. While any estimation of global crypto users remains approximate, there is little doubt that crypto usage has steeply increased between 2016 and 2022.

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[7] "A John Doe summons is an investigative tool that allows the IRS to gather information about unnamed taxpayers from a third party" (Ferreira et al., 2021).

Figure 1: Evolution of Crypto Users 2016–2022
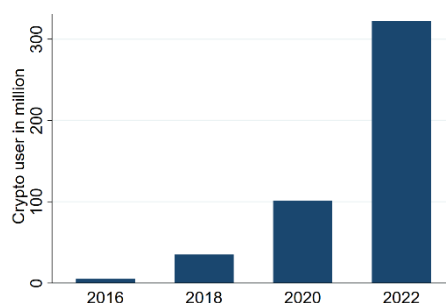
Source: 2016 – 2020: Blandin et al. (2020); 2022: Triple A (n.d.).

4.   THE DISTRIBUTION OF BITCOIN CAPITAL GAINS AND TAX SIMULATION

This section provides empirical evidence on the distribution of capital gains from Bitcoin across EU countries and simulates the taxation potential. The analysis is limited to Bitcoin due to its economic dominance within the cryptocurrencies market and data restrictions regarding other cryptocurrencies. In general, capital gains accrue when the price of a cryptocurrency exceeds its price at the time of purchase. Selling cryptocurrency realises the gain, which is equivalent to the difference between the selling price and the purchase price. Due to the decentralised and cryptographic nature of cryptocurrencies, the empirical evidence regarding the distribution of capital gains is limited. Nevertheless, in order to assess the taxation potential of Bitcoin capital gains, it is crucial to understand how capital gains are distributed across countries.

Data on the Distribution of Capital Gains from Bitcoin in the European Union

The empirical analysis focusses on EU member states, driven by the European Union's proposal concerning the exchange of crypto-related information between tax authorities within the EU (Directive on Administration and Cooperation [DAC8] proposal).[8] The data on annual capital gains from Bitcoin throughout 2020 was provided by Chainalysis (2021). Their estimation of capital gains from Bitcoin involves two steps: (1) the attribution of aggregate on-chain transaction volume to countries and (2) an estimation of realised and non-realised capital gains (Chainalysis, 2021).

Feyen et al. (2022) discuss the first step in detail. While transactions recorded on the Bitcoin blockchain are public, the geographic locations of the involved addresses remain unknown. According to Feyden et al. (2021), in order to attribute Bitcoin transactions to countries, "Chainalysis combines proprietary knowledge" about the owners of cryptoasset wallets "with web traffic data provided by SimilarWeb, a website analytics and traffic intelligence platform" (p. 14). Specifically, the transaction flow to on-chain addresses identified as belonging to a particular platform is linked to countries according to the corresponding country-specific web traffic (Feyen et al., 2022). To illustrate the approach, consider a crypto platform, "cryptoABC", which operates a website "cryptoABC.com". The Bitcoin transaction flow of

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[8] The European Commission (2022) provides the impact assessment of the DAC8 proposal.

identified addresses associated with cryptoABC is assigned to countries based on the origin of the web traffic to "cryptoABC.com". Feyen et al. (2022) add that, in order to refine this country breakdown, Chainalysis considers additional factors, such as "time zones, fiat currency pairs offered, website language options, and the location of the service's headquarters" (p. 14). While facing limitations, such as the potential use of Virtual Private Networks (VPNs) to conceal the actual location of crypto users, Chainalysis conducted several crosschecks to validate the results (Chainalysis, 2021).

Secondly, in an ideal scenario, realised (unrealised) capital gains from Bitcoin would be calculated as the difference between the selling price (current price) and the purchase price for each investor. However, due to the absence of comprehensive data about these individuals, the figures need to be approximated. Chainalysis (2021) exploits the fact that each Bitcoin transaction carries a unique timestamp, enabling it to be linked to the corresponding Bitcoin price. Therefore, to compute capital gains at the platform level, Chainalysis (2021) compares the price of Bitcoins when they entered a platform with their current price (unrealised capital gains) or their price when they left a platform (realised capital gains).

By merging the first and second components, aggregate capital gains from Bitcoin can be attributed to each country.

Figure 2: Estimated Capital Gains from Bitcoin in 2020 Across EU countries, Realised (Green) and Unrealised (Red).
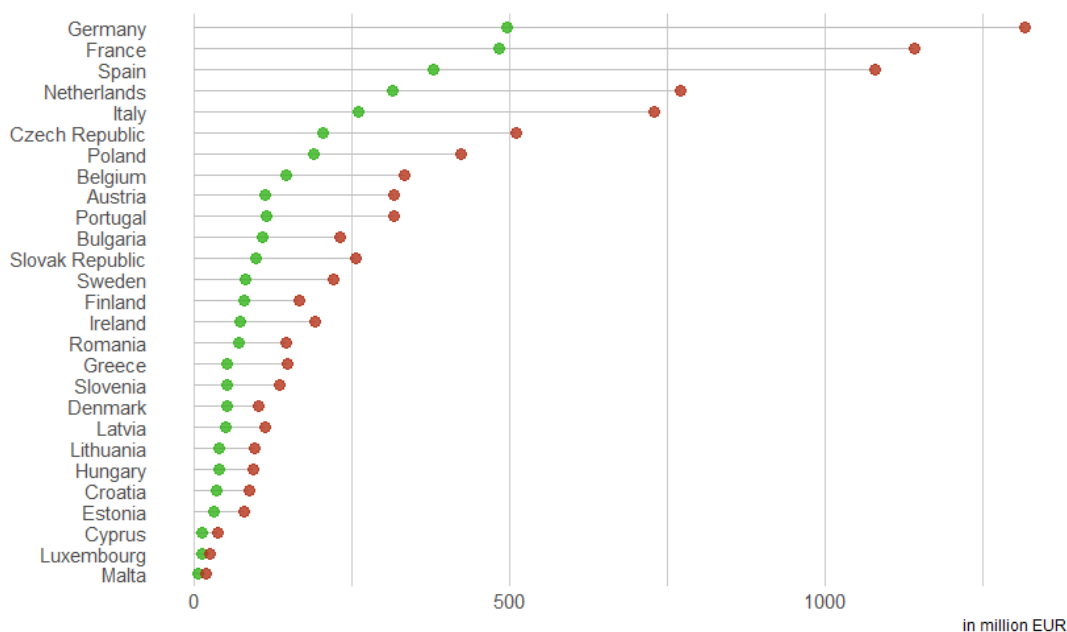
Note: Exchange rate as of 25 May 2021 (1€ = 1.2212 US$).

Source: Author's depiction

Figure 2 shows the estimated capital gains (realised and unrealised) from Bitcoin across EU countries in 2020. The total realised capital gains in the European Union amount to €3.6 billion, whereas the unrealised capital gains reach €9.1 billion. Germany ranks highest in terms of realised gains (€500 million), followed by France (€480 million), and Spain (€380 million). Figure 3 compares capital gains from Bitcoin to the GDP of each country. Central and Eastern

European (CEE) countries emerge at the top, with Bulgarian and Latvia leading at 0.6% of GDP. Conversely, Germany ranks at the lower end (below 0.1% of GDP), in contrast to its leading position when comparing absolute capital gains. Interestingly, the largest EU economies found themselves on the lower end of the Bitcoin capital gains distribution in 2020 relative to GDP. CEE countries seemed to benefit from a larger fraction of early crypto adopters, which could account for their strong relative position.

A sizeable fraction of capital gains remained unrealised in 2020. The proportion of realised capital gains to total gains, called the realisation share, ranged between 24% in Spain and 32% in Slovenia. These findings suggest that investors could be able to realise a sizable amount of capital gains in subsequent years. Naturally, forecasting future Bitcoin capital gains hinges on the unit price of a Bitcoin, which continues to exhibit high volatility.

*Figure 3: Estimated Capital Gains from Bitcoin in 2020 in the European Union (in % of GDP).*
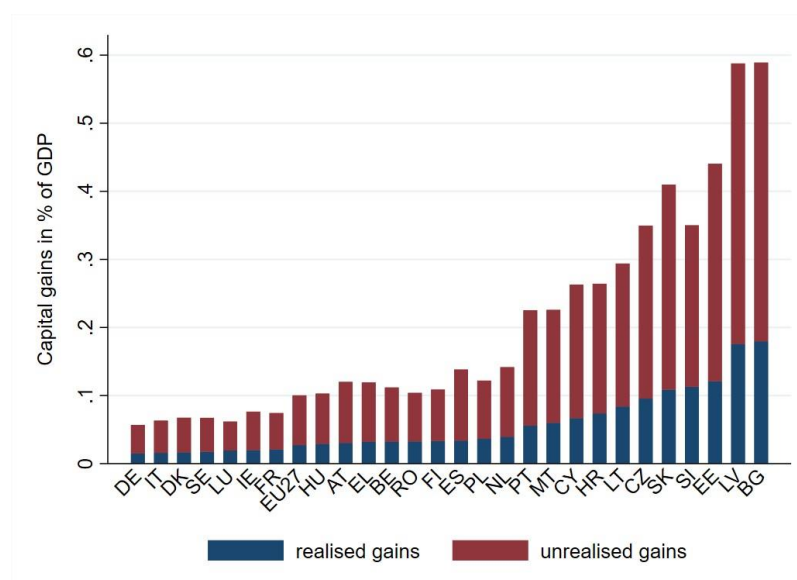
Source: Author's depiction

The Revenue Potential of Taxing Capital Gains from Bitcoin

To assess the revenue potential of taxing realised capital gains from Bitcoin in 2020, I simulate two different scenarios. Scenario (A) applies a uniform tax rate of 25% on realised capital gains from Bitcoin across all EU member states. In contrast, scenario (B) replicates the tax rules that member states impose on realised capital gains from shares held for at least one year, effectively exempting capital gains from taxation in some countries (see Table 1). Neither scenario considers individual tax provisions, which would actually be applied in scenario (B). Consequently, the tax simulation is equivalent to employing a single tax rate to aggregate realised capital gains. Whenever capital gains are subject to different personal income tax (PIT) rates, I apply the top marginal rate (in Malta and Spain). It is important to note that scenario (B) does not necessarily mirror the actual tax treatment of capital gains from Bitcoin. Firstly, it does not consider tax exemptions or tax credits. Secondly, realising capital gains from Bitcoin does not necessarily trigger a taxable event in all countries (OECD, 2020). Nevertheless,

scenario (B) reasonably approximates the revenue potential if countries adopt the tax rules akin to those for capital gains from shares.

Figure 4: Simulated Revenue from Bitcoin Capital Gains Taxation (CGT) in the European Union in 2020 (left-hand side: in % of GDP; right-hand side: in % of Property Tax Revenue).
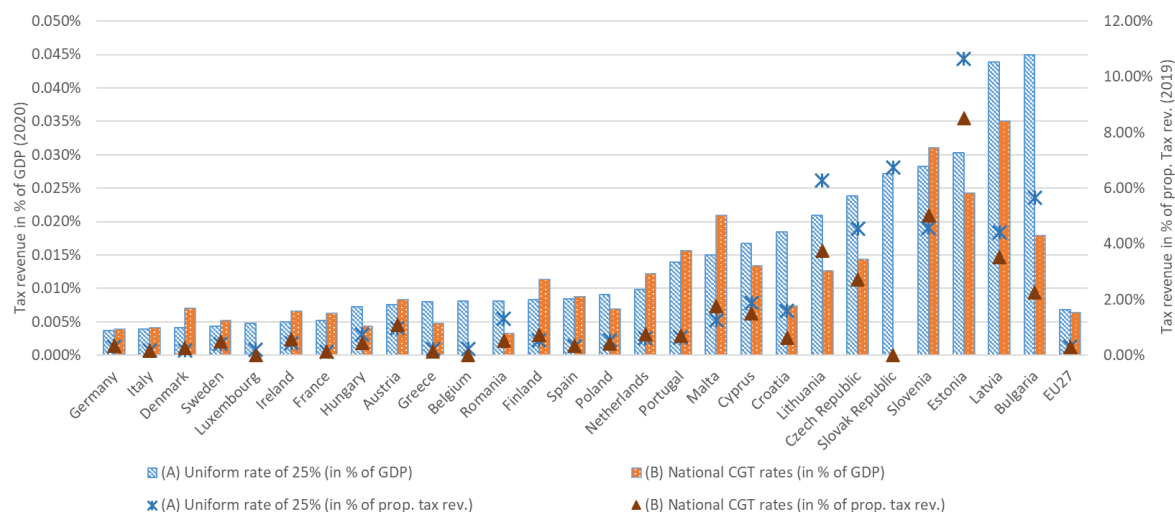
Source: Author's depiction

Figure 4 illustrates the simulated revenue from the Bitcoin capital gains taxation (CGT) across countries and scenarios relative to GDP (on the left vertical axis), and relative to revenue from property taxation (on the right vertical axis).[9] Relative to GDP, CEE countries benefit the most from tax scenario (A) due to their accumulation of realised capital gains. However, when applying national CGT rates in scenario (B), the pattern becomes less clear. Latvia ranks highest, taxing capital gains at 20%, while several countries exempt capital gains from taxation (Luxembourg, Belgium, and the Slovak Republic). Total revenue in the European Union reaches €904 million or 0.0068% of GDP in scenario (A), and €843 million or 0.0063% of GDP according to scenario (B).

To offer a more intuitive interpretation, the right vertical axis of Figure 4 expresses Bitcoin CGT revenue in terms of revenue from property taxes. In scenario (A), EU-wide Bitcoin CGT revenue accounts for 0.31% of the total property tax revenue of 2019,[10] and in scenario (B), it accounts for 0.29%. However, significant variation exists among countries. In scenario (A), CGT revenue relative to property tax revenue ranges from 0.12% in France to 10.7% in Estonia. Under scenario (B), this range varies from 0.14% in France to 8.5% in Estonia, excluding countries where capital gains are exempt.

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[9] Table 2 provides the detailed results. Property tax revenue is the total revenue from recurrent taxes on immovable property together with other property taxes, such as taxes on wealth transfers or on net wealth (European Commission, Directorate-General for Taxation and Customs Union, 2021)

[10] To deal with the different reference years (2019 and 2020), I compare revenue from Bitcoin CGT to tax revenue from property taxes, both in terms of GDP in the corresponding years.

Estimation uncertainty arises from the data on capital gains from Bitcoin, which is inherently an estimation itself. Further, the simulation implicitly assumes full tax compliance. As a result, the simulated potential tax revenue is likely an upper bound estimate. The taxation of capital gains from Bitcoin, as well as from other cryptoassets, poses challenges. Several countries fail to provide clear guidance about the accounting framework and taxation of capital gains from cryptoassets (Luo & Yu, 2022; OECD, 2020; Sixt & Himmer, 2019), and tax authorities might not possess the necessary means to adequately audit crypto-related tax declarations made by taxpayers in their jurisdiction. Cryptocurrencies have evolved into a novel asset class, characterised by a departure from the conventional financial sector, which typically facilitates income information through third-party reporting agreements. Cryptoasset service providers, which have only recently come under financial regulation, are often not obliged to report tax-related information about their clients. Moreover, individuals may be able to evade taxes by holding their cryptocurrencies in private wallets that are not associated with any CASP (OECD, 2022; Scarcella, 2021).

In response to these challenges, the OECD (2022) proposed a new Crypto-Asset Reporting Framework (CARF), with the aim of collecting and exchanging pertinent information about transactions involving cryptoassets. In a similar vein, the European Commission suggested the revision of the DAC8 to furnish tax administrations with the information needed to enable them to identify taxpayers investing in cryptoassets (European Commission, 2021, 2022).

5.   CONCLUSION

Bitcoin's creation in 2009 marked the birth of the cryptocurrency market, which has since experienced dramatic growth. At the peak in November 2021, the market capitalisation reached a size equivalent to that of the French GDP. The increasing economic significance of the cryptocurrencies market presents new challenges to the public sector, including that of the taxation of capital gains from cryptocurrencies.

At the same time, empirical knowledge regarding the taxation of capital gains from cryptocurrencies is generally very limited. We often lack information about cryptocurrencies' true owners, capital gains, and distribution. This paper makes a first attempt to address this gap. Based on the only available comprehensive empirical evidence, shared by Chainalysis (2021), I analyse the distribution of capital gains from Bitcoin in 2020 across the European Union. Total gains amount to €12.7 billion in 2020, encompassing €3.6 billion in realised gains. The simulated potential revenue from taxing realised capital gains from Bitcoin ranges between €843 million and €903 million. To put these figures in context, Bitcoin accounted for about 60% (about 40%) of the cryptocurrencies market in 2020 (March 2023). Hence, the simulation results only capture a fraction of total potential tax revenue from capital gains from cryptocurrencies. Furthermore, the value of cryptocurrencies and the implied capital gains rose significantly between 2022 and March 2023, despite having experienced a large drop in 2022.

A pending question related to the taxation of capital gains from cryptocurrencies is the extent to which taxation can be enforced. Once tax authorities start to report tax revenue stemming from capital gains from cryptocurrencies, there will be an opportunity to delve into that question. Additionally, it would be promising to analyse how cryptocurrency ownership differs across the income and wealth distributions. It would be enlightening to determine whether cryptocurrency ownership is prevalent among the "traditional wealthy". The efforts being made by the IRS are likely to yield more comprehensive data on crypto activity among U.S. taxpayers, potentially providing a source for further research.

A promising way in which to improve tax enforcement would be the establishment of an automatic exchange of tax-relevant information between cryptoasset service providers and tax authorities on an international level. This would allow the global challenge of cryptocurrencies to be addressed through a global approach. Furthermore, our understanding of the global distribution of cryptocurrencies and their tax implications could greatly improve. The initiatives being taken at OECD (CARF) and EU (DAC8) levels on the matter seem promising.

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APPENDIX

Table 1: Capital Gains Taxation Scenarios

Country	A) Uniform Tax rate (%)	B) National capital gains taxation (2021) Tax rate (%)	Comments
Austria	25	28	Separate taxation of capital income.
Belgium	25	0	Not taxable, unless professional income.
Bulgaria	25	10	Subject to PIT.
Croatia	25	10	Tax rate of 12% before January 2021.
Cyprus	25	20	-
Czech Republic	25	15	Subject to PIT.
Denmark	25	42	27% up to DKK56,000 (in 2021) and 42% on any excess.
Estonia	25	20	Subject to PIT.
Finland	25	34	34% on excess above €30,000; 30% below.
France	25	30	12.8% tax and 17.2% social insurance contributions.
Germany	25	26	Separate capital income taxation, including solidarity surcharge.
Greece	25	15	-
Hungary	25	15	-
Ireland	25	33	-
Italy	25	26	Separate taxation of capital income.
Latvia	25	20	-
Lithuania	25	15	-
Luxembourg	25	0	No tax applies to the sale of shares held for more than six months.
Malta	25	35	Subject to PIT (max. rate = 35%, above €60,000).
Netherlands	25	31	31% tax rate, which is the maximum rate on the deemed return from capital.
Poland	25	19	-
Portugal	25	28	-
Romania	25	10	-
Slovak Republic	25	0	Capital gains are exempt from tax if shares held for at least one year.
Slovenia	25	28	Capital gains are exempt from tax if shares held for at least 20 years.
Spain	25	26	Rates vary between 19% and 26%.
Sweden	25	30	-

Notes: PIT refers to personal income tax. Note that, in these scenarios, the tax rate equals the average tax rate. Both capital gains tax scenarios disregard any basic exemption, which might lower the tax base. The national capital gains taxation scenario (B) is based on the tax rates that are applied to realised gains from the disposal of shares held for at least one year. Any specific exemption is disregarded.
Source: IBFD Tax Research Platform (accessed on 2 July 2021).

Table 2: Simulated Revenue from Bitcoin Capital Gains Taxation (2020)

| Country | Realised capital gains | Bitcoin capital gains tax revenue | | | | | |
| | | A)   Uniform rate (25%) | | | B)   National CGT rates | | |
	mio. EUR	mio. EUR	% of GDP	% of property tax revenue	mio. EUR	% of GDP	% of property tax revenue
Germany	497	124.3	0.004	0.316	131.1	0.004	0.333
Italy	261	65.2	0.004	0.167	67.8	0.004	0.173
Denmark	52	13.0	0.004	0.163	21.8	0.007	0.275
Sweden	83	20.7	0.004	0.406	24.9	0.005	0.487
Luxembourg	12	3.1	0.005	0.202	0.0	0.000	0.000
Ireland	73	18.3	0.005	0.441	24.1	0.007	0.582
France	484	120.9	0.005	0.116	145.1	0.006	0.140
Hungary	40	9.9	0.007	0.741	5.9	0.004	0.445
Austria	115	28.7	0.008	0.986	31.5	0.008	1.085
Greece	53	13.3	0.008	0.239	8.0	0.005	0.143
Belgium	147	36.7	0.008	0.231	0.0	0.000	0.000
Romania	71	17.8	0.008	1.306	7.1	0.003	0.522
Finland	80	19.9	0.008	0.538	27.1	0.011	0.732
Spain	379	94.8	0.008	0.329	98.6	0.009	0.342
Poland	190	47.5	0.009	0.540	36.1	0.007	0.410
Netherlands	316	79.0	0.010	0.617	97.9	0.012	0.765
Portugal	113	28.3	0.014	0.634	31.7	0.016	0.711
Malta	8	1.9	0.015	1.259	2.7	0.021	1.763
Cyprus	14	3.5	0.017	1.892	2.8	0.013	1.514
Croatia	36	9.1	0.018	1.600	3.6	0.007	0.640
Lithuania	41	10.3	0.021	6.283	6.2	0.013	3.770
Czech Republic	206	51.4	0.024	4.556	30.8	0.014	2.733
Slovak Republic	100	24.9	0.027	6.756	0.0	0.000	0.000
Slovenia	52	13.1	0.028	4.577	14.4	0.031	5.035
Estonia	33	8.2	0.030	10.656	6.6	0.024	8.525
Latvia	51	12.9	0.044	4.417	10.3	0.035	3.533
Bulgaria	109	27.2	0.045	5.646	10.9	0.018	2.259
EU27	3,615	903.7	0.007	0.310	847.0	0.006	0.290

Notes: CGT abbreviates capital gains tax; "mio." represents million. Scenario A) applies a uniform tax rate (25%), while scenario B) applies the CGT rates that EU member states apply to capital gains from shares (see Table 2). Property tax revenue is based on European Commission, Directorate-General for Taxation and Customs Union (2021). It includes revenue from recurrent taxes on immovable property and other property taxes, such as wealth transfers or net wealth. GDP is based on EUROSTAT data (nama_10_gdp), available from https://ec.europa.eu/eurostat/data/database, accessed on 5 July 2021.
Source: Own calculation, using data by Chainalysis (2021).