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The distributional consequences of Bitcoin[1]

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Abstract: The original promise of Nakamoto in 2008 to provide the world with a better global means of payment has not materialised. Instead, the focus has increasingly shifted to Bitcoin as an investment asset promising high capital gains. Promoters of this investment vision have made little effort relating Bitcoin to an economic function which would justify its valuation. While most economists argue that the Bitcoin boom is a speculative bubble that will eventually burst, in this paper, we analyse the impact of a Bitcoin-positive scenario in which its price continues to rise in the foreseeable future. What sounds intuitively promising or at least not harmful is problematic: Since Bitcoin does not increase the productive potential of the economy, the consequences of the assumed continued increase in value are essentially redistributive, i.e., the wealth effects on consumption of early Bitcoin holders can only come at the expense of consumption by the rest of society, which is impoverished. While previous discussions on the redistributive effects of Bitcoin assumed that badly timed trading was a necessary condition for losses, this paper shows that neither poor timing of trades nor holding Bitcoin at all are necessary for being negatively affected by a Bitcoin-positive scenario.

Keywords: Bitcoin; asset price bubble; wealth effect on consumption; redistribution

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JEL Codes: E21, E25, E53, G12

1. Introduction

The pseudonymous Satoshi Nakamoto published the whitepaper on Bitcoin in 2008, with the vision of a global digital currency for making payments without a trusted third party acting as intermediary. But Bitcoin's conceptual design and technology appear to have prevented this vision from materialising. Even 16 years after its inception, real Bitcoin payments, i.e., effectively "on chain", are still cumbersome, slow, and expensive. Moreover, its value is considered too volatile to fulfil the classic functions of money, i.e. unit of account, means of payment, and a store of value (Bergsli et al., 2022; Chu et al., 2017; Segnon and Bekiros, 2020).

Bitcoin has never been used to a significant extent for legal real-world transactions (Bindseil and Schaaf, 2022). In El Salvador, the first country to declare Bitcoin as an official currency with legal tender status in 2021, Bitcoin is not extensively used and has remained "a failure" (Perez-Obregon, 2023). Moreover, the El Salvadorian Chivo Wallet settles Bitcoin payments in its own central ledger and not on the Bitcoin blockchain, betraying the core proposition of the Bitcoin whitepaper and of decentralised finance (DeFi). Many Bitcoin critiques deny a real use case within the boundaries of legality: Cryptocurrencies "remain the financial product of choice among financial predators, lawbreakers and criminals worldwide. The least harmful use would be speculation and gambling (as opposed to its other uses for tax evasion, fraud, ransomware, sanctions evasion, terrorist funding, narcotics trafficking, money laundering, etc.)" (Kelleher, 2024). At the same time, and maybe for this reason, the Bitcoin narrative has changed gradually for some years away from the means of payment idea of the whitepaper to Bitcoin as an attractive investment, the price of which would significantly increase over time (Paterson, 2022).

The Bitcoin price has been on an unprecedented rollercoaster ride, with interim price gains of 1000% (e.g., from spring 2020 to November 2021) but also losses of almost 80% during the "crypto winter": After the Bitcoin price had reached a record high of around USD 69,000 in November 2021, the price fell in the subsequent correction phase, which intensified over the course of 2022 to around USD 16,000 in November 2022. In this respect, those who got in at relatively low prices and/or sold at high prices have made high profits, and those who bought and held Bitcoins at low prices and did not sell them have high imputed profits. Opinions differ as to how sustainable the high valuation of Bitcoin is and where its fair value lies. Many economists consider the fair value of Bitcoin to be zero and therefore classify the Bitcoin market's capitalisation as a bubble (e.g., Taleb, 2021; Avoca Global Advisors, 2021). In contrast, Bitcoin enthusiasts believe that the rally is far from having reached its ultimate peak, even though they generally find it difficult to justify or even calculate both a fair value and their price forecasts.

Section 2 will review the question of use cases and fair valuation of Bitcoin, and the emerging investment view of Bitcoin, which has also gained prominence in the political debate.

Section 3 analyses the macroeconomic issues associated with speculative increases in asset prices and applies the findings from the literature to the scenario in which Bitcoin prices increases

significantly for a prolonged period. This focus on such a "Bitcoin-positive scenario" (i.e., a sustained increase in its price without a final crash during the theoretical observation period) is a deliberate simplification intended to enhance the clarity of the analysis. This assumption should not be mistaken for a prediction of future real-world price developments. Similarly, the term "positive scenario" does not imply societal benefit, nor does it represent a normative judgment compared with a scenario in which the speculative bubble bursts. While the previous literature has mostly focused on the distributional consequences and risks associated with the volatility of Bitcoin prices, our key point is that even without such volatility, in the apparent ideal scenario of steadily increasing prices, Bitcoin implies redistribution and the implied societal problems.

Section 4 turns to the redistributive aspects of Bitcoin. A number of economists (e.g., Rogoff, 2017; Roubini, 2018; Avoca Global Advisors, 2021; Bindseil and Schaaf, 2022) have critically examined the social damage associated with the wealth redistribution resulting from the high volatility of the Bitcoin price or an eventual burst of the assumed Bitcoin bubble: Redistribution takes place that benefits those who time their trades well (e.g., bought Bitcoin at an early stage when the price was low, or in the crypto winter, and sold it when the price was much higher) at the expense of those with poor timing (e.g., those who bought in November 2021 and sold during the crypto winter, or who bought Bitcoin any time at a high price and would still hold it when the price would fall to an end state of zero).[2] In this paper, we go one step further and ignore the scenario of high price volatility or a bursting bubble: Instead, Section 4 focuses on a type of redistribution that occurs in particular in a Bitcoin-positive scenario of continuously increasing prices in the foreseeable future. Even Bitcoin-critical economists may have assumed that this scenario does not harm anyone. Earlier discussions on the redistributive effects of Bitcoin assumed that trading Bitcoin in a badly timed manner was a necessary condition for welfare losses from Bitcoin, but this paper demonstrates that neither poor timing of trades nor holding Bitcoin at all are necessary for impoverishment on aggregate under a Bitcoin-positive scenario. Moreover, the redistribution of wealth and consumption in this scenario at the expense of latecomers and nonholders of Bitcoin is not a relative one but an absolute one.

Section 5 concludes accordingly that the consequences of the Bitcoin-as-an-investment vision with perpetually increasing Bitcoin prices imply a corresponding impoverishment of the rest of society, endangering cohesion, stability, and ultimately democracy.[3]

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[2] Indeed, the redistribution in a zero-sum game over the time axis was already touched upon implicitly discussed in in the P2Pfoundation forum with Satoshi Nakamoto himself immediately after the publication of the original whitepaper. There, it was pointed out "that the early adopter finds the worm" in this system. But this was more referring to the miners rather than investors: "This would mean that – the earlier someone gets in on the bitcoin system establishing a node, the more chance they have of becoming lucky and being able to generate coins." https://p2pfoundation.ning.com/forum/topics/bitcoin-open-source?id=2003008%3ATopic%3A9402&page=1.

[3] We (Bindseil and Schaaf, 2024; Bindseil et al., 2022) and many others (e.g., Kolbert 2021) have pointed out the energy consumption and implied ecological and social damage caused by Bitcoin mining. However, the focus of this paper is different, and we therefore do not recall the ecological issues in detail.

2. The use case of Bitcoin and its valuation

2.1. Bitcoin offers payment services to society: Nakamoto's original vision of 2008

Nakamoto (2008) believed that Bitcoin would play a role in the future of payments, thereby also generating value for society that could justify a positive price. More specifically, he explained:

"Commerce on the Internet has come to rely almost exclusively on financial institutions serving as trusted third parties to process electronic payments. While the system works well enough for most transactions, it still suffers from the inherent weaknesses of the trust-based model. Completely non-reversible transactions are not really possible, since financial institutions cannot avoid mediating disputes. The cost of mediation increases transaction costs, limiting the minimum practical transaction size and cutting off the possibility for small casual transactions, and there is a broader cost in the loss of ability to make non-reversible payments for non-reversible services this seems to be purely a contractual and legal problem, not a technological one. With the possibility of reversal, the need for trust spreads. Merchants must be wary of their customers, hassling them for more information than they would otherwise need. A certain percentage of fraud is accepted as unavoidable. These costs and payment uncertainties can be avoided in person by using physical currency, but no mechanism exists to make payments over a communications channel without a trusted party."

The problem that Nakamoto (2008) believes to have identified seems however to start from a misunderstanding. In principle, financial institutions can avoid mediating disputes. Mediation is rather an optional service than a necessity. It is appreciated and demanded by customers and therefore offered and charged for by payment services providers. For example, PayPal does not offer any dispute mediation if payments are made in the "friend and family" mode, and these are free of charge. Likewise, credit transfers between bank accounts are not mediated, i.e., if an e-commerce delivery is paid in advance via credit transfer and the customer is unsatisfied with the good received, the bank will not mediate. Nakamoto however presents the modus operandi of e-commerce as a technical necessity. "Delivery-vs-payment" (or "atomic" settlement) to prevent principal settlement risk is difficult to achieve in e-commerce, and ex ante trust-building mechanisms (e.g., assessment histories by users), escrow accounts, or ex post mediation mitigate this problem, but are not necessary per se. Nakamoto continues:

"What is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party. Transactions that are computationally impractical to reverse would protect sellers from fraud, and routine escrow mechanisms could easily be implemented to protect buyers. In this paper, we propose a solution to the double-spending problem using a peer-to-peer distributed timestamp server to generate computational proof of the chronological order of transactions."

Again, it can be argued that a normal credit transfer has also no trusted third party and does not promise a mediation mechanism either. Moreover, escrow accounts are also provided as add-on to credit transfers in some e-commerce market platforms. Moreover, Nakamoto's perspective seems to be tilted towards the interest of the merchant, who according to his view, needs protection from fraudulent buyers. In this context, the merchant's key interest is to receive the funds instantaneously. The received money is fungible, i.e., homogeneous and standardised. The merchant indeed benefits

from the impossibility of reversing transfers. But that is only one side of the coin. The customer, however, might only approve of the purchase after having assessed the quality of the purchased product or service. Hence, the customer has a higher interest in mediation and the option to reverse the purchase.[4] The proposed escrow mechanism for buyers' protection would need to be provided by a third party, i.e., a (trusted) intermediary. It is the nature of an escrow account that it should not be managed, controlled, or owned by one of the acting parties amid a potential conflict of interest.

A further point that Nakamoto (2008, 8) claimed to address with Bitcoin related to the perceived problem of double-spending in peer-to-peer networks:

"We started with the usual framework of coins made from digital signatures, which provides strong control of ownership, but is incomplete without a way to prevent double-spending. To solve this, we proposed a peer-to-peer network using proof-of-work to record a public history of transactions that quickly becomes computationally impractical for an attacker to change if honest nodes control a majority of CPU power."

While it is true that the history of transactions of the Bitcoin network is "impractical for an attacker to change", it is unfortunately also true that proof-of-work is highly impractical itself, as it is costly and inefficient compared with alternative ways to secure the safety and prevent double-spending of a payment instrument. The problem of double-spending is hardly an issue in payments (because it is generally solved without particular difficulties, and certainly with far less social cost than those incurred in the solution offered by Bitcoin). Cybercrime and fraud are serious risks for payment systems, including Bitcoin, but they are different from the problem of double-spending (see also Watts and Low (2024) for a critique of Nakamoto's treatment of the double-spending issue in the Bitcoin white paper).

Overall, Nakamoto's (2008) understanding of retail payments was inaccurate. It is therefore doubtful whether his invention effectively addressed the problems he perceived in e-commerce, and it is therefore also hardly surprising that Bitcoin was never significantly used in legal e-commerce.[5]

Despite our overall critical analysis and the negative assessment of Bitcoin as a global means of payment (and thus its failure to achieve its original and proclaimed goal), this should not be seen as a final verdict on the potential of the underlying blockchain technology or on the catalytic role that Bitcoin has played in paving the way for more powerful variants and subsequent generations (from proof of work to proof of stake, etc.) to gain increasing traction and practical recognition. At the same time, recognising the originality of the invention and the catalytic impact of the innovation is no reason

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[4] Recently, a customer accidentally paid fees amounting to USD 60,000. According to Cointelegraph (2025) The user wanted to send BTC 0.48 (around USD 37,770 at that time) using Bitcoin's RBF function, a feature which resends a transaction with a higher fee if the original one is stuck in the mempool (the "waiting room" for unconfirmed transactions). The user may have seen a warning that their fee – just 30 sats in total – was too low for quick processing. Trying to correct it, they likely entered "305,000," thinking it meant 30.5 sats per byte. But instead of a modest adjustment, the wallet interpreted this as 305,000 sats per byte – a massive overpayment that far exceeded the typical fees and led to a loss of over USD 60,000. Due to the irreversibility of the transaction and the fee payment, this amount is (from the user's perspective) irretrievably lost.

[5] We deliberately do not consider the use of Bitcoins to pay for or conceal illegal activities, as we do not think that these widespread uses are socially or economically useful.

to cling to it or to use or promote it in practice despite its many shortcomings. After all, the prospect of flying with the Lilienthal glider from 1891 – or the Wright brothers' Flyer I from 1903 – does not seem particularly appealing today either.

2.2. The fair value of Bitcoin

Financial and real asset values are typically anchored in a future income or utility stream. Most assets generate regular cash flows, e.g., real estate yields a rent, shares pay dividends, and bonds pay interest. Based on the present and expected future cash flow, the present value of such an asset can be calculated. Obviously, the future income stream is exposed to a high level of uncertainty and is subject to expectation. As has been argued elsewhere (e.g., Bindseil and Schaaf, 2022), Bitcoin lacks the traits of established financial assets. It does not generate any cash flow (like real estate), interest (like bonds), or dividends (like stocks), and cannot be used productively (like commodities). By consequence, most established ways of calculating or estimating the fair value of an asset fail when applied to Bitcoin.

- The discounted cash flow (DCF) is a valuation method that estimates the present value of an investment using its expected future cash flows. Applying the DCF model to Bitcoin is challenging because of Bitcoin's lack of income streams, coupons, or dividends.

- Technical analysis is employed by traders to predict price movements by analysing historical price charts, patterns, and indicators. While sometimes useful for short-term and medium-term predictions, this method is not typically suitable for long-term fair value estimation, as it is detached from economic fundamentals.

- Relative valuation compares an asset with other assets. This method could allow investors to estimate Bitcoin's value by assessing its relative strengths and weaknesses. Some indeed compare Bitcoin's price with that of gold, adjusting for volatility differences to estimate Bitcoin's fair value. However, in the absence of a clear understanding or notion what the autonomous value of Bitcoin is, the calculation of a relative price (and exchange rate) remains doubtful.

- Fundamental analysis evaluates Bitcoin's utility, scarcity, security, and potential use cases, providing a qualitative perspective on its value based on its inherent characteristics and future applications – a method that might work for believers but lacks analytical rigor amid the absence of legal use cases that are effectively beneficial to society.

- Regression analysis could seek more generally relationships between Bitcoin's price and various fundamental or market-related variables. This quantitative approach can offer insights based on historical data and identified correlations, but fails in the not too unlikely case of an inflated speculative bubble.

- The stock-to-flow (S2F) model compares the current supply of Bitcoin with the new supply (mined coins) over a specific period. It suggests that assets with a higher S2F ratio are scarcer and should therefore have higher value. While this model has gained popularity, critics argue that a basic linear regression with only one predictor (the stock-to-flow ratio) to forecast something as complex as Bitcoin's price is overly simplistic. Accordingly, the S2F model has failed to predict Bitcoin's price movements accurately in recent years; for example, it did not anticipate the significant price drop in 2022 (Rustgi, 2023).

- Biais et al. (2023) claimed that the value of crypto assets like Bitcoin is its stream of net transactional benefits, which depend not only on its fundamentals but also its future prices. This implies that, in addition to fundamentals, prices may also reflect sunspots. A sunspot is a random, nonfundamental signal that has no direct impact on economic fundamentals (like productivity, preferences, or technology) but influences expectations, leading to price effects in the markets. The authors analysed how fundamentals influence the expected returns required by investors and found that these account for only about 5% of the variation in Bitcoin returns. Assuming that their model is correctly specified and the data proxies are accurate, this means that most of Bitcoin's price movements are driven by external factors unrelated to fundamentals.

Valuation is a challenging issue for other investments as well, particularly for firms with perceived high growth potential. If a new technology is discovered and/or pioneered by one company, its market value can initially be very high relative to its net income stream over the first years (e.g., Tesla, Amazon, OpenAI, and Nvidia in their early years). These companies will thus exhibit a high equity to earnings ratio, suggesting that investors expect a significant growth of future earnings. In some cases, it can even take years until such a company stops operating at a loss and eventually earns net profits, as was the case with Amazon. Some of these companies match expectations; some will disappoint; others will even exceed the high-growth scenarios that justified their very high price-to-earnings ratio. Still, their valuation is typically based on fundamental analysis and their expected capacity and risks to deliver products for society in a profitable way.

2.3. Bitcoin as a pure investment detached from a use case

Many Bitcoin supporters nowadays view Bitcoin as an investment asset, the value of which will increase for a long time regardless of the specific service it may have for society or the traditional traits which define a financial asset. They argue that a demand effect, combined with the limited supply, would fuel an eternal upwards valuation trend (despite occasional cyclical term setbacks).

The list of prominent supporters of Bitcoin who seem to take this investment perspective is long and encompasses financial professionals, huge investors, campaigning politicians, and other celebrities. For example, Larry Fink, CEO of BlackRock, the largest asset manager in the world, draws the analogy to gold[6] and skips the attempt to explain why Bitcoin has value as a means of payment (or through other specific use cases), as reported widely in the media (this excerpt from Bitcoin Magazine):

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[6] A deeper analysis of the analogy with gold is beyond the scope of this paper. While there are common traits like self-custody, pseudonymity, and limited supply, the differences prevail. Taleb (2021), for instance, dismisses the analogy by arguing, that gold is used industrially. Indeed, unlike Bitcoin, which has no intrinsic physical utility, gold plays a vital role in various industries due to its exceptional chemical and physical properties, namely its non-corrosiveness, high density, ductility, and conductivity. In the electronics and semiconductor sector, gold is indispensable for circuitry, microprocessors, and connectors, as it offers high conductivity and corrosion resistance, making it essential in smartphones, computers, and space technology. In medicine, gold is valued for its biocompatibility, used in dental alloys, pacemakers, and cutting-edge applications like cancer therapy and diagnostics with gold nanoparticles. The aerospace industry relies on gold foils for heat protection and radiation shielding in spacecraft and satellites. Gold also improves energy efficiency in the glass and optics sector, where it enhances reflective coatings on buildings and optical devices. Lastly, in the chemical industry, gold nanoparticles serve as

In a notable statement, BlackRock CEO Larry Fink has expressed a positive perspective on Bitcoin during an interview today with CNBC, affirming that … "I believe it goes up if the world is frightened, if the people have fearful geopolitical risks, they're fearful of their own risks," said Fink. "It's no different than what gold represented over thousands of years. It is an asset class that protects you." … This endorsement from the head of the world's largest asset management firm is a significant milestone for Bitcoin's acceptance within mainstream financial circles. "Unlike gold where we manufacture new gold, we're almost at the ceiling of the amount of Bitcoin that can be created," Fink continued. "What we're trying to do is offer an instrument that can store wealth." (Hoffman, 2024a)

"I'm very bullish on the long term viability of Bitcoin," Fink stated…Fink's bullish stance on Bitcoin's long-term prospects aligns with the broader trend of institutional adoption and recognition of Bitcoin as a legitimate investment opportunity. As the CEO of the world's largest asset management firm, Fink's positive outlook on Bitcoin carries significant weight and may influence investor sentiment towards BTC." (Hoffman, 2024a)

In a TV interview, Mike Novogratz, a former hedge fund manager and founder of Galaxy Digital, also compared Bitcoin to gold: "It will be larger than gold," although he admitted that Bitcoin's then market cap wasn't yet one-tenth of gold's USD 1.21 tr. compared with USD 13.79 tr. (Rowe, 2024). In a similar way Tyler Winklevoss, the co-founder of Gemini, formulates: "We believe Bitcoin disrupts gold. We think it's a better gold if you look at the properties of money. And what makes gold? Scarcity. Bitcoin is actually fixed in supply, so it's better than scarce. It's more portable, it's fungible, it's more durable. It sort of equals a better gold across the board." (Langlois, 2018) Unsurprisingly, earlier Bitcoin owners also continue to have a positive view on the long-term viability of Bitcoin. For example, Hope (2024) reports that some Bitcoin investors expect the price of Bitcoin to go up significantly, notably to USD 1 million per coin:

"Cathie Wood, CEO of the investment firm ARK Invest, has significantly increased her bullish outlook on Bitcoin's price trajectory. In a recent interview, she revealed that ARK has "brought forward" its previous $1 million price target for Bitcoin by 2030. Wood attributes this shift to the recent approval of spot Bitcoin ETFs in the United States. The surge in interest and investment potential unlocked by these ETFs has prompted ARK to re-evaluate Bitcoin's future. "That target...it was before the SEC gave us the green light," Wood explained, referring to the Securities and Exchange Commission's approval of spot Bitcoin ETFs. "And I think that was a major milestone, and it has pulled forward the timeline." While Bitcoin has already seen significant price appreciation, Wood believes the party is just getting started."

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effective catalysts in processes like hydrogen production and exhaust purification. In contrast to Bitcoin, gold combines monetary value with tangible industrial utility. Its price for industrial usage might be inflated considerably amid the historically grown acceptance as a – very precious – store of value, but in functioning markets, its price still seems acceptable for producers (and effectively consumers of the final products). Taleb (2021) also argues that gold has been appreciated as jewellery for centuries before it became a store of value, an investment asset, or a reserve currency. Its general attractiveness has been established for millennia, with many ancient civilisations (Egyptians, Romans, Chinese) already regarding it as a sign of wealth and power. Finally, gold does not degenerate over time and retains its value even in chaotic or degenerative states of the world like natural catastrophes or in the case of a temporary or lasting failure of the electric or digital infrastructure.

Michael Saylor sees the Bitcoin price going up to USD 10 million per coin (Ngari, 2024; a video of the podcast interview is available e.g., on Twitter and YouTube) due to investment inflows from new large groups, notably Chinese investors, and considers that this will make the new investors wealthy:

"When you hear the Bank of Shanghai is rolling out a Bitcoin ETF, custody at the Bank of Shanghai, you would say this is great. That will give access to Bitcoin to 1.5 billion people in China, okay? They will buy a bunch of Bitcoin and the price of Bitcoin will go up to 10 million dollar a coin. So here is the question: do you want billion people in China to be rich? Or do you want the people in China to be poor?"

With a like-minded optimistic mindset, Marty Bent believes that Bitcoin can play a key role in closing gaps in US pension funds' solvency (Bent, 2024):

"Once you hit the end of the road and visualize the state of the American economy through a multi-generational lens you'll come to the conclusion that the American pensions are absolutely f[…]. … The only viable solution to this problem is to get off the hamster wheel of the fiat system. Bitcoin is the antidote to this problem. It is a verifiably finite asset running on a distributed system that cannot be controlled by any central authority and its demand will only increase from here on out as individuals around the world rabidly search for the antidote to the fiat poison they've been free basing for a decades. If pensions have any intention of closing the massive gaps between the money they've promised and the money they actually have, they better start allocating to bitcoin. In all seriousness though, the fact that a $1.2 Trillion pension fund out of Japan has begun the diligence process on bitcoin should be a sign to every other pension around the world that the tock is clicking. … As more and more pensions follow the first domino a virtuous cycle the likes of which you have never seen before will begin to take hold and there will be many pension managers kicking themselves because they didn't move early enough."

Celebrities who are not expected to be particularly familiar with the subject of finance and economics also do not shy away from expressing their enthusiasm or loyalty for Bitcoin as an investment instrument. "I'm a big believer in the future of Bitcoin", NFL quarterback Tom Brady revealed in an interview at Consensus 2021 (Coindesk, 2021). Hollywood actress Gwyneth Paltrow stated on Twitter: "I think Bitcoin and cryptocurrency is here to stay." Actor Ashton Kutcher told the TechCrunch Disrupt conference already in 2013 that the "Bitcoin revolution" is here and it offers an investing opportunity. "I think bitcoins are obviously becoming more and more relevant," said Kutcher, who is also founder of the A-grade venture (CNBC, 2013).

Larry Fink, Cathy Wood, Michael Saylor, and many other prominent figures share a common view on Bitcoin as a pure investment asset with growing future valuations decoupled from the economic services Bitcoin could potentially deliver to society. In their public statements, Bitcoin's future value does not rely on the Nakamoto narrative, which positions Bitcoin as an attractive means of payment. Instead, at best, they draw parallels with gold as a pure investment, assuming that society can coordinate around any asset with a finite or limited supply as an investment vehicle, leading to a virtuous cycle where its value continuously rises. They do not present or explain the reasons why society would choose Bitcoin for this purpose. While there may be volatility, they expect Bitcoin's valuation to follow a long-term upward trend, independent of any utility it provides to society – apart from making its holders wealthier.

That this vision could materialise for a significant period of time is not excluded, despite the fact that economists have argued that this investment perspective would be flawed (e.g., Roubini, 2021): there are countless assets on earth with a limited or finite supply, and for none of them is the notion particularly plausible that they can sustain an ever-increasing valuation over the long term, regardless of the services or benefits they provide to society. These scarce assets include tangible items like German stamps from the 19th century or any other set of collectibles, pieces of art, land (which, however, also has use for society), and virtual assets, such as various possible types of unbacked crypto-units, the value of which is supposedly guaranteed by computer code that limits the number of "coins" or nonfungible tokens that could be generated. Proponents of the Bitcoin investment perspective ignore the fact that "scarcity" describes the relationship between supply and demand. A limited, finite supply does not equate to scarcity. In the context of Bitcoin, with its limited and fixed supply, the noneconomic term "rarity" seems more appropriate. If supply is fixed, the price becomes exclusively dependent on demand. And if the demand were to disappear, the price would be zero.

2.4. The investment vision of Bitcoin in political debate

The development of the Bitcoin price does not take place in a vacuum. As there is no intrinsic anchor of value and given the wide range of criticism that Bitcoin has faced, politics plays a major role for Bitcoins' destiny, as the legal framework, including approval as an investment product or possible restrictions or bans, affect price developments and market sentiment. There is a very heterogeneous regulatory landscape, ranging from the ban of trading and mining in some jurisdictions, through the recognition in the US as an investment product (e.g., by licensing Bitcoin exchange traded funds (ETF) and futures) to the legal tender status in El Salvador. In contradiction to the initial vision of Bitcoin as being independent from legal and governance interference, legislation and legal recognition are crucial for the prospects of Bitcoin.

It is therefore hardly surprising that the crypto industry and major investors are trying to influence legislation and politics in general to sustain a positive price momentum. In fact, this phenomenon is not new anymore. In the US, the number of crypto lobbyists would have almost tripled from 115 in 2018 to 320 in 2021 (The Economist, 2021). And the 2024 US presidential election has brought cryptocurrency regulation to the forefront of political discourse, with the major parties and their potential candidates adopting distinct stances on Bitcoin and crypto (Bitfinex, 2024). It fits into this picture that the current election campaign is also being financed with funds from the Bitcoin industry. Public Citizen, a think-tank, reports that crypto companies have contributed USD 119 million to a crypto-friendly super political action committee (PAC) already, representing nearly half of all corporate election spending in the current cycle (Claypool, 2024).

A significant portion of the funds donated by the crypto industry for the campaigns has not yet been spent, however (as of early September 2024). Of the approximately USD 25 million which has been utilised, more than USD 20 million has been allocated to supporting Republican candidates or opposing Democratic ones. Interestingly, many adverts placed by these crypto reserves refrain from even mentioning crypto, technology, or technology regulation. Rather, they aim to discredit alleged crypto-critical candidates (White, 2024). Three crypto-funded super PACs spent $62 million on video

ads in September 2024 that never mentioned crypto but that supported crypto-friendly candidates and/or went against more crypto-critical ones (Ge Huang and Ostroff, 2024).

Voters might also be concerned by the political stance on Bitcoin – but far less than the crypto lobby may want to make politicians think. The precise fraction of the US population holding Bitcoin is disputed. While there are findings surveyed by the crypto industry, according to which, 16% of US adults say they have invested in, traded, or used cryptocurrencies like Bitcoin or Ether (Perrin, 2021), and other sources indicate that more than 15% of US adults have engaged with cryptocurrencies in some form, the real figures are probably lower. A survey by the US Federal Reserve concludes that only about 7% of US adults were holding or using cryptocurrency in 2023, down 3 percentage points from 2022 and down 5 percentage points from 2021 (Federal Reserve, 2024).

To create more interest and revive capital inflows from retail customers, the cryptocurrency industry is exploring strategies to engage the broader public. Firms such as Crypto.com, Kraken, Bitpanda, and Arkham Intelligence have recently secured new sponsorship agreements with European football clubs, contributing to the sector's record spending of USD 170 million on the sport this season. Football, as one of the most widely viewed sports globally, has emerged as a key avenue for mass-market outreach, offering a more cost-effective platform compared with previous industry practices. During the cryptocurrency boom in 2021, companies engaged in aggressive marketing and expansion efforts, pursuing high-profile deals exceeding USD 100 million, including Formula One team sponsorships and naming rights for major US stadiums. At the time, cost considerations were secondary, as retail investors were eager to enter the cryptocurrency market at unprecedented rates (Nicolle, 2024).

Currently, within the relatively small group of owners, Bitcoin-related wealth is more concentrated than other wealth. Research has found that the Bitcoin ecosystem is dominated by large players, be it miners, Bitcoin holders, or exchanges, despite the significant attention that Bitcoin has received over the last few years. The same study shows that individual investors collectively control 8.5 million Bitcoins (i.e., less than half of the Bitcoins in circulation by the end of 2020) and that within individual holdings, there is significant skewness in ownership; the rest of the Bitcoin is held by large miners or exchanges (Makarov and Schoar, 2021).

While only a small fraction of US citizens seems to hold Bitcoin or crypto, the cryptocurrency industry pushes hard to urge political candidates on both sides of the aisle to embrace crypto (White, 2024). Whether or not the respective candidates are convinced, their proclaimed political stances on Bitcoin – and crypto in general – will most likely have an impact on future regulations.
Bitcoin and crypto do not play a major role in any of the party programs. They are not mentioned at all in the official 2024 Democratic Party platform and only got a got a paragraph on the Republican agenda (Kharif, 2024). Still, politicians have aimed at attracting voters invested in Bitcoin to support them, with the abovementioned US presidential campaign generating unprecedented commitments of candidates. The Democratic Party, represented by Vice President Kamala Harris as nominee, has shown a nuanced approach to crypto regulation.[7] Initially, the Biden administration took a cautious

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[7] However, there are internal debates within the Democratic Party, exemplifying the divergence within the party. While some Democrats, like Senator Elizabeth Warren, continue to emphasize the risks associated with cryptocurrencies, others are advocating for a more open approach "to foster innovation".

stance, focusing on consumer protection and financial stability (The conversation, 2024). However, as the election approached, there was a moderate shift towards a more crypto-friendly view. The passage of the Financial Innovation and Technology for the 21st Century Act (FIT21) in May 2024, with significant Democratic support, signalled a growing recognition of the industry's importance. Harris, while not yet articulating a definitive position, engaged with crypto representatives, indicating a willingness to consider the sector's perspectives (The conversation, 2024). On the Republican side, President Donald Trump has made a dramatic pivot in his approach to crypto assets (The conversation, 2024). Once a critic, Trump now presents himself as a champion of digital assets, embracing the industry. For example, when Trump spoke at the Libertarian National Convention on 25 May 2024 and promised supporting Bitcoin if elected and emphasised that Bitcoin holders already represent 50 million voters in the US:

"I will ensure that the future of Crypto and the future of Bitcoin will be made in the USA, not driven overseas; I will support the right to self-custody to the nation's 50 million crypto-holders, I say this, with your vote; I will keep Elizabeth Warren and her goons away from your Bitcoin, and I will never allow the creation of a central bank digital currency." (Gerard, 2024)

Trump continued to ramp up his support for Bitcoin over the course of the campaign. He appeared at the Bitcoin 2024 Conference in Nashville on 27 July and signalled to the Bitcoin industry:

"In just 15 years, Bitcoin has gone from merely an idea posted anonymously on an internet message board to being the ninth most valuable asset anywhere in the world. … It's already bigger than Exxon Mobil. Soon it will be surpassing the entire market cap of silver. … One day it probably will overtake gold … bitcoin and crypto will skyrocket like never before, even beyond your expectations … Because when America is prospering, bitcoin is soaring, and it will go up with it…. During my four years in office, bitcoin surged by 3,900%, from $898 the day I took office to $35,900 the day I left … Now, compare that to just after three and a half years of Biden and Harris adjusted for inflation, bitcoin is up 50% now 50% sounds good, but not when you're comparing it to almost 4,000% right?

… if I am elected, it will be the policy of my administration, United States of America, to keep 100% of all the bitcoin the U.S. government currently holds or acquires into the future, we'll keep 100 … This will serve, in effect, as the core of the strategic national bitcoin stockpile. … I take steps to transform that vast wealth into a permanent national asset to benefit all Americans. … You are the modern-day Edisons and Wright brothers and Carnegies and Henry Fords, and what you do in your lifetime stands a chance to outlive us all and inspire humanity for generations to come."

Trump did not explain in his speech what services of Bitcoin to society would justify its current and future ever higher valuation, even though he compared it to past innovations for which this was rather clear. This shift aligns with the broader Republican stance, which generally favours less regulation and more market-driven approaches to the crypto sector (Bitfinex, 2024). The Republican stance, as embodied by Trump's statements, leans towards a more permissive regulatory environment for crypto assets (Seatter, 2024). This approach aimed to attract support from the crypto community and appeal to younger, tech-savvy voters who are increasingly engaged with digital assets (The conversation, 2024). Overall, the crypto industry seemed to perceive Trump as significantly more favourable candidate. While the crypto industry showed more willingness to engage with the Harris campaign, hoping for a more positive policy direction, analysts anticipated a significant disparity between the two political outcomes. They predicted very different prices developments for Bitcoin depending on who won the US

Presidential election, speculating that if Trump won, Bitcoin could go up to USD 80,000–90,000, but if Harris won the presidential race, the price could drop to USD 30,000–40,000 (Hunt, 2024). Consistent with this, the price for Bitcoin slid as investors reacted to the presidential debate on 11 September between Harris and Trump, when the market assessed Harris as having won the debate, even though Bitcoin was not discussed at all. Indeed, Trump, who has embraced the crypto sector, was often on the defensive; moreover, pop star Taylor Swift announced her endorsement of Harris right after the debate (Ghosh, 2024).

The then independent presidential candidate Robert F. Kennedy Jr. has gained traction as a prominent pro-crypto candidate, resonating strongly with independent voters and those dissatisfied with the policies of Trump and Biden. Kennedy has consistently emphasised his support for Bitcoin and blockchain technology, distinguishing himself as a unique advocate for digital assets in the presidential race. Among his campaign promises are ambitious initiatives, such as placing the entire US budget on the blockchain to enhance transparency and accountability in government spending. He envisions a system where every American can review budget items at any time, aiming to promote greater public oversight and trust (Bitfinex, 2024). Kennedy promised in the 2024 Nashville Bitcoin convention on 27 July 2024 that he would order massive purchases of Bitcoin by the US Treasury if he would be elected and, in addition, that Bitcoin would effectively be exempt from capital gains taxation and from controls against illicit payments:

"I intend as President of the United States to sign an Executive Order on day 1 … to transfer approximately 200,000 Bitcoin held by the US Government to the US Treasury where it will be held as a strategic asset. …. On day one as President, I will sign another Executive Order directing the US Treasury to purchase 550 Bitcoin daily until the US has a reserve of at least four million Bitcoin. … our nation holds approximately 19% of global gold reserves; this policy will give us around the same proportion of total Bitcoin. The cascading impact of these actions will eventually move Bitcoin to a valuation of hundreds of trillion of dollars. On day one as President, I will sign also an Executive Order directing the IRS to issue public guidance that all transactions between BTC and the USD are unreportable transactions, and by extension untaxable. … Bitcoin is a technology for freedom, for optimism, for independence, for democracy, for transparency, it is the currency of hope, it is the perfect currency."

Kennedy did not elaborate further on why he believes Bitcoin to be the perfect currency, and what would justify making Bitcoin transactions against USD unreportable and untaxable. In any case, a total valuation of "hundreds of trillion" of USD of Bitcoin would imply a valuation of one Bitcoin of at least 10 million USD. Kennedy suspended his campaign on 23 August 2024. He then endorsed Trump (CNN, 2024).

As the election drew closer, both Democrats and Republicans recognised the growing importance of crypto policy to voters. A recent survey indicated that a significant portion of voters in swing states considered crypto policies important enough to influence their voting decisions (Seatter, 2024). This has led to increased efforts from both sides to court the "crypto vote", with initiatives like Crypto4Harris emerging to enhance the Democratic candidate's appeal on cryptocurrency issues (The conversation, 2024). The outcome of the 2024 election could have far-reaching implications for the future of cryptocurrency regulation in the United States. While the Democratic approach under Harris

may have sought a middle ground, the Republican victory led by Trump could potentially usher in a more crypto-friendly regulatory environment (Seatter, 2024).

3.   The macroeconomics of large asset price exuberance

In this section, we briefly review the literature on the macroeconomic effects of speculative asset price increases and how the central bank may react to neutralise their impact on inflation or how they trigger short-term fluctuations in economic activity. We focus on the period of asset price increases, as we are less interested in a possible burst of a bubble (which we do not exclude for the real future), consistent with our interest in a Bitcoin-positive scenario. While in Section 4, we will assume, for simplicity reasons, that the central bank is perfectly able to neutralise the effects of significant Bitcoin price increases on inflation and avoid economic volatility, in Section 3, we briefly review the economic literature on how the central bank can achieve this result.

New technologies are pivotal to growth and the increase in the welfare of societies. By increasing the overall economic production potential, technological progress facilitates the inflation-free expansion of the consumption potential. Innovations based on technological progress increase total factor productivity (TFP), which leads to a more efficient utilisation of existing production factors (Grimm et al., 2024). The increase in production potential through new technologies manifests itself in various forms. Investments in machines, automation systems, and intangible capital can increase productivity. More recently, new technologies such as artificial intelligence and robotics could replace missing labour and thus counteract demographic change (Sachverständigenrat, 2024).

For tech companies and their market cap (Google, Tesla, Amazon, Apple, or Nvidia), sudden market cap explosions are assumed to match the increase in the future production potential of the economy, also making assumptions on the specific profitability path of the companies. In general, the co-movement of equity wealth and of production potential enables a higher supply of goods and services without leading to inflation. The increased consumption triggered by wealth effects matches the improved and augmented supply of goods and services, as a rise in assets' valuation is generally believed to stimulate people's consumption. "In cases where wealth is gained and the additional value is spent within the economy, there is a wealth effect […]" (WEF, 2022), e.g., soaring stock markets can increase the marginal propensity to consume through wealth effects even before the actual increase in productivity has materialised, in anticipation of future real wealth increases.[8] However, the market valuations of new technologies or products as well as their producers and providers can obviously be based on a misjudgement by investors. The wealth effect on consumption of a significant increase in asset prices and its implied macroeconomic consequences in year T are probably independent of whether, in T+10, the valuation of year T appears justified or not in retrospect. The more the asset price increases anticipate a future increase in the production potential (in contrast to an immediate one), the more the implied wealth effect will likely be inflationary and risk a boom-bust cycle, and therefore raises questions of the right monetary policy reaction.

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[8] For simplicity reasons, we do not account explicitly for the differences in the wealth effect type of financial and nonfinancial assets between the US and the Euro area. Indeed, the wealth effects are generally lower in the Euro area than in the US (de Bondt et al., 2019; Sousa, 2009; Cooper and Dynan, 2016).

Several cases can be distinguished in terms of timing and uncertainty of asset price increases vs. increases in the production potential of the economy. Consider the following five examples.

3.1. Increased productivity without a (marketable) wealth effect

Some increases in the production potential (say through the invention and deployment of a new technology) may come along without a directly related visible increase in asset values; for example, if the growth of the production potential relates to a sector which is not incorporated in the form of stock-traded companies (e.g., the government sector). In this case, there is no directly visible positive asset valuation shock and if some assets gain value, these may be illiquid (e.g., human capital). The absence or illiquidity of increases in asset values will reduce the effects of the positive productivity shock on consumption, even if the anticipation of higher future incomes will likely still have a positive effect on consumption. In Figures 1–5, we show productivity increases in light green boxes and the related asset price increases – if any – in dark red. We show Case (A) in its extreme form, in which a positive productivity shock would have no direct wealth effect at all. From the perspective of monetary policy, this would likely be largely a positive supply shock, with the price-dampening effects being predominant.

Figure 1. Increased productivity without a wealth effect.

3.2. Simultaneous wealth and productivity effects

In the case where a new technology (or the news about it) appears more or less simultaneously to its deployment and the start of the realisation of a steady flow of additional production, while the future productivity is captured by widely held stock company, then the wealth effects on consumption and the increase in the production potential may be considered to match, so that we obtain a sort of neutrality from the perspective of the macroeconomic equilibrium and price pressures in the economy.

Figure 2. Productivity effects and wealth effects occurring simultaneously.

3.3. Lagged productivity effects relative to wealth effects

It might be that a new technology is invented but will take years before being usable. Still, investors may believe in its future deployment are such that the stock company that invented the technology (or the related industrial sector) has immediate large valuation gains. In this case, in between the increase in wealth and the productivity gains, the wealth effects are likely inflationary, and monetary policy may have to be tightened for a while to prevent inflation or unwarranted economic fluctuations.
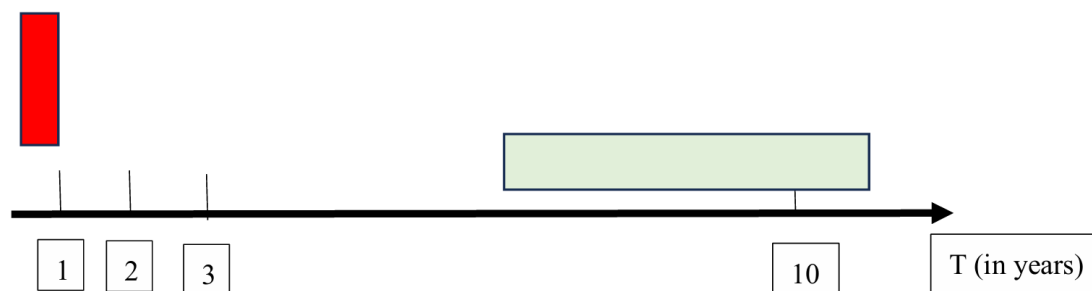

Figure 3. Productivity effects appearing after a significant time lag relative to the wealth effect.

3.4. Wealth effects without productivity effects: The Bitcoin-positive scenario

The case of Bitcoin as investment detached from any use case can be understood as an increase in wealth without any increase in the production potential, whereby the wealth increase is gradual over the years as Bitcoin prices increase and increase. This case is likely similar for the initial years as the previous one, i.e., a tightening of monetary policy is likely warranted. However, the phase in which the productivity gains kick in and may allow for an opposite adjustment of policies does not materialise.

Figure 4. Wealth effects without productivity effects.

3.5. An asset price bubble that bursts without any productivity effects

Finally, the classic asset price bubble would mean that there is a temporary wealth effect which is later reversed when the bubble bursts, and that there are no productivity gains that match the asset price bubble.

Figure 5. Wealth effects and the burst of a bubble (without productivity effects).

In the literature and the numerous analyses of exuberant asset price increases, economists mostly focus on the financial stability risks and the consequences of the bubble bursting. For instance, in Minsky's groundbreaking theory (1993), investors initially engage in saving financing at the beginning of a cycle: The income that follows the investments is sufficient to repay the loans, including the principal. Speculative financing initially appears profitable. In the next phase, the cash flow is then only sufficient to service the interest on the loans taken out; the repayments of the principal, on the other hand, are replaced by new loans. Finally, the investors switch to a "Ponzi scheme": Loans are even taken out to finance the interest burden, as investors still trust that at the very end, the income from the investment will be sufficient to meet all the accumulated obligations. The economic system becomes increasingly unstable until the speculative bubble bursts.

We are less interested here in the scenario of an asset bubble bursting, as, for analytical purposes, we assume a Bitcoin-positive scenario in which the value of Bitcoin continues to increase for good. The literature is relevant in our context in the sense that if the wealth effects relate to an unjustified asset price "bubble", they would also not be associated with a proportional growth in productivity and, therefore, would initially require a similar monetary policy reaction like the case of the Bitcoin-positive scenario.

Our Bitcoin-positive scenario comes closest to the rational bubbles approach in economics, where asset prices deviate from their fundamental values but persist due to the collective belief that prices will continue to rise. Tirole (1985) argues that overpriced assets (relative to their fundamentals) emerge in environments where no alternative, fundamentally driven asset has a better yield than the bubble asset. Blanchard and Watson (1982) show how bubbles can persist under rational expectations as long as agents believe that they can sell the asset to someone else at a higher price in the future (the "greater fool theory"). Abreu and Brunnermeier (2003) show how rational traders recognise that an asset is overvalued but are uncertain about the timing of the inevitable crash. Within their concept of "synchronised beliefs", such bubbles can grow even though rational investors are aware that they are in a bubble. There is a growing number of scholars analysing multiple equilibria in the context of financial bubbles (e.g., Hirano and Toda, 2025; Plantin 2023) and even the phenomenon of repeatedly burst and reflated financial bubbles, particularly those related to crypto markets (e.g., Oldani et al., 2025).

Regardless of the origins of a bubble, as the bubble grows, unsophisticated investors are drawn into the market (Mishkin, 2008; Borio and Lowe, 2002; Kindleberger and Aliber, 2011). These latecomers are often retail participants. Their interest is triggered by the success stories of early adopters and the belief that prices will continue rising indefinitely. Lacking economic, financial, and

investment knowledge, they contribute to the bubble by pouring new capital into already exuberantly priced assets, accelerating the market frenzy (Barber and Odean, 2000; Greenwood and Nagel, 2009; Welch, 2000).

Some argue that asset price exuberance could have also positive macroeconomic effects under certain circumstances. According to this view, under certain conditions, asset bubbles can crowd in productive investment and lead to an expansion in total employment, and the bursting of these bubbles can have an immediate negative impact on these variables (Shi et al., 2014). Similarly, bubbles could also promote innovation and technological progress by channelling capital into new sectors in the presence of endogenous credit constraints. Credit-driven stock price bubbles could relax the credit constraints and reallocate capital more efficiently among firms (Miao and Wang, 2012).

Central banks ask themselves how to respond to price pressures arising from wealth effects due to the soaring valuations (either relative to a "bubble" or to tech companies without corresponding immediate productivity gains). Despite the abundant literature, there is no consensus on the policies a central bank should adopt to address price pressures stemming from soaring asset prices to enhance macroeconomic stabilisation (Myftari and Rossi, 2007). The problem starts with the fact that central banks will normally not know in advance when the anticipated enhancement of the production potential will materialise – if at all. Identifying speculative asset bubbles has been one of the major challenges for macroeconomists and central banks alike over the past decades (Bernanke, 2002).

Since identifying asset price bubbles (or, more generally, significant asset price increases which are not matched by a timely increase in the production potential) is already an analytical challenge, it is not very surprising that there is neither a clear consensus on how central banks or other macroeconomic authorities should address these supposed speculative bubbles. Indeed, various approaches exist to tackle these challenges. For example, Bernanke and Gertler 2001 recognise the effect that asset prices (including bubbles) have on aggregate demand, like many other phenomena impacting economic developments, and argue that these effects should be included in the central bank's projections for output and inflation and be addressed in that general context, implying that no special treatment of asset price explosions is required. A related eclectic approach is the "flexible inflation targeting," which involves considering asset prices within the framework of inflation targeting rather than targeting them directly. This method allows central banks to account for the broader economic implications of asset price movements without making them the primary focus of monetary policy (Cecchetti et al., 2002).

In contrast, the "leaning against the wind" approach advocates that central banks should tighten monetary policy to counteract the formation of asset price bubbles. This approach assumes that pre-emptive action can avoid excessive risk-taking and the buildup of financial imbalances (Lukonga, 2023). Hennequin and Hommes (2024) even find that a strong interest rate response is successful in preventing or deflating large price bubbles, while a weak response is not.

However, Gali (2014) warns that central bank interventions targeting asset price bubbles might backfire: If interest rates are raised in the presence of an identified bubble, the bubble must grow at a higher rate to survive, potentially worsening the threat. Conversely, Adam et al. (2017) challenge the rational expectation assumption and show that "leaning against bubbles" can be optimal for monetary policy.

The use of macroprudential tools has been proposed to address financial imbalances without resorting to broad monetary tightening (Fernandez-Gallardo, 2024). These tools, such as capital requirements and countercyclical buffers, allow for targeted interventions that can help maintain financial stability while minimizing the impact on overall economic growth.

Currently, most central banks apply a pragmatic approach that prioritises price stability and inflation targets while incorporating financial stability considerations into their policy decisions, including the monitoring and analysis of asset prices. In this context, macroprudential tools are often seen as the first line of defence against financial imbalances, allowing for more targeted responses to specific risks. Additionally, maintaining flexibility in policy decisions is crucial for central banks to adapt to rapidly changing economic conditions. In general, one could conclude that central banks avoid targeting asset prices directly, but monitor and analyse the respective phenomena and consider the broader economic impacts of these prices within their existing mandates and policy frameworks. In the case of Bitcoin, they would presumably also avoid a specific judgement but simply take the positive aggregate demand effects of a significant Bitcoin price increase[9] into account by tightening policies further, i.e., imposing higher policy interest rates to bring back aggregate demand to a noninflationary level. If they do not fully identify the consumption effect of Bitcoin wealth, then they might tighten insufficiently, and a temporary effect on inflation may materialise.

4.   The distributional effects of Bitcoin: An illustration

The payment services view of Bitcoin by Nakamoto has not materialised (except for illicit payments) and has largely been replaced by a pure investment vision for Bitcoin. We therefore assume now that Bitcoin takes its value only from a collective self-fulfilling belief of an increasing valuation, also supported by steady fresh investment inflows (van Oordt, 2024). While economists may not like this scenario because it relies on the random choice of one equilibrium amongst many possible ones, it needs to be acknowledged that societies can sustain such belief equilibria for a long time. For example, very diverse and mutually exclusive spiritual beliefs have existed simultaneously for centuries or even millennia, illustrating the lasting power of beliefs beyond a purely scientific logic[10]. Moreover, we assume that Bitcoin has no impact on the economy's production potential. This assumption seems reasonable or slightly biased to the positive side. Most economists view Bitcoin negatively due to its (in their view) missing use case, high energy use, and association with illicit payments. On the other side, some supporters still believe in Nakamoto's vision of it as an efficient payment tool, even though this

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[9] To refrain from an explicit judgement that Bitcoin is a speculative bubble (which would inevitably burst), we replace the term "bubble" in the remainder of this paper with "price exuberance" when we discuss Bitcoin, as we assume here that the valuation of Bitcoin "rises exuberantly", though this is not matched by an increase in the production potential, Still, we would keep it open as to whether the prices will ever "implode" again.

[10] Even the crypto-critical Zeke Faux (2023, 237) concludes that "The one coin I especially would never bet against is Bitcoin. It's not that it is useful – if anything, it's more unwieldy than the others. But Bitcoin's true believers are so convinced that it's hard to imagine anything will change their minds. To them, whatever the question, the answer is 'buy Bitcoin.' Everything they see is evidence Bitcoin will rise, like the members of a cult certain that the apocalypse – and their salvation – is just around the corner."

has still not materialised, and most holders now focus on Bitcoin as an investment. Malekan (2024), in a response to our paper, explains why, in his view, Bitcoin is positive for society (and its production potential), even if Nakamoto's vision of Bitcoin is no longer necessarily relevant.

A price of one million USD per Bitcoin (as insinuated by Cathy Wood) would mean a market capitalisation of close to USD 20 trillion, while Robert Kennedy refers to a future market capitalisation of "several hundreds of trillions", implying a Bitcoin valuation of at least USD 10 million, which is consistent with Michael Saylor's prediction of June 2024. To put this in perspective: The total global equity valuation was USD 111 trillion in end 2023. As of August 2024, the total market value of gold was around USD 12.2 trillion. This estimation accounts for of gold held in central banks as reserves (one quarter) and by private investors in various forms such as jewellery, coins, and bullion (Gold Council, 2024). Against this backdrop, Kennedy's vision acclaimed at the Nashville Bitcoin Conversion would imply a Bitcoin market cap way beyond equity and gold taken together (the size of the global bond market is estimated around EUR 130 billion, according to the International Capital Market Association, but debt does not represent a net value; rather, it cancels out between creditors and debtors). While the current market value of Bitcoin is around USD 70,000, it could be argued that any price for Bitcoin is equally plausible, including 10 million or more, as none of these prices has any particular economic justification or imputed basis.

Bitcoin wealth has, as any wealth, positive consumption effects for Bitcoin owners. At the same time, since Bitcoin does not impact on the production potential of the economy, these positive consumption effects must be at the expense of some other usage of GDP, such as the consumption of the rest of society, or investments, or the current account ("GDP = consumption + investment + external balance"). As we are not interested in the effects of Bitcoin in a specific country but in principle for society as a whole, we can ignore the possible Bitcoin wealth effect on the external balance (since the external balance cancels out globally). Effects on investment vs. effects on the consumption of others depend on interest rate elasticities: When the central bank tightens monetary policy to address the additional consumption of Bitcoin owners, it will normally impact on both, with elasticities determining the relative decline in the two.

In the example below, we assume, for the sake of simplicity, that the crowding out occurs exclusively at the expense of other consumers. A scenario in which investments are also impacted requires more comprehensive modelling to be meaningful. In any case, it is not a scenario that seems more attractive than the one examined below in which total consumption and investments both stay the same: Lower investments mean lower growth, which also eventually impacts negatively on the welfare of the non-Bitcoin owners and latecomers (in addition to the direct crowding out of consumption). A further simplifying assumption in the illustration below is to only have two subsets of the population, each of which is internally homogeneous with regards to their Bitcoin holdings: Early birds (who have Bitcoin from the beginning) and latecomers (who gradually buy Bitcoin from the early birds). We do not foresee a category of people who never hold any Bitcoin, although the simulation could be adopted to include those (the people never holding Bitcoin would be even worse off compared with the latecomers). For simplicity reasons, we also assume that the marginal propensity to consume out of wealth/income is the same for the early birds and latecomers. Moreover, we ignore the possible anticipation effects of future wealth on consumption. Last but not least, we abstract from Bitcoin mining and assume that the amount of Bitcoin held by society remains unchanged across time.

We assume, again to be able to formulate a simple example, that the over-proportional Bitcoin owners sell some of their Bitcoins every period to the under-proportional Bitcoin owner, and that the latter finances this partially by reducing consumption and partially by liquidating real assets (which are bought by the early Bitcoin owners). The Bitcoin sales flow is specified such that a fixed percentage of the Bitcoin holding difference between the two subsets of society is sold from the early birds to the latecomers. In other words, the flow of Bitcoin from the over-proportional to the under-proportional consumer is matched by both a reverse effect on consumption and a reverse flow of standard investment assets (summing up to the Bitcoin transfer). Aiello et al. (2024) provide empirical evidence on the impact of Bitcoin valuation gains on consumption, although they do not cover the crowding out effects on the non-Bitcoin holders and how the latter finance their gradual way into higher Bitcoin holdings:

"Household crypto investors appear to treat crypto as one piece of an investment portfolio, some households chasing crypto gains and other households rebalancing a portion of crypto gains into traditional brokerage investments. Households also use crypto wealth to increase their discretionary consumption. The MPC [marginal propensity to consume] out of crypto wealth is substantially higher than the MPC out of equity wealth, but lower than the MPC out of lottery winnings. Households also withdraw crypto gains to purchase housing—both to enter the market as new buyers and to upgrade their existing housing. This increased spending on housing puts upward pressure on local house prices, particularly in areas that are heavily exposed to crypto assets. In the aggregate, growth in county-level crypto wealth causes county house prices to increase."

As mentioned, the early birds' wealth effect on consumption is financed through gradually selling some Bitcoin to the latecomers. We assume that the amount of Bitcoin sold corresponds to w% per annum of the difference in Bitcoin holdings between the initial holders and the noninitial holders. In the figures below, w = 2%. Therefore, over time, there is (at least for a range of parameter values) a convergence of the exposure to Bitcoin of the two groups. The latecomers finance their Bitcoin purchase by either selling other assets or reducing consumption, with the shares being q and (1 − q), respectively. The initial Bitcoin holders will accordingly consume more and accumulate other assets, mirroring the shares q and (1 − q). In Figures 6–9 below, we assume that q = 0.5, i.e., the latecomers finance their Bitcoin acquisition half by liquidating their real asset holdings and half by reducing consumption. The initial Bitcoin owners will consume more for two reasons: first, they consume a part of the Bitcoin they sell (1 − q); second, over time, they accumulate more and more real assets which yield a financial return. We assume that real assets generate a real net annual return of z% in net terms that the owners of the assets consume. In Figures 6–9 below, z = 2%. We also assume an annual labour income of v (homogeneously across the two groups; set to 2 in the figures below to obtain an equal stream). Early birds and latecomers are assumed to have labour income of the same size. Total capital and labour income do not change in our economy over time (we assume a constant production potential). We assume an initial Bitcoin endowment of the early birds of BE_0, e.g., $BE_0 = 10$. The initial endowment of the latecomers with Bitcoin is 0: $BL_0 = 0$. The real wealth of society is 100 (consisting ultimately in real assets). We also assume a Bitcoin value growth rate of y (e.g., y = 10%), consistent with the Bitcoin-positive scenario we are focusing on. Table 1 summarises the key parameters and their definitions.

Table 1. Key parameters of the example for the distributional effects of Bitcoin.

Parameters	Description	Range
W	Share of the difference between Bitcoin early birds and latecomers which is transferred every year	w in [0,1], for example, w = 2%
Q	Share of the transfer of Bitcoin that is financed by an equal transfer in the other direction by real assets. The other share $1 - q$ is financed by the reduced consumption of latecomers (implying the correspondingly higher consumption of early birds)	q in [0,1], for example, q = 0.
Z	Real yield of real assets (that is consumed by the owner of the asset)	z in [0,0.1], for example, z = 2%
V	Annual labour income (which is consumed)	v in R (real number)
Y	Annual price increase of Bitcoin in percentage	y in [0,0.5], for example, y = 10%

We are interested in the evolution of the six key variables summarised in Table 2.

Table 2. Key variables simulated.

Variable	Description	Initial value	Evolution
BE_t	<u>B</u>itcoin value held by an early bird in period t	BE_0 in [0,∞] e.g., BE_0=10	$BE_t = (1 + y) BE_{t-1} - w(BE_t - BL_t)$
BL_t	<u>B</u>itcoin value held by a latecomer in period t	$BL_0 = 0$	$BL_t = (1 + y)BL_{t-1} + w(BE_t - BL_t)$
RE_t	<u>R</u>eal asset value of held by early birds in period t	RE_0 in [0,∞] e.g., $RE_0 = 50$	$RE_t = RE_{t-1} + wq(BE_t - BL_t)$
RL_t	<u>R</u>eal asset value held by latecomers in period t	RL_0 in [0,∞] RL_0=RE_0	$RL_t = RL_{t-1} - wq(BE_t - BL_t)$
CE_t	<u>C</u>onsumption of early birds in period t		$CE_t = v + z RE_t + w(1 - q)(BE_t - BL_t)$
CL_t	<u>C</u>onsumption of latecomers in period t		$CL_t = v + z RE_t - w(1 - q)(BE_t - BL_t)$

Note: RL_t and CL_t cannot be negative. If any of the two hits zero, the evolution comes to an end. We are more interested in the parameter value combinations in which this does not occur.

On this basis, we can simulate, for any set of parameters and horizons, the evolution of the six variables in Table 2. Figures 6 to 9 show such a simulation for w = 2%, q = 0.5, v = 2, y = 10%, BE_0 = 10, RE_0=RL_0 = 50, and a time horizon of 35 years. This specific set of parameters, as an illustration, shows the evolution of the shares of early birds and latecomers in real wealth (Figure 6), Bitcoin wealth (Figures 7 and 8), and consumption (Figure 9). Figure 6 shows that early birds gradually take over a larger share of real assets, since we assumed that a part of the Bitcoin transfers to latecomers are effectively paid through a transfer of real assets. Accumulating real assets implies having a larger share per capita of capital income that can be consumed.
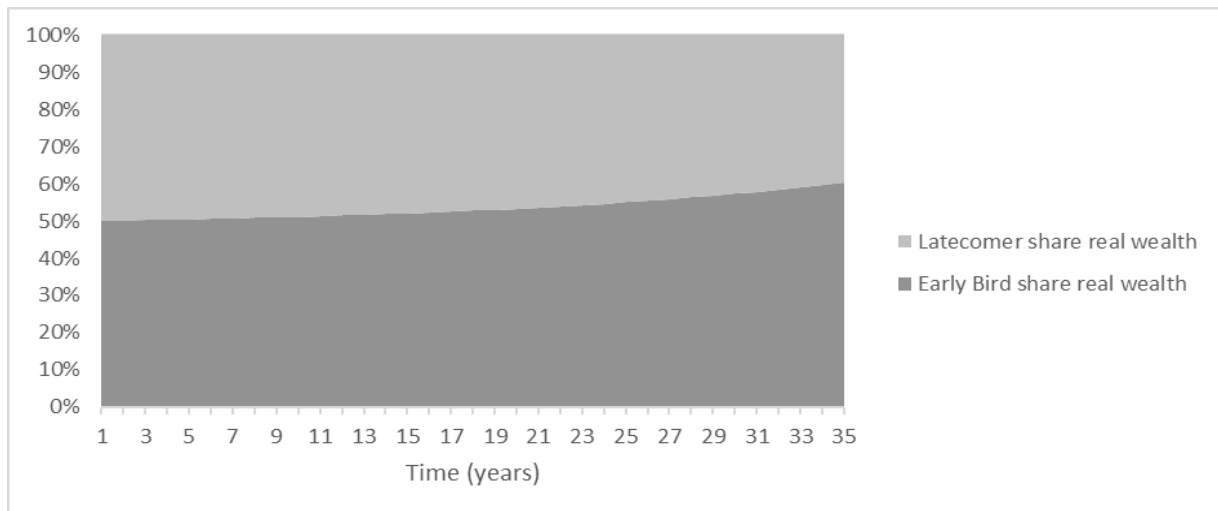
Figure 6. Sharing of real wealth (total real wealth stays constant at 100).

Figures 7 and 8 show that the latecomers have a growing share of Bitcoin, and ultimately, the Bitcoin distribution converges to equality across the entire population. When equality is close, Bitcoin will no longer trigger any fresh material distributional consequences, i.e., it will have become neutral. However, when this stage is reached, (i) the early birds had benefitted for years from higher consumption levels and (ii) they will continue enjoying higher consumption as a result of their higher share in the capital stock.
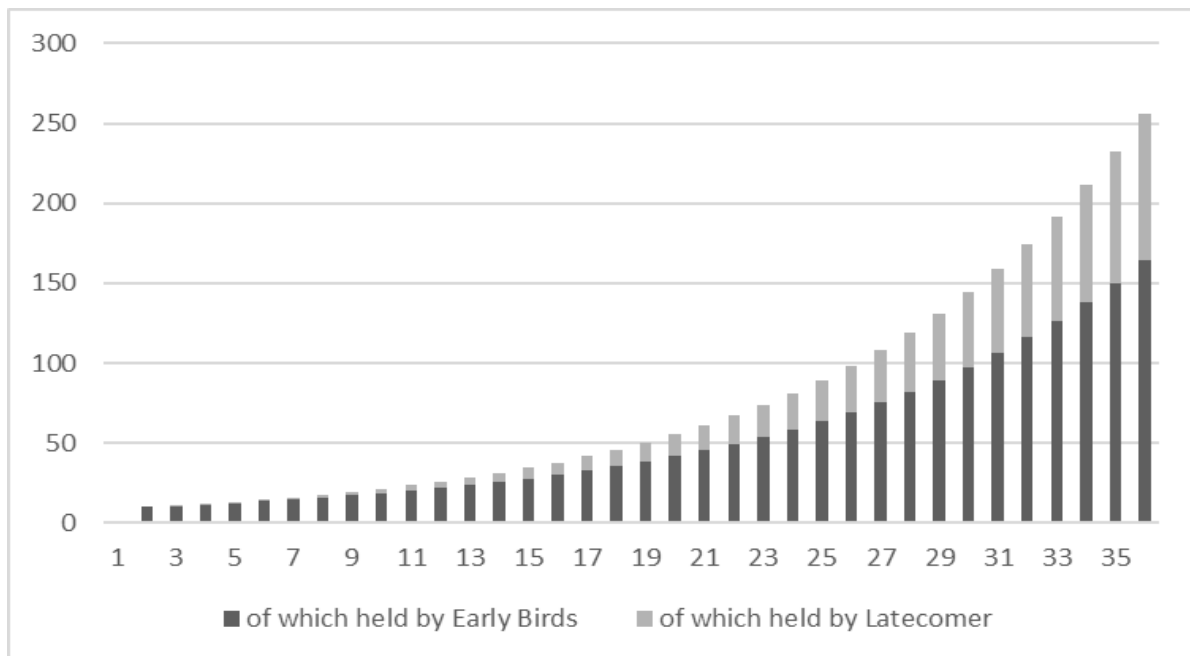

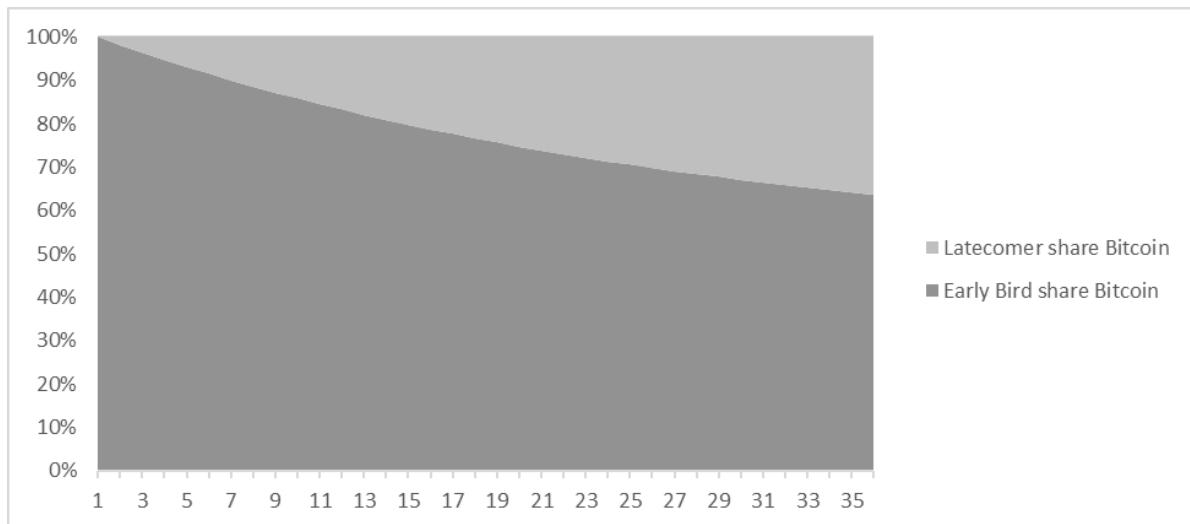**Figure 7.** Total Bitcoin wealth.

Figure 8. Shares of Bitcoin holdings.

Finally, Figure 9 illustrates the early birds' increasing share in consumption, necessarily at the expense of the latecomers.
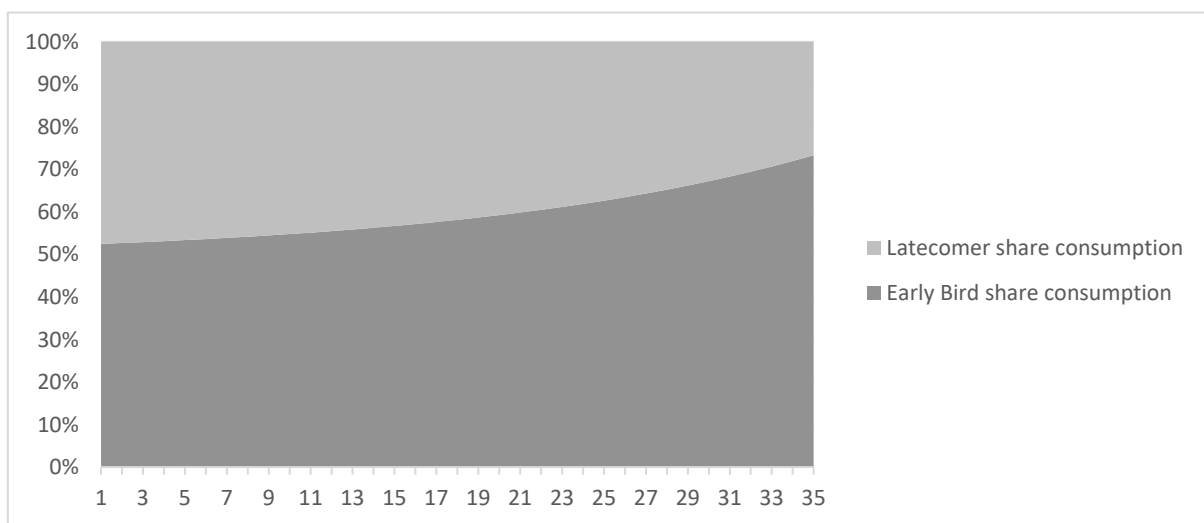

Figure 9. Per capita consumption.

The model above distinguished only early birds and latecomers. But what about those who never hold any Bitcoin? It appears plausible that the demand overhang of consumption created by Bitcoin wealth relative to the production potential will also make it difficult for the non-Bitcoin holders to maintain their previous consumption level. The effects will, however, depend on some factors:
- The more the latecomers finance their Bitcoin purchases through reduced consumption, the less there is a consumption demand overhang. In the extreme case that the latecomers finance all their Bitcoin purchases through reducing consumption, then the model above predicts that non-Bitcoin holders are not affected negatively at all.

• The central bank's reaction matters: If the central bank tolerates that the consumption demand overhang leads to inflation, and the non-Bitcoin holder is invested in long term fixed-coupon bonds, then these households will lose real wealth as result of the inflation shock. In the alternative case that the central bank increases interest rates in time and perfectly prevents inflation, and/or the household is invested only in equity, then the non-Bitcoin holder's wealth is protected. Higher central bank interest rates may incentivise everyone to save more, which would scale down the consumption demand overhang and lead to some sort of forced saving of the non-Bitcoin-holding household, meaning that the foregone consumption would at least result in higher savings and non-Bitcoin wealth accumulation.

In summary, the case of the non-Bitcoin-holding household is more complex and the effects are less straightforward. This could be one reason why early Bitcoin holders insist on the narrative that prices will go up through structural investment inflows from new investors (pension funds or Chinese investors, as suggested in some of the quotations above) and not just from speculative trading flows within the established Bitcoin community.

5.   Conclusions

The debate about the benefits, utility, and sustainability of Bitcoin goes back to Nakamoto's original work from 2008. Most economists argue that Bitcoin is a speculative bubble that will burst at some point and will then have accumulated substantial social costs (such as the energy costs of mining, and the costs of having facilitated illicit payments). Bitcoin supporters deny this and assume that the Bitcoin value will continue rising, that Bitcoin is a great investment asset and that even a (relatively) late jump on this bandwagon is still worthwhile. In this paper, we show that even a Bitcoin-positive scenario, in which the Bitcoin price continues to rise (and the "bubble" diagnosed by critics does not burst) is problematic from a social perspective, as all the wealth effects enjoyed by the early adopters through the rising prices would be at the expense of the latecomers (and possibly non-holders), who are impoverished. Therefore, Bitcoin's redistribution effects and the related social damage go beyond the implications of good or bad timing of purchases and sales by investors amid a volatile price, or the fact that some may lose all their money in the case when the Bitcoin bubble eventually bursts as predicted by many economists.

In line with the shift of the Bitcoin community to emphasise less and less the role of Bitcoin as means of payment but as investment vehicle, we assumed that Bitcoin does not change the production potential of the economy (which may be criticised as being a Bitcoin-benevolent, in view of the high energy consumption of Bitcoin and its facilitation of illicit payments). This implies that the wealth effects associated with it would be viewed as a zero-sum game. In absolute terms, early adopters exactly increase their real wealth and consumption at the expense of the real wealth and consumption of those who do not hold Bitcoin or who invest in it only at a later stage. At some stage, the Bitcoin holdings are equally spread amongst the two subsets of the population we assume in Section 4 (or have largely converged to this state), such that the subsequent valuation increases of Bitcoin will be neutral (and have no effects at all on relative consumption and none on total consumption, unless consumption crowds out investments and therefore undermines growth). However, the sharing of real wealth has shifted from the latecomers to the early birds and will remain as legacy of the initial disparity in Bitcoin holdings. These redistributive

effects can be significant in a long-term scenario characterised by ever-increasing Bitcoin prices. The new Lamborghinis, Rolexes, villas, and equity portfolios of early Bitcoin investors do not stem from an increase in the economy's production potential; rather, they are financed by diminishing the consumption and wealth of those who initially do not hold Bitcoin. It is like filling one bucket by draining water from another: The latecomers have to give up their "water" for the benefit of the early holders. This redistribution of wealth and purchasing power is unlikely to occur without detrimental consequences for society. Even if the latecomers cannot attribute their loss of purchasing power, they will feel a malaise and frustration that will contribute further to an ever more split society.

The evolution of Bitcoin's price, lacking a stable intrinsic anchor, is heavily influenced by government attitudes and actions, including regulatory measures, legislation, and the potential establishment of a Bitcoin reserve—although this reliance on the government obviously undermines the original concept of Bitcoin's independence from public policies and government interventions. In a democratic context, where politicians are accountable to voters, this dependency implies that attitudes toward Bitcoin could sway election outcomes. The recent US presidential election campaigns illustrate the strong efforts of some candidates to win over crypto voters. Early adopters have a vested interest in promoting Bitcoin values to redistribute wealth and consumption from the latecomers to themselves, maybe without being conscious of the redistributive nature of their vision. In any case, current non-holders should realise that they have reasons to worry about Bitcoin and any legislation favouring it. Latecomers and non-holders and their political representatives should emphasise that the idea of Bitcoin as an investment relies on redistribution at their expense. Failing to do so could skew election results in favour of politicians who advocate pro-Bitcoin policies, fuelling the division of society.

Author contributions

We worked jointly, joint responsibility. All authors have read and approved the final version of the manuscript for publication.

Use of AI tools declaration

The authors declare they have not used artificial intelligence (AI) tools in the creation of this article.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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