

Decoding Digital Philanthropy: Analyzing Donors' Choices in Cryptocurrency Donations

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Since Bitcoin's inception in 2009, cryptocurrencies have found applications in various domains. However, despite the unique potential of cryptocurrencies for the nonprofit sector, especially in fundraising, there is a scarcity of research on the behavior of crypto donors. In this research, we investigate key attributes of cryptocurrencies that correlate with the amount of donations made in that specific digital currency, and explore characteristics of digital wallets that predict the donation behavior of wallet holders. For our regression analysis, we use donation data from the *Aid for Ukraine* campaign, one of the largest cryptocurrency fundraising initiatives launched in response to the Russian invasion of Ukraine. Our findings indicate that cryptocurrencies with a larger market cap and higher age tend to be favored by donors, while those associated with higher transaction fees are preferred less frequently. Donors also exhibit a propensity to contribute more in cryptocurrencies of higher price volatility. Moreover, everything else equal, stablecoins are used more often for donations. On the other hand, our results highlight that frequent cryptocurrency users tend to make larger crypto donations and are more inclined to continue supporting the campaign through future contributions. Furthermore, donors with identifiable names for their wallets tend to donate larger amounts, although this feature does not predict their inclination for future contributions.

Keywords: Cryptocurrency, Philanthropy, Donation, Blockchain, Crowdsourcing, Aid For Ukraine

1. Introduction

Funding for the nonprofit sector consistently falls far behind the budget required to satisfy their needs (Turrini et al., 2020). Despite the constant increase in funding appeals from the nonprofit

organizations (NPOs), more than 55% of their needs remain unmet (Besiou and Van Wassenhove, 2020). Furthermore, the economic impacts of recent crises such as Covid-19, the Russo-Ukrainian war, and the Israeli-Hamas conflict, have led to a decline in contributions from major donors, particularly governments. Consequently, NPOs have three general solutions to address this budget concern: i) improved allocation of scarce resources (Keshvari Fard et al., 2022); ii) increased efficiency through reducing expenditures (Kotsi et al., 2023), as well as collaborating and resource-sharing with other organizations (Bhattacharya et al., 2014); and iii) seeking additional sources of funding (McCardle et al., 2009). Recent technologies have contributed to the latter by introducing additional means and channels for donations, such as mobile money and PayPal. Cryptocurrencies are one of the latest advancements in this category, embraced by NPOs to augment and diversify their sources of donations.

Cryptocurrencies are probably the most well-known application of the blockchain technology. In 2008, Satoshi Nakamoto published the white paper on Bitcoin, the pioneering blockchain technology to support a decentralized currency (Nakamoto, 2008). Two months later in January 2009, the first Bitcoin was mined, making the inception of the cryptocurrency era. The financial crisis of 2008 and the subsequent erosion of trust in financial institutions and the need for a decentralized, transparent and more efficient banking alternative, contributed to the initiation and growing popularity of cryptocurrencies. Subsequently, cryptocurrencies received significant interest from investors and businesses, with Bitcoin's market cap reaching \$1.28 trillion by November 2021. According to CoinMarketCap, by 2023 more than 20,000 cryptocurrencies have been developed over hundreds of different blockchain networks. Businesses worldwide, including major names such as Microsoft, Tesla, AT&T, Paypal, Burger King, Virgin Galactic, Morgan Stanley, and Goldman Sachs, have adopted cryptocurrency as a method of payment (Wiener and Boyd, 2022). Numerous crypto companies like Coinbase are listed on NASDAQ and other stock exchanges, and Bitcoin ATMs exist on multiple continents (Mai et al., 2018). Due to the substantial returns in cryptocurrency investing, a growing number of investors, spanning from individuals and banks to hedge funds

and even governments, are now holding crypto portfolios (Díaz et al., 2023). The adoption of cryptocurrencies has reached a notable milestone with the recognition of Bitcoin as legal tender by El Salvador in September 2021. Assuming current adoption trends continue, cryptocurrency users is expected to reach one billion by 2030 (Cheng and Tang, 2022).

The nonprofit sector was among the early adopters in acknowledging the potential of cryptocurrencies. Save the Children began accepting donations in Bitcoin in response to Typhoon Haiyan in the Philippines in 2013. The American Red Cross, as another early adopter, started accepting Bitcoin from 2014 through a partnership with the BitPay - a crypto payment service provider. In 2014, the BitGive Foundation became the first crypto NPO to receive 501(c)(3) status by the IRS, i.e., recognized as a charitable organization by the US government. The world's largest humanitarian organization, the UN, joined a few years later, when UNICEF began accepting cryptocurrency with the launch of UNICEF CryptoFund in 2019, building on its past blockchain projects.

After more than a decade since the inception of the technology, cryptocurrencies have proven to be a potent tool for philanthropic donations. For example, in 2021, Ethereum's founder, Vitalik Buterin, donated over \$1.1 billion worth of cryptocurrencies (Ether and Shiba Ino) to India Covid Crypto Relief Fund, making one of the largest individual Covid-19 donations. Third party platforms like The Giving Block, Engiven, and Fundraiseup, which facilitate crypto donations for charities, have reported that individual crypto donations are, on average, tens of times larger than other online donations within the nonprofit sector, see for example, The Giving Block (2021). Consequently, the NPOs accepting cryptocurrencies have received substantial donations in these digital assets; for instance, in 2021, Fidelity Charitable reported receiving over \$330 million in cryptocurrencies (Fidelity Charitable, 2021). As of 2022, 49 out of 100 nonprofits in the Forbes list of America's top charities accept cryptocurrency donations, marking a notable increase from 12 charities in 2019 (The Giving Block, 2023).

Despite the potentials and promising trend toward crypto philanthropy, there have been very few studies about understanding donors' behavior and preferences when contributing in cryptocurrencies. In this research, we seek to bridge this literature gap. By analyzing transaction-level crypto



Figure 1 First Tweet of Aid for Ukraine requesting for cryptocurrency donations

donation data, we investigate the attributes of cryptocurrencies favored by crypto users for donation purposes. Furthermore, we explore certain characteristics associated with crypto digital wallets that can serve as predictors of the donation behavior originating from those wallets.

To that purpose, we focus on one of the largest crypto donation campaigns, *Aid for Ukraine*. On February 26th 2022, two days after the Russian invasion of Ukraine, the official Twitter account of Ukraine asked for cryptocurrency donations to their announced Bitcoin and Ethereum wallet addresses (see Figure 1). In the subsequent days, the campaign provided additional wallet addresses, allowing for donations in larger number of cryptocurrencies, and thus, more flexibility for potential donors. Aid for Ukraine is a decentralized autonomous organization (DAO), a new type of blockchain-based organization managed by a scalable community supported by blockchain-enabled coordination mechanisms (Zhao et al., 2022). Aid for Ukraine DAO is managed by different participants from Ukrainian government, as well as crypto firms such as Everstake and Kuna. On 4th March 2022, Aid for Ukraine launched a crypto donation website¹ to facilitate donations of cryptocurrencies and non-fungible tokens (NFTs) from different blockchains. Due to legal restrictions on the use of crypto donations, Ukraine's government took action on March 7th 2022 by establishing a regulatory framework for the crypto market, easing the process of handling crypto donations for Aid for Ukraine and other similar initiatives.

¹ <https://aid-for-ukraine.io>

The Aid for Ukraine case study was chosen for this research for several reasons. Firstly, to the best of our knowledge, the campaign is the largest crypto crowdfunding initiative in terms of both the number of donations and contributors, with over 114,000 valid and successful donation transactions from more than 90,000 distinct donor addresses in 227 cryptocurrencies across 13 blockchains by the end of 2022. The campaign also stands out for the extensive number of blockchains and cryptocurrencies utilized for contributions. The global importance of the Russo-Ukrainian war, along with active promotion of the campaign by numerous entities, including the Ukrainian government, provided Aid for Ukraine with an unprecedented media attention worldwide. Moreover, the campaign's cause and implementation align with various donation motives, as explored in Bekkers and Wiepking (2011). The combination of these factors renders Aid for Ukraine a distinctive and comprehensive case study, offering a broad perspective for examining crypto donation behavior.

Our empirical findings shed light on specific attributes of cryptocurrencies that correlate with an increased frequency of use for donation purposes. The age and market cap of a cryptocurrency are positively related with the total donation value received in that cryptocurrency. Additionally, donors tend to gravitate toward cryptocurrencies characterized by lower transaction fees. Donors also exhibit a tendency of donating cryptocurrencies with higher price volatility. Furthermore, all else being equal, stablecoins are donated more frequently than other tokens. Our results also suggest that frequent crypto users tend to make larger donations and are more likely to engage in future contributions. Moreover, donors whose wallet addresses possess identifiable names, e.g., Ethereum Name Service, tend to make larger donations, although this feature does not predict higher likelihood of future contributions.

This paper contributes to the literature on philanthropic behavior, crowdfunding and cryptocurrency by examining the behavior of crypto donors regarding their choice of cryptocurrency and the features of the tokens used for donations, as well as characteristics of donors' wallet addresses that can predict the amount and frequency of crypto donations. To the best of our knowledge, no academic research has studied and established such associations.

The rest of the paper is organized as follows: in Section 2, we provide a quick overview of cryptocurrencies in fundraising, followed by developing our hypotheses. In Section 3 we explain the data used for this study, and in Section 4 we present our econometric models and findings. Then in Section 5 we extend our discussions toward other aspects of crypto fundraising such as liquidation policies and solicitation strategies. Finally, Section 6 concludes the paper.

2. Background & Hypothesis Development

In this section, we first provide a concise overview of cryptocurrencies in fundraising within the nonprofit sector, followed by the formulation of our hypotheses.

2.1. Cryptocurrencies & fundraising

Cryptocurrencies can provide additional sources of funds for NPOs, mainly from two category of donors: i) a niche demographic of young, tech-savvy and wealthy crypto users who are less likely to indulge in traditional giving but will donate in cryptocurrencies; and ii) founders and executives of blockchain and crypto projects, as well as foundations associated with crypto firms, such as Binance Charity Foundation (Howson, 2021; Gemini, 2021). Moreover, since cryptocurrencies are considered as property in many countries, crypto donations are exempt from capital gain tax and donors can receive a charitable deduction on the fair value of their crypto contribution at the time of giving. This makes cryptocurrencies a strategic tool for donations for individuals and corporations, especially after a period of appreciation in value (Pittman, 2015).

As cryptocurrency transactions are recorded on permissionless public blockchains, they provide a high degree of transparency and traceability for all stakeholders, detailing the inflow and outflow of donations. The additional surveillance power granted to donors from the transparency and immutability of transactions could force NPOs to be more accountable. This can enhance the trustworthiness of NPOs, potentially leading to increased contributions (Sung et al., 2023). The issue of trust is of utmost importance in the nonprofit sector where corruption and bribery are not uncommon, and thus, the mitigation of mistrust can bring about significant changes (Khan et al., 2022). In scenarios of shared fundraising among several NPOs, this transparency can foster swift trust among different parties, facilitating inter-organizational collaboration (Dubey et al., 2020).

NPOs can also benefit from special features of the crypto ecosystem such as crypto airdrops, initial coin offerings (ICOs), and NFT auctions in their crypto fundraising activities. Crypto airdrops are marketing initiatives to boost awareness or raise funds by distributing newly minted tokens for free or upon tasks completion (Allen et al., 2023). NPOs can mint these tokens at a very low cost and distribute them to donors as a form of gratitude. Considering that these airdrops can potentially increase in value if their corresponding cause is well received, they can be an effective tool for motivating donors. Similarly, NPOs can raise funds through ICOs, by minting new tokens and offer them to the public. An example is AidCoin, a crypto project developed on Ethereum blockchain, which raised \$16.5 million in its ICO (Bitcoin.com, 2018). Finally, NPOs can raise funds by leveraging NFT auctions, a new variant of the traditional charity auctions. The Giving Block (2021) reported that in 2021, NFT auctions raised \$12.3 million for charities working with this platform. In addition to their fundraising potentials, NFT auctions can generate substantial media attention, reach a wider range of potential donors, and raise awareness about NPO's missions.

2.2. Hypothesis development

In this subsection, we propose several hypotheses regarding the attributes of cryptocurrencies that enhance their popularity for donation purposes, as well as characteristics of wallet addresses that are more likely to initiate contributions.

2.2.1. Market cap and age. Cryptocurrencies of greater popularity and established credibility tend to have a higher circulation and a broader user base. Such tokens are often part of the portfolios of cryptocurrency users and thus, are more likely to be utilized for charitable donations.

A major indicator of a financial health of a cryptocurrency, or any other financial asset, is its market cap. A higher market cap often signals long term expectations of strength and future earning potentials of an entity (Sriram, 2008). A cryptocurrency with a large market cap indicates that it is well-established, has a larger user base, and enjoys greater trust in its performance, thereby fostering a stronger network effect. Additionally, market cap is positively correlated with other key indicators such as the trading volume of a cryptocurrency (Momtaz, 2021). A large market

cap indicates increased adoption of the cryptocurrency by individuals and businesses, suggesting a greater likelihood of its usage for various purposes, including donations. Therefore:

Hypothesis 1. *The amount of donations received in a cryptocurrency is positively associated with the market cap of the cryptocurrency.*

The age of a cryptocurrency is another factor that can serve as an indicator of its stability and the extent of its user network. While thousands of new cryptocurrencies are introduced annually, only a small fraction of them manage to maintain their relevance over the years. Factors such as subpar algorithms, technical glitches, inadequate development and updates, and ineffective marketing or entry strategies can contribute to the downfall of a new cryptocurrency – paralleling the factors that forecast the failures of newly developed products in the high-tech industry (Yap and Souder, 1994). The principle of “survival of the fittest” may suggest that older cryptocurrencies that remain pertinent, tend to inspire greater trust from crypto users. Moreover, having a longer presence in the market increases the likelihood that a potential donor has been exposed to it and may have used it in the past, thereby feeling more comfortable making contributions in that cryptocurrency.

Hypothesis 2. *The amount of donations received in a cryptocurrency is positively associated with the age of the cryptocurrency.*

2.2.2. Price volatility. Crypto assets have a high price volatility, which makes them riskier than stocks or other financial assets (Pessa et al., 2023). Since the majority of cryptocurrency users, including those making crypto donations, primarily use cryptocurrencies for investment purposes (Ilk et al., 2021), the general approach of crypto users to portfolio risk management can impact their behavior toward making crypto donations. Reducing portfolio risk, often involving the management of high risk assets, has been a major concerns for investors (Markowitz, 1952). This is exemplified by the higher frequency of trading in smaller and more volatile cryptocurrencies compared to established ones like Bitcoin (Hasso et al., 2019). Donating from more volatile crypto assets in the portfolio could serve not only as a philanthropic gesture but also as a strategic risk management approach. The literature on stock donation by individuals, albeit limited, indicates

comparable behavior. For example, Amin and Harris (2020) suggests that NPOs receive fewer stock-based donations during the periods of high investor sentiment, implying a negative relationship between donating a stock and benefits of holding it in the portfolio. Thus, we hypothesize that cryptocurrencies characterized by greater price volatility are selected more frequently as the preferred choice for donations.

Hypothesis 3. *The price volatility of a cryptocurrnecy is positively associated with the amount of donations received in that cryptocurrency.*

2.2.3. Transaction fee. Transaction fees represent payments made by cryptocurrency users to enable the processing of transactions (Lu et al., 2021). While at the micro level, the fee's size depends on factors such as the balance between demand for transactions vs supply of miners, as well as the prioritization of transactions offering higher fees (Ilk et al., 2021; Donmez and Karaivanov, 2022; Shang et al., 2023), at the macro level, the fee for a cryptocurrency transaction is largely determined by the inherent mechanisms of the host blockchain, such as architecture, consensus mechanism, block size, reward for new blocks, as well as the overall popularity of the blockchain and demand for transactions on it. As a result, the average transaction fee for cryptocurrencies across various blockchain networks can vary significantly. A high transaction fee can dissuade users, prompting them to abandon the cryptocurrency, or reducing the frequency of their transactions on that particular cryptocurrency (Easley et al., 2019). The philanthropy literature also highlights that raising the cost of giving could decrease the amount of donations (Bekkers and Wiepking, 2011). Therefore, we hypothesize that cryptocurrencies associated with higher transaction fees are likely to experience reduced usage for donation purposes.

Hypothesis 4. *The transaction fee's magnitude negatively impacts the amount of donations received in a cryptocurrency.*

2.2.4. Stablecoins. Stablecoins are a category of cryptocurrencies aimed at minimizing price volatility through one of the following approaches: i) pegging against a fiat currency or commodity; ii) controlling coin supply using algorithms; and iii) using cryptograms as collateral (Grobys et al.,

2021), although the most common approach is to peg against a major fiat currency, usually, US Dollar. Stablecoins are preferred for on-chain financial transactions as their purchasing power remains steady (Zhao et al., 2022). They are also used for international remittances, for online payments in e-commerce, and for lending money.

These factors imply that cryptocurrencies provide a higher utility for NPOs than other cryptocurrencies. These digital coins can address concerns associated with the fair valuation of donations arising from the price volatility of cryptocurrencies, thereby facilitating a consensus in tax rebate calculations among all parties involved. Additionally, stablecoins alleviate donors' apprehensions regarding the depreciation of crypto donations, stemming from the liquidation strategy employed by the NPOs, thanks to their minimal price volatility. These factors may engender a psychological reassurance for crypto donors who choose to contribute in stablecoins. Furthermore, stablecoins can enhance the operational efficiency of the NPOs as they can be directly utilized, e.g., to purchase goods and services from crypto-friendly suppliers, for international aid transfers to refugees, or as a payment method for gig workers in the global south (Kharif, 2022; Asmakov, 2022; Binance Blog, 2022; Pannone, 2023). Donors comprehend the increased utility and reduced complexity associated with stablecoin donations. Thus, we hypothesize that everything else being equal, a higher volume of donations will be received in stablecoins.

Hypothesis 5. *Donors have a higher tendency to contribute in stablecoins.*

2.2.5. Features of donors' digital wallets. Studies in philanthropic literature have explored the characteristics of individuals who make financial contributions to charities. For instance, Lee and Chang (2007) found out that individuals who are older, have higher income levels, are female, married, have children, and score higher in empathy are more likely to make donations. Moreover, these traits, with the exception of marital status, are predictors of larger donation amounts as well. Other studies have contributed to understanding the characteristics of cryptocurrency users. While crypto users are mainly driven by investment, trading, and speculative purposes (Ilk et al., 2021; Hadan et al., 2023), additional motivations such as curiosity, and using crypto for specific

payments also underlie the possession of these digital assets. The majority of crypto users are men, aged between 35 to 44, living in urban areas, and have high income (Hasso et al., 2019; Gemini, 2021). Regarding the charitable behavior, crypto investors exhibit a higher tendency for philanthropy compared to the traditional investors, and are more likely to make substantial donations. Furthermore, within the demographic spectrum, Millennials demonstrate greater generosity and charitable inclinations in donating cryptocurrencies compared to both Generation X and Baby Boomers (Fidelity Charitable, 2021).

We aim to contribute to the literature on the behavior of crypto donors by exploring the characteristics of their digital wallets. Due to the transparent nature of the permissionless blockchains, one can track the transaction history of each donor using their wallet addresses and determine how frequent they use cryptocurrencies. Some donors are frequent crypto users who use cryptocurrencies for various purposes and make frequent crypto transactions. Others are the casual users or individuals new to the crypto world, making crypto donations primarily out of curiosity toward the new technology.

Frequent users of a technology demonstrate higher levels of trust in that technology. According to the technology acceptance model in e-commerce, trust can lead to lower perceived risk, higher perceived usefulness, and higher perceived ease of use, all contributing to an enhanced intention for making transactions (Pavlou, 2003). Consequently, we hypothesize that frequent crypto users are more likely to actively participate in crypto philanthropy, either by making larger cryptocurrency donations or through more frequent contributions.

Hypothesis 6a. *The number of historical transactions under a wallet address is positively associated with the total amount of donations made from that wallet.*

Hypothesis 6b. *The number of historical transactions under a wallet address is positively associated with the probability of future donations from that wallet.*

Wallet addresses are typically characterized by a lengthy string of characters, which makes it challenging to identify the wallet holders. However, certain blockchains such as Ethereum, Solana

and Tron offer users the option to assign an identifiable name to link with their wallet addresses. An example is the Ethereum Name Service (ENS), which wallet holders on the Ethereum blockchain can acquire by paying a small fee. Using identifiable names enhances visibility, and can signal the reputation of the wallet holder, particularly when it pertains to a corporate entity.

On the other hand, philanthropy literature highlights the importance of recognition by others as a motivation for giving; donors prefer their contributions to be acknowledged and recognized by others (Andreoni and Petrie, 2004), and displaying the names of donors can increase the likelihood of donations (Silverman et al., 1984). The transparent nature of blockchains ensures that the contributions of donors are visible to everyone. This transparency amplifies the motivation for donors whose wallets are linked to identifiable names, especially corporate donors, to actively engage in philanthropic giving. Therefore,

Hypothesis 7a. *Having an identifiable name linked to a wallet address is positively associated with a higher amount of donations from that wallet.*

Hypothesis 7b. *Having an identifiable name linked to a wallet address is positively associated with the probability of future donations from that wallet.*

3. Data

From 26 to 28 February 2022, the official Twitter account of Ukraine provided wallet addresses on Bitcoin, Ethereum, Solana, Tron, Dogecoin and Polkadot. In the subsequent weeks, they added an additional seven wallet addresses for smaller blockchains as well. Table A.1 in Appendix A presents the list of wallet addresses of Aid for Ukraine, along with the source of our data collection for each blockchain. We collected all transactions to and from these wallet addresses. For each transaction, we collected various data including timestamp, donation amount (in the cryptocurrency unit), wallet address of sender, token's name and contract address (if the token is not the native cryptocurrency of the blockchain), transaction fee, block address, etc. Transactions labeled as failed by the blockchain explorer were removed from our dataset.

Donations started on 26 February 2022, shortly after the release of the first tweet. Since the war,

and consequently donations to the campaign, is ongoing as of the time of writing this paper, we have designated 31 December 2022 as the end of the study period.

We used CoinGecko.com as the reference for the price and market cap of each cryptocurrency. Out of 517 different cryptocurrencies donated until the end of 2022, CoinGecko recognizes only 227 of them; the rest of the tokens were mainly scam or worthless tokens. The motivation behind the donation of such tokens by donors could be inflating their value. We removed donations in those tokens from our dataset. This led to a total of 114,671 valid donations.

For the remaining 227 cryptocurrencies, we collected hourly data for price and market cap for the entire year 2022. Each donation is then linked to the price and market cap (in USD) of the closest hourly data point to the time of donation. This way, we calculate the USD valuation of each donation as well as the market cap of the cryptocurrency at the time of the donation. The total value of donations, calculated using the price at the time of contribution, is \$77,267,774.

These hourly prices are also utilized to calculate the USD equivalent of the transaction fees paid for each donation. When transactions include multiple recipients in one contract, we divide the total transaction fee by the number of recipients to approximate the transaction fee of the donation.

To calculate the age of cryptocurrencies, it is essential to first obtain the initiation date of each token. For native tokens of each blockchain, such as ETH for Ethereum, we use the creation date of the genesis block of the blockchain. Moreover, for non-native tokens like USDT on Ethereum, we use the date of the first transaction of that token on the blockchain.

Note that some tokens such as Tether (USDT) exist across multiple blockchains. In our analysis, the definition of a cryptocurrency involves considering each unique pairing of a blockchain and a token as a separate entity; for example, we consider USDT on Ethereum, Tron and Solana blockchains as three different cryptocurrencies, because despite having the same market cap and price, being on different blockchains could mean different transaction fee calculations and different initiation dates. We use the contract addresses of the tokens to identify unique cryptocurrencies.

Table 1 Summary of donations to Aid for Ukraine across different blockchain platforms

Blockchain	No. tokens	No. tokens with 5+ transactions	No. donations via blockchain	Total donation value
Ethereum	162	16	78,862	38,027,060
Bitcoin	1	1	19,151	23,297,838
Polkadot	1	1	3,300	8,340,003
Tron	9	5	8,466	3,652,700
Solana	46	5	2,054	1,827,637
Hedera-Hashgraph	1	1	61	980,475
Icon	1	1	31	782,624
Near	1	1	43	165,226
Dogecoin	1	1	2,180	127,075
Algorand	1	1	310	43,916
Cardano	1	1	93	17,124
Stellar	1	1	94	4,126
Casper	1	1	26	1,970

Table 2 Summary of donations in the top 10 cryptocurrencies used for donation to Aid for Ukraine

Token	Blockchain	No. valid trans	Total value	% total value	Mean value	No. donors	Mean trans fee	Initiation date	Stable coin	Native token
ETH	Ethereum	73,888	23,584,510	30.52	319.2	66,129	2.847	07/2015		x
BTC	Bitcoin	19,151	23,297,838	30.15	1,216.5	12,982	0.467	01/2009		x
USDT	Tron	6,810	3,647,360	4.72	535.6	2,810	0.290	04/2019	x	
USDT	Ethereum	3,953	11,490,547	14.87	2,906.8	2,132	6.116	11/2017	x	
DOT	Polkadot	3,300	8,340,003	10.79	2,527.3	2,154	0.335	05/2020		x
DOGE	Dogecoin	2,180	127,075	0.16	58.3	1,121	0.070	12/2013		x
TRX	Tron	1,630	5,066	0.01	3.1	804	0.007	06/2018		x
SOL	Solana	1,436	329,682	0.43	229.6	1,225	0.000	03/2020		x
USDC	Ethereum	580	1,258,371	1.63	2,169.6	427	6.672	08/2018	x	
USDC	Solana	497	1,203,318	1.56	2,421.2	426	0.000	01/2021	x	

Among all 227 pairs of cryptocurrency-blockchain with valid prices in CoinGecko, we identified 13 stablecoins on three blockchains of Ethereum, Tron and Solana, according to the list of stablecoins in CoinGecko.

Table 1 provides a summary of information for the 13 blockchain platforms through which donations were made to Aid for Ukraine. It can be observed that Ethereum is the most popular blockchain with the highest number of transactions and the largest amount of donations. It also hosts the highest number of contributed tokens. Moreover, out of 227 donated cryptocurrencies, only 11% of them had 5 or more transactions.

Furthermore, Table 2 presents a summary of the leading 10 cryptocurrencies in terms of the number of donations. These cryptocurrencies account for 94.8% of the total donation value and 98.9% of all transactions.

As we can see in Table 2, Ether (ETH), the native cryptocurrency of Ethereum blockchain, has

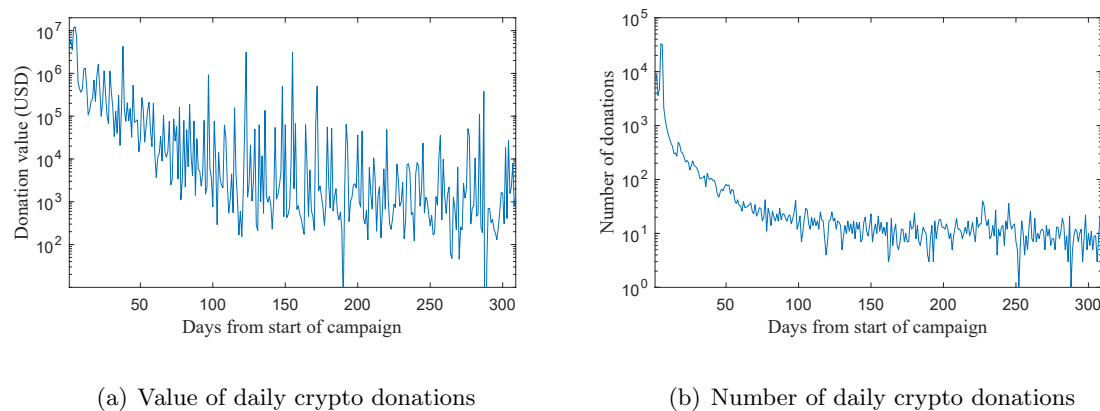


Figure 2 The daily (a) value and (b) number of crypto donations throughout the study period

been the most popular coin for donations, accounting for more than 31% of the total donation value. It also has the highest number of distinct donors, with 66,129 wallet addresses, almost three times as many as all the other donors combined. Following ETH, Bitcoin (BTC) stands as the second most popular cryptocurrency with 30% of the total donations value. Moreover, stablecoins have been widely adopted for donations; for example, Tether (USDT) on both Ethereum and Tron blockchains, and USD Coin (USDC) on both Ethereum and Solana blockchains are among the top 10 donated cryptocurrencies.

Figure 2 shows the daily amount and number of donations throughout the study period. Note that the vertical axis in both charts uses a logarithmic scale. As we can see, both the frequency and amount of donations have been decreasing over the study period, which is similar to patterns commonly seen in philanthropic fundraising activities. Another contributing factor to the declining trend is that over time, more donation channels, both crypto and cash, became available and thus, some donations may have been diverted to those alternative channels. For example, on 5 May 2022, Ukraine's president launched an integrated donation channel, UNITED24, accommodating different types of donations, including cryptocurrencies¹, which benefited from higher media attention, and likely channeled away substantial crypto donations from Aid for Ukraine.

Figure 3 compares the distribution of transaction fees paid for donations on the major

¹ UNITED24 removed crypto donation portals from the website on November 2022.

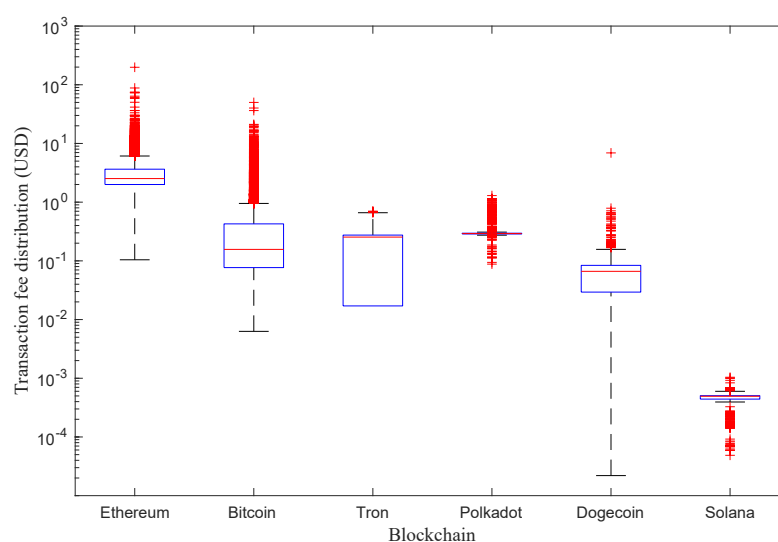


Figure 3 Distribution of transaction fee paid for donations in cryptocurrencies hosted on the top 6 blockchains

blockchains. While blockchains such as Solana and Dogecoin impose minimal transaction fees, transactions on Ethereum blockchain incur significant fees.

To investigate Hypotheses 6 and 7, we concentrate on transactions and donor wallets on the Ethereum blockchain, comprising approximately 73% of all donors. This is because the identifiable name services are available on only a few blockchains, with Ethereum Name Service (ENS) being the most widely recognized among them. We collected data on the number of past transactions for each donor's wallet, up to their latest contribution to Aid for Ukraine, as well as their ENS names, if they possessed one.

Note that in this research we only focus on fungible tokens. Aid for Ukraine's wallets also received over 1000 NFT donations on Ethereum and Solana during our study period. Furthermore, as mentioned earlier, Aid for Ukraine is just one of the crypto fundraising campaigns for Ukraine since the onset of the Russian invasion. Tracking donations on some of those campaigns like UNITED24 is challenging, due to the platform generating new wallet addresses for each donation. Other initiatives such as *Ukraine DAO* had fewer wallets, attracted less media attention, and received less donations. Table B.1 in Appendix B provides a list of some crypto fundraisers for Ukraine with static wallet addresses, as well as the blockchains hosting those wallets.

4. Statistical Modeling and Empirical Findings

In this section, we develop three regression models to test our hypotheses.

4.1. Determinants of donation values received in a cryptocurrency

Equation (1) models Hypotheses 1 to 5.

$$\begin{aligned} Donations_j^t = & \beta_0 + \beta_1 MarketCap_j^t + \beta_2 TimeSinceLaunch_j^t + \beta_3 PriceVolatility_j^t \\ & + \beta_4 TransactionFee_j^t + \beta_5 StableCoin_j + \sum_t \beta'_t T^t + \epsilon_j^t \end{aligned} \quad (1)$$

In this model, $Donations_j^t$ is the total value of donations (in USD) made in cryptocurrency j during period t , derived from aggregating all corresponding donations received in that period. $MarketCap_j^t$ refers to the market cap of cryptocurrency j at time t . We estimate this value by calculating the weighted average of the market cap of cryptocurrency j at the time of each donation made in period t . $TimeSinceLaunch_j^t$ measures the age of cryptocurrency j by the time of period t ; to calculate this variable, we first calculate the age of crypto j at the time of each donation using data on the initiation date of the cryptocurrency. We then take the average of these values for donations made in period t . $TransactionFee_j^t$ is calculated as the average of the standardized transaction fees charged for donations in cryptocurrency j during time t . The standardized transaction fee of a single transaction is simply computed as the ratio of the fee value to the corresponding donation value. The standardized fee is used to isolate the impact of the transaction value on the size of the transaction fee. To calculate $PriceVolatility_j^t$, we first compute the coefficient of variation (CoV) of the price of cryptocurrency j over the 30 days preceding each donation; subsequently, we compute the average of these CoVs for all transactions in crypto j during period t . Using CoV instead of standard deviation allows to compare volatility between different cryptocurrencies with different prices (Bhosale and Mavale, 2018). Additionally, we introduce the binary variable $StableCoin_j$ to determine whether cryptocurrency j is a stablecoin. We also add fixed effect variables corresponding to each time period. This is a common practice in panel regressions, see for example, Mejia et al. (2019). These binary variables are referred to as T^t . Finally, β_0 to β_5 and β'_t denote the regression coefficients, and ϵ_j^t represents the error term.

We apply Box-Cox transformation to all non-binary variables in Equation (1) as well as all other models in this section. The Box-Cox transformation serves to linearize any non-linear patterns while stabilizing the variance within each variable (Atkinson et al., 2021). The parameter of the Box-Cox function for each variable is selected using the method proposed by Guerrero (1993), which minimizes the coefficient of variation. This method has been employed in other research, see for example, Petropoulos and Siemsen (2023).

We assume the duration of each period t to be seven days (weekly) because the daily data is sparse for many minor cryptocurrencies. Our data spans 44 weeks; to avoid a non-integer number of periods, we use 30 December 2022 as the end date for the analyses in this section. Moreover, we present the results under the daily frequency in Subsection 4.3 as part of the robustness check. Table 3 reports the results of the regression analysis for Equation (1). Note that we exclude the time fixed effect variables for presentation in this table.

Table 3 Results of Equation (1) regarding the determinants of the donations size in each cryptocurrency

Variable	Coeff.	Std. Error	p -value	Sig.
(Intercept)	-46.269	4.903	$\ll 0.001$	***
MarketCap	0.795	0.112	$\ll 0.001$	***
TimeSinceLaunch	2.073	0.312	$\ll 0.001$	***
PriceVolatility	17.242	5.264	0.0011	**
StableCoin	2.885	0.680	$\ll 0.001$	***
TransactionFee	-0.707	0.084	$\ll 0.001$	***
(The coefficients for period's fixed effects are not reported.)				
Residual standard error: 4.863 on 657 degrees of freedom				
Multiple R-squared: 0.4054; Adjusted R-squared: 0.3619				
F-statistic: 9.33 on 48 and 657 DF, p -value: $\ll 0.001$				

As we can see in Table 3, the overall model is significant at 0.001 level, with a relatively high R^2 (0.41). Moreover, all main variables are significant at 0.001 level, except *PriceVolatility* which is significant at 0.005 level. *MarketCap* and *TimeSinceLaunch* have positive relationship with the dependent variable, confirming Hypotheses 1 and 2. Additionally, *PriceVolatility* of a cryptocurrency has a positive relationship and *TransactionFee* has a negative association with the amount of donations made in the cryptocurrency, approving Hypothesis 3 and 4. Finally, larger donations are made in *StableCoin* tokens, affirming Hypothesis 5.

4.2. Determinants of total donations made from a wallet address

As discussed earlier, to test Hypotheses 6 and 7, our analysis centers on transactions and donor wallet data within the Ethereum blockchain. For these analyses, we also exclude transactions originating from hyper-active wallets, which are typically linked to crypto companies, e.g., donor is a crypto exchange, or donor makes contribution through the exchange's platform. Therefore, we omit wallet addresses with 1000 or more historical transaction. Additionally, we exclude donations executed through many-to-many or many-to-one contracts, i.e., when the payments come from multiple senders, as it obscures the identity of the donor's wallet. Such transactions are often made by crypto exchanges and alike. Equation (2) addresses Hypotheses 6a and 7a.

$$Donations_i = \beta_0 + \beta_1 PastTransactions_i + \beta_2 ENS_i + \epsilon_i \quad (2)$$

In Equation (2), $Donations_i$ refers to the total amount of donations made by wallet address i , and $PastTransactions_i$ denotes the total number of transactions under wallet i . Moreover, ENS_i is a binary variable determining whether wallet address i has an associated ENS. Finally, ϵ_i is the error term. Table 4 presents the results of Equation (2).

Table 4 Results of model of Equation (2) regarding donors' characteristics				
Variable	Coeff.	Std. Error	p-value	Sig.
(Intercept)	1.777	0.013	$\ll 0.001$	***
PastTransactions	0.420	0.005	$\ll 0.001$	***
ENS	0.227	0.031	$\ll 0.001$	***
Residual standard error: 1.823 on 64528 degrees of freedom				
Multiple R-squared: 0.1097; Adjusted R-squared: 0.1097				
F-statistic: 3975 on 2 and 64528 DF, p-value: $\ll 0.001$				

As we can see in Table 4, both variables $PastTransactions$ and ENS are significant at 0.001 level and are positively associated with the total amount of donations made from a wallet address, thus confirming Hypotheses 6a and 7a. This model has a R^2 of 0.11.

Finally, to test Hypotheses 6b and 7b, we use a logistic regression to calculate the probability of a specific wallet address making future donations:

$$Pr(FutureDonation_i) = \frac{\exp(\beta_0 + \beta_1 PastTransactions_i + \beta_2 ENS_i + \epsilon_i)}{1 + \exp(\beta_0 + \beta_1 PastTransactions_i + \beta_2 ENS_i + \epsilon_i)} \quad (3)$$

In Equation (3), $FutureDonation_i$ is a binary variable determining whether wallet address i has made more than one donation during the study period. Table 5 presents the results.

Table 5 Results of model Equation (3) regarding probability of future donations				
Variable	Coeff.	Std. Error	p-value	Sig.
(Intercept)	-4.404	0.061	$\ll 0.001$	***
PastTransactions	0.212	0.020	$\ll 0.001$	***
ENS	0.064	0.105	0.540	
Null deviance: 13036 on 64530 degrees of freedom				
Residual deviance: 12907 on 64528 degrees of freedom				
AIC: 12913				

From Table 5 we can see that *PastTransactions* is positive and significant at 0.001 level, confirming Hypothesis 6b. However as *ENS* is not statistically significant, there is insufficient support for Hypothesis 7b, and thus it is rejected. The Akaike's Information Criterion (AIC) value for this model is 12913 which outperforms the base model with no predictors (AIC= 13038).

4.3. Robustness Check

We tested our first model in Equation (1) against the usual linear regression assumptions and did not identify any issues related to non-independence (Durbin-Watson test: p -value = 0.6476), non-normality (via probability plots and given large sample sizes), and heteroskedasticity (studentized Breusch-Pagan test: p -value = 0.1857). Additionally, the independent variables display very low levels of collinearity; see Table 6 that reports the generalized variance-inflation factors.

Table 6 Generalized variance-inflation factors of the model presented in Table 3.			
Variable	GVIF	DF	GVIF^{(1/(2*DF))}
MarketCap	2.647	1	1.627
TimeSinceLaunch	2.404	1	1.550
PriceVolatility	2.979	1	1.726
TransactionFee	1.147	1	1.071
StableCoin	2.554	1	1.598
Periods' fixed effects	2.280	43	1.010

We also conducted a series of robustness checks regarding the model of Equation (1). First, we focused on the impact of the end date of the study period. While our original end date is 30 December 2022, we also considered a longer period, up to 21 August 2023, which is the end of

our data collection (equal to 77 weeks of data). This model resulted in effects for the independent variables that are of the same direction (same signs for the β coefficients) and about the same coefficient size. The model is overall significant and does not exhibit any multicollinearity, linearity or heteroskedasticity issues, although it displays a slightly lower adjusted R^2 (0.3584).

Next, we changed the definition of periods from weekly to daily. The results agrees with those presented in Table 3 regarding the signs of the coefficients. Moreover, all variables are significant at a 0.001 level, and the adjusted R^2 is equal to 0.394. Having said that, we would approach this set of results with caution as the model based on the daily data suffers from serial dependence and heteroskedasticity.

We also modified the model by replacing the fixed effects dummy variables for the time period in Equation (1) with a single variable for trend indicator (also Box-Cox-transformed). This new model widely agrees with the results presented in Table 3, however *Price Volatility* becomes weakly significant (p -value = 0.07623) in the new model. As expected, the sign for the trend indicator is negative, i.e., as time passes, the amount of donations decreases. However, we believe that a model with fixed effect variables provides a more accurate representation of the fluctuations in donations due to the changing dynamics of the war and its impact on contributions, as well as the effect of specific news on certain dates on the flow of donations.

Finally, we attempted to replace the Box-Cox transformation with a simple logarithmic transformation, which is common in the literature. While the estimated coefficients and signs agree with our main model, this model suffers from heteroskedasticity (studentized Breusch-Pagan test: p -value = 0.0131). Regardless, we present the model based on the logarithmic transformations in Table 7, as the interpretation of the standardized coefficients is more straightforward in this case.

Regarding the results presented in Table 4, we did not identify any multicollinearity issues (the variance-inflation factor was 1.05), while other assumptions of regression modeling were also satisfied (Durbin-Watson test for independence: p -value = 0.7608; studentized Breusch-Pagan test for homoskedasticity: p -value = 0.2779). Furthermore, to check the robustness of the results of this model, we also tried to change the threshold of defining hyper-active users, by capping at

Table 7 Results of model of Equation (1) with logarithmic transformation instead of Box-Cox transformation

Variable	Coeff.	Std. Coeff.	Std. Error	p-value	Sig.
(Intercept)	-41.839		4.825	$\ll 0.001$	***
MarketCap	0.653	0.396	0.080	$\ll 0.001$	***
TimeSinceLaunch	1.882	0.280	0.307	$\ll 0.001$	***
PriceVolatility	13.476	0.151	4.311	0.0018	**
TransactionFee	-0.409	-0.272	0.046	$\ll 0.001$	***
StableCoin	2.325	0.168	0.625	$\ll 0.001$	***
(The coefficients for weeks' fixed effects are not reported.)					
Residual standard error: 4.638 on 657 degrees of freedom					
Multiple R-squared: 0.4367; Adjusted R-squared: 0.3955					
F-statistic: 10.61 on 48 and 657 DF, p-value: $\ll 0.001$					

500 and 100 transactions (instead of 1000). Both models had similar estimated coefficients for the two independent variables, however, they show lower explanatory power, with adjusted R^2 values of 0.0973 and 0.0639 respectively. In Table 8, we also present the results of the model outlined in Equation (2) with logarithmic transformations of the respective variables instead of Box-Cox transformations. While the model has a good fit, it suffers from heteroskedasticity (studentized Breusch-Pagan test: p -value $\ll 0.001$).

Table 8 Results of model of Equation (2) with logarithmic transformation instead of Box-Cox transformation

Variable	Coeff.	Std. Coeff.	Std. Error	p-value	Sig.
(Intercept)	2.067		0.014	$\ll 0.001$	***
PastTransactions	0.362	0.345	0.004	$\ll 0.001$	***
ENS	0.249	0.028	0.034	$\ll 0.001$	***
Residual standard error: 1.956 on 64528 degrees of freedom					
Multiple R-squared: 0.1244; Adjusted R-squared: 0.1243					
F-statistic: 4583 on 2 and 64528 DF, p-value: $\ll 0.001$					

5. Further discussions and implications for the nonprofit sector

In this section, we discuss the findings from Section 4 and their implications for NPOs, along with additional considerations regarding crypto fundraising.

5.1. What cryptocurrencies to accept/appeal?

Our results in Section 4 confirm Hypotheses 1 and 2, signifying the importance of NPOs being receptive to well-known and established cryptocurrencies. Looking at the standardized coefficients in Table 7, the market cap of a cryptocurrency is the biggest predictor of the amount of donations received in that cryptocurrency. This result is not surprising though, as cryptocurrencies with

larger market caps generally exhibit higher circulation and a larger user base; they also tend to receive more public and social media attention (Al Guindy, 2021). These factors would lead to a larger pool of potential donors in the possession of high market cap cryptocurrencies.

The second largest predictor for the amount of donations in a cryptocurrency is its age. While many of the newer cryptocurrencies are hosted on the later generations of blockchain networks with higher transaction speed, lower transaction fees, better scalability, less energy consumption, and larger crypto ecosystems that could provide higher utility for the holders of those cryptocurrencies, they often lack users' trust and awareness. On the other hand, older cryptocurrencies that remain relevant, benefit from early mover advantages, including a sustainable market share (Makadok, 1998). The performance of these cryptocurrencies and their underlying blockchains has been tested over time, and they had more time to identify and address security issues. Older cryptocurrencies also leverage the abundance of content and electronic word of mouth about them, which would attract them more investors especially if the content about their performance is positive (Aggarwal et al., 2012). Consequently, NPOs should prioritize and be receptive to cryptocurrencies with higher market cap, particularly those with a longer market presence. As of 2023, some cryptocurrencies meeting one or both of these criteria include BTC, ETH, USDT, BNB, XRP, USDC, and DOGE.

Following market cap and age, transaction fee features the next highest absolute standardized coefficient. This implies that, all else being equal, donors tend to prefer cryptocurrencies with lower transaction fees when making contributions. Therefore, possessing wallet addresses on efficient blockchain platforms such as Solana and Ripple, capable of executing transactions at minimal fees and high speeds, could potentially persuade prospective donors who are concerned about substantial transaction fees. However, the inclination of donors to lower transaction fees should not necessarily lead NPOs to dismiss specific blockchains and cryptocurrencies solely based on higher fees. Ilk et al. (2021) noted that the high transaction fees of Bitcoin do not dissuade users from utilizing it. Indeed, the highest amount of donations to Aid for Ukraine was received in cryptocurrencies on the Ethereum blockchain, which compared to the other blockchains in this study, charges the largest transaction fee relative to the size of donations.

Our findings also highlight the significance of stablecoins in crypto fundraising, as donors appear to lean toward contributing more in stablecoins than other cryptocurrencies. Stablecoins are a common method of payment in on-chain transactions (Zhao et al., 2022), and as of November 2023, have a combined market cap of over \$127 billion¹. They not only resemble online cash donations, but also could alleviate concerns regarding the valuation of contributions. The fair valuation of non-cash donations has been a challenge for various stakeholders in the nonprofit sector, particularly tax agencies, and can result in penalties for donors if the tax authorities suspect over-reporting of the donation's value (Lederman, 2020); an example is IRC Section 6662 in the US concerning charitable donations. On the other hand, stablecoins minimize concerns regarding loss of donations' value due to their minimal price volatility. They also offer higher utility for the recipients NPOs; not only more suppliers are receptive toward being compensated in stablecoins, but also they represent higher utility for NPOs' cross-border aid transfers. For example, UNHCR uses USDC to transfer funds to the digital wallets of Ukrainian refugees, where the recipients can convert it to USD, EUR, or the local currency of the place of residence and withdraw the funds from nearby MoneyGram outlets (Asmakov, 2022). Binance Charity's Refugee Crypto Card initiative is another example (Binance Blog, 2022). The combination of these factors could explain the slight preference for stablecoins over other tokens as a means of crypto donations. Therefore, NPOs should set up wallet addresses on blockchain platforms that support stablecoins, such as Ethereum, Tron and Solana, and to explicitly ask for donations in stablecoins.

Interestingly, our findings suggest that crypto donors are inclined to contribute cryptocurrencies that experienced higher price volatility, even though the standardized coefficient for *Price Volatility* is the lowest among the variables under study. As discussed in Section 2.2, this observation can be attributed to the risk management behavior of crypto donors aiming to mitigate overall portfolio risk by allocating their more volatile crypto assets toward philanthropic contributions. A special case of this could be that some contributions are made after a sharp decline or rise in the token price.

¹ Source: www.CoinGecko.com

On the other hand, cryptocurrencies with small market cap often exhibit higher price volatility and can yield bigger returns, thus many crypto investors hold such tokens in their portfolio (Liu et al., 2022). By being receptive to such tokens, NPOs may encourage some crypto investors to donate their more volatile crypto assets when looking to divest from their portfolio holding.

Examining blockchains commonly used for cryptocurrency fundraising could also provide valuable insights. By looking at the wallets utilized by Aid for Ukraine, alongside other fundraising campaigns dedicated to Ukraine, as presented in Table B.1, and referencing the list of cryptocurrencies accepted by third-party donation platforms like The Giving Block, a recurring pattern emerges. Ethereum, Bitcoin, Tron, Solana, and Litecoin stand out as the most popular networks for crypto fundraising. NPOs looking to venture into cryptocurrency fundraising may find it beneficial to consider offering wallet addresses on these blockchains.

Out of these networks, Ethereum, Tron, and Solana support smart contracts and host various tokens including stablecoins as well as numerous small and highly volatile tokens. Their wide ecosystem also include NTF and decentralized applications (DApps). The backing of these features and possibilities suggests a growing user base who own wallets and cryptocurrencies on these blockchains. Consequently, sharing wallet addresses on these networks can effectively entice a broader pool of potential donors.

5.2. Soliciting strategies

Our findings confirm Hypotheses 6a and 6b, that frequent crypto users are more likely to participate in crypto philanthropy as they donate larger sums, and are more inclined to make future donations. Based on the standardized coefficients in Table 8, we can observe that out of the two predictors employed in Equation (2), the number of past transactions stands out as a significantly stronger predictor of the amount of donations. This behavior could be attributed to the higher trust, lower perceived risk, higher perceived usefulness, and higher perceived ease of use that frequent crypto users have toward cryptocurrencies. Interestingly, our data shows a positive linear correlation between the number of past transactions and donating stablecoins ($p\text{-value} < 0.001$),

highlighting the discernment of frequent crypto users regarding their choice of cryptocurrencies and their suitability for donations.

Therefore, NPOs should specifically target frequent crypto users in their crypto fundraising campaigns. Given the online nature of crypto fundraising, online channels are preferred over conventional soliciting methods such as direct mail or telemarketing. Social media platforms, notably are crucial online channels for NPOs, offering advantages such as broader reach and lower fundraising costs (Di Lauro et al., 2019). Social media has proven to be an effective tool for NPOs and fundraising activities (Mejia et al., 2019; Yan and Pedraza-Martinez, 2019). Moreover, crypto users, being tech-savvy and predominantly young, have a significant presence on social media, to an extent that social media discourse can even impact the valuation of cryptocurrencies (Mai et al., 2018). Aid for Ukraine and many other crypto fundraising initiatives for Ukraine used Twitter as their initial and main platform to reach potential donors. On the other hand, compared to tweets, internet forums can wield a stronger influence on the behavior of the crypto users (Mai et al., 2018). Some social media platforms have active topical communities on cryptocurrencies; for instance, Reddit has several specialized communities with millions of active users, such as r/CryptoCurrency and r/Bitcoin. NPOs can target these specialized communities for solicitation from crypto enthusiasts. Furthermore, using relevant hashtags, e.g., #CryptoGivingTuesday, can also increase the visibility and reach of the fundraising cause. Boosting soliciting activities following price hikes in the crypto market, or towards the end of the year –to attract donors with tax reduction motivations– can result in increased donations.

Our findings on Hypothesis 7a indicate that wallet addresses with identifiable names tend to contribute more. As discussed in Section 2.2, the visibility and recognition of donations can explain the larger contributions of ENS holders. Anonymity tends to have a negative impact on donation amounts, a factor especially pertinent when donations are directly observable (Hoffman et al., 1996; Bekkers and Wiepking, 2011). Given the transparent and immutable nature of crypto donations, corporate and individual donors with identifiable names have stronger incentives to make larger

contributions. Moreover, similar to frequent crypto users, ENS holders exhibit a preference for contributing in stablecoins; conducting a Welch two-sample t-test shows that ENS holders are more likely to donate in stablecoins (p-value= 0.005), indicating their awareness of the higher utility of these tokens for the NPOs.

Our results align with the findings of The Giving Block (2023) which reports that 79% of the crypto donations made through their platform came from donors who wished to share their details with the recipient NPOs. Even in the absence of ENS, many crypto donors satisfy their desire for recognition by sharing snapshots of their donations on social media, especially with NFT donations. Therefore, having crypto donation portals that facilitate the sharing of donations on different social media platforms can be an effective means of encouraging donors.

It is important to note that a significant portion of crypto donations comes from executives and corporations associated with cryptocurrencies and blockchains. In the case of Aid for Ukraine, these contributors included individuals such as the founders of Polkadot and Ethereum, foundations associated with blockchain projects like Solana Foundation, as well as crypto or blockchain companies such as Kraken, Binance, Kuna, WhiteBit, and EXMO. The motivations behind these donations should align with typical benefits cited in corporate philanthropy literature, such as ethical motives, enhancing the donor's profile, marketing for the product or corporation, lobbying, and tax rebates, see for example, (Yermack, 2009; Gautier and Pache, 2015; Iatridis, 2015). NPOs can seize this opportunity by directly soliciting executives of crypto and blockchain projects. In our discussion with a founder of Aid for Ukraine, he emphasized the importance of these corporate donations in giving momentum to the campaign and signaling credibility to potential donors.

Our results, however, do not support Hypothesis 7b, indicating that donors with ENS are not motivated more than non-ENS holders to make future contributions to the campaign. A plausible explanation could be that the urge for reputation and recognition is satisfied with the initial contribution; consequently, ENS holders are not more motivated than non-ENS users to engage in further giving practices.

5.3. Liquidation policies

Generally speaking, NPOs can either conduct crypto fundraising independently, or delegate this task to third-party platforms such as The Giving Block. In the latter scenario, the third party platform sets up and manages crypto wallets on behalf of the NPO, provides donation portals, and works with crypto exchanges to convert crypto donations into fiat currencies. This enables NPOs to circumvent technical and legal intricacies and receive donations in their preferred fiat currency, calculated based on the value of the crypto donations at the time of contribution. However, these platforms have certain limitations. They often impose subscription fees and/or charge a percentage of donation values as commissions. Additionally, they only accept a limited number of cryptocurrencies. Furthermore, as these platforms become the primary intermediary between donors and the NPO, some donation information becomes inaccessible to the NPO, hindering their ability to develop more comprehensive crypto fundraising strategies. While this approach might be favored by larger NPOs, the advantages of managing own crypto fundraising channels may outweigh the associated costs for smaller NPOs.

When an NPO manages its own digital wallets, it will eventually need to convert the crypto donations into fiat currency through a cryptocurrency exchange. Although, it is worth noting that some crypto donations can be spent directly with crypto-friendly suppliers, as demonstrated in the case of Aid for Ukraine (Kharif, 2022), or sent directly to the wallet addresses of beneficiaries, as seen in UNHCR's support for Ukrainian refugees (Asmakov, 2022).

To mitigate the risks associated with price volatility, NPOs can consider liquidating donations at the earliest feasible opportunity. This can be achieved either manually or by implementing auto-liquidation through integrating the digital wallet with a crypto exchange. However, some level of aggregation of crypto funds before converting to fiat, rather than instantly liquidating each donation, can be a preferred strategy to minimize the total fees incurred.

On the other hand, although cryptocurrencies are riskier than stocks or other financial assets, they have a high risk-adjusted return (Platanakis and Urquhart, 2020). Therefore, for resourceful

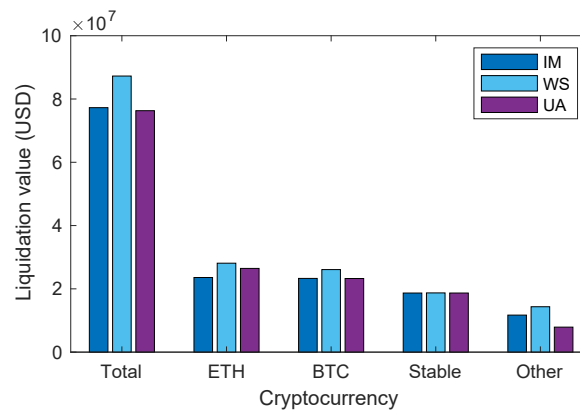


Figure 4 Comparison of yield (in USD) among IM, WS, UA liquidation scenarios

NPOs with knowledge of the crypto market and investment, the liquidation can be delayed to benefit from potential price appreciation. An example is WFP’s Innovative Finance and Venture Launchpad, where one of its objectives is the portfolio management of crypto donations (World Food Programme, 2021).

While a proper analysis of liquidation strategies for crypto donations is beyond the scope of this paper, we conduct a simple analysis to gain insights from liquidation of crypto donations by Aid for Ukraine. We track the outflow of cryptocurrencies from the 13 wallet addresses during the study period. We compare this with the alternative scenario of immediate liquidation of crypto donations. We refer to the actual Aid for Ukraine’s liquidation as “UA” and the immediate liquidation scenario as “IM”. In addition, we consider a hypothetical Wait and See scenario, where the decision maker has full knowledge of future prices for all crypto assets and chooses the best timing to maximize revenue (in USD) from liquidating crypto donations. This scenario, referred as “WS”, acts as the upper bound for the fiat revenue from liquidating crypto donations. The details of our calculations can be found in Appendix C. Figure 4 compares these three scenarios. From this figure, we can see that UA and IM scenarios perform similarly, mainly due to the frequent liquidation of the main cryptocurrencies by Aid for Ukraine.

On the other hand, during the period of study, crypto market had a bearish trend, with three major crashes: Terra Luna in May, Celsius in June, and FTX in November 2022. This led to devaluation of crypto donations held by Aid for Ukraine during these crashes. Consequently on

average, for smaller tokens which were not liquidated frequently, IM outperforms UA. Conversely, the UA scenario resulted in a notable increase in revenue from ETH (12.18%) compared to IM, highlighting the potential of achieving a higher yield, even in a bearish market, by refraining from the immediate liquidation of cryptocurrency donations. Moreover, as expected, stablecoins led to almost the same revenue regardless of the liquidation strategy.

While these findings cannot be generalized, they can offer valuable insights for NPOs. Holding cryptocurrencies requires a proper understanding of trading and crypto market. Even when such knowledge exists, maintaining a diverse portfolio of various cryptocurrencies can entail significant risk. A sound risk management strategy, which involves holding a select few and quick liquidation of the remainder may be the prudent approach for NPOs.

6. Conclusion

In the ever-evolving landscape of philanthropy, the emergence of cryptocurrencies as a powerful disruptive technology has sparked new possibilities for the nonprofit sector. In this research, we delved into the features of cryptocurrencies that exhibit correlation with increased donation values, and analyzed characteristics of crypto wallets that tend to be associated with higher degrees of contribution, in order to lay a foundation for more effective crypto fundraising strategies. To that purpose, we analyzed donation data from Aid for Ukraine, one of the largest crypto fundraising campaigns in terms of number of participants, amount of donations raised, and diverse range of supported cryptocurrencies.

Our analysis indicates that the market cap of a cryptocurrency is the most significant predictor of the donation amount received in that cryptocurrency, followed by the age of the cryptocurrency. Additionally, all else being equal, cryptocurrencies associated with higher transaction fees are expected to receive fewer donations. Moreover, donors, on average, have a tendency to contribute in stablecoins. Interestingly, our results also indicate that donors are more likely to donate cryptocurrencies with higher price volatility from their portfolio. Furthermore, our findings show that frequent crypto users are more likely to donate larger amounts and to make future contributions. Additionally, crypto wallet addresses that possess name services such as ENS tend to

associate with larger donations, although this attribute does not predict a higher likelihood of future contributions.

Several avenues for future research emerge from our study. Firstly, a more in-depth investigation into the statistical causality behind our empirical findings is needed. Future studies should aim to uncover the causal relationships that underlie the patterns identified in our study. Additionally, further exploration of the impact of each independent variable, such as investigating the elasticity of crypto donations toward transaction fees, could provide valuable insights. Optimizing the liquidation strategies of crypto donations employed by NPOs is another intriguing direction for future research. Exploring the motivations behind philanthropic donations from cryptocurrency leaders within the context of corporate philanthropy, especially the effects of large crypto donations from crypto moguls on the price dynamics of their respective cryptocurrencies, is also an area that requires further studies. Furthermore, considering the central role of social media in crypto fundraising, further research on this topic is needed. Lastly, certain findings from our study may have implications in wider contexts such as crypto crowdfunding, or analogous settings such as stock donations; extending the scope of our research in these directions could provide valuable insights for a more diverse audience.

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Appendix A: Wallet addresses of Aid for Ukraine

Table A.1 Wallet addresses of Aid for Ukraine

No.	Blockchain	Digital Wallet Address	Source of Data
1	Bitcoin	357a3So9CbsNfBBgFYACGvxxS6tMaDoa1P	https://www.blockchain.com/
2	Ethereum	0x165cd37b4c644c2921454429e7f9358d18a45e14	https://etherscan.io/
3	Solana	66pJhhESDjdeBBDdkKmxYYd7q6GUggYPWjxpMKNX39KV	https://solscan.io/
4	Polkadot	1x8aa2N2Ar9SQweJv9vsuZn3WYDHu7gMQu1RePjZuBe33Hv	https://www.subscan.io/
5	Cardano	addr1qykgqgv5flwu4rm9wt2e69vuywj0fx368ylxqzqa7ep0ckm4zeuw67f9snkur4syrz2elqeyafx8wculjeearp3tz0wscz9350	https://blockchair.com/
6	Dogecoin	DS76K9uJJzQjCFvAbpPGtFerP1qkJoeLwL	https://www.blockcypher.com/
7	Hedera	0.0.779299	https://hedera.com/
8	Icon	hxd07e6d45d9c136a9dcc18eebad937044e36cbc75	https://tracker.icon.community/
9	Casper	9431cafe98ca1ef6e3e53cadba95c719bfbfb25d6bebf76b79e9373afbd1c1b1	https://casperstats.io/
10	Tron	TEFccmfQ38cZS1DTZVhsxKVDckA8Y6VfCy	https://tronscan.io/
11	Algorand	KYJCXKA3GB4QLCJKN7QIKARL63U6BD3PSBAB7ZGJGCR4E4X54CYVUPLW4	https://algoexplorer.io/
12	Near	ukraine	https://near.org/
13	Stellar	GD7ZVRSGHETeyLB4XUVFVGFWJKNDHORHAY72HZVXYFINUNZSRVABKVSH	https://stellar.org/

Appendix B: Other crypto campaigns to support Ukraine in Russo-Ukrainian war

Table B.1 Some of other crypto fundraisers for Ukraine

Fundraiser	Blockchain of wallets
Cyberpolice of Ukraine	Bitcoin, Ethereum, Tron, Solana
Ministry of Health of Ukraine	Bitcoin, Ethereum, Litecoin
The Rreturn Alive Foundation	Bitcoin, Ethereum, Tron, Solana
Unchain Ukraine	Bitcoin, Ethereum, Binance, Polygon, Solana
Palianytsia	Bitcoin, Ethereum, Tron, Polkadot, Dogecoin, Solana
Ukraine DAO	Ethereum
Ukraine Razom	Bitcoin, Ethereum
Dobrobut Foundation	Bitcoin, Ethereum, Tron
Humanity First - Ukraine Emergency Relief Fund	Bitcoin, Ethereum
Any.Cash Army	Bitcoin, Ethereum, Tron, Litecoin
Any.Cash Humanitarian	Bitcoin, Ethereum, Tron, Litecoin
Fainiy Fund	Bitcoin, Ethereum, Tron
I Support Ukraine	Bitcoin, Ethereum, Tron
Phoenix	Ethereum, Tron, Solana, Binance
Exon Help Fund	Bitcoin, Ethereum, Tron, Litecoin
United Humanitarian Front	Bitcoin, Ethereum, Tron
Army SOS	Bitcoin, Ethereum, Tron
Hospitallers	Bitcoin, Ethereum
Voices of Children	Bitcoin, Ethereum, Tron
Hell Rides	Bitcoin, Ethereum
Kolo	Bitcoin, Ethereum, Tron, Solana
Ukrainian Cyber Alliance	Bitcoin
Faine Misto	Bitcoin, Ethereum, Litecoin, Binance
Hope For Ukraine	Bitcoin, Ethereum
Nova Ukraine	Ethereum
Dim- International Charity Fund	Bitcoin, Ethereum, Tron, Dogecoin, Binance, Dash, Monero

Appendix C: Comparison of different liquidation scenarios

In this part, we explain how we calculate the revenue under the three liquidation scenarios of UA, IM, and WS in Subsection 5.3. Let T_0 be the start date of the analysis, i.e., $T_0 = 26 - Feb - 2022$, and T_e be the end date, i.e., $T_e = 31 - Dec - 2022$. For simplicity, we assume that any remaining cryptocurrency by the end date should be liquidated by this day. For the UA scenario, let $\theta_j^{UA} = [T_{j,1}^{UA}, T_{j,2}^{UA}, \dots, T_{j,k}^{UA}, \dots, T_{j,n}^{UA}, T_e]$ identify the time periods with an outflow of crypto currency j from Aid for Ukraine, with n identifying the last outflow of crypto j within the study period. T_e is included to guarantee that any remaining crypto j at the end of the study period will be liquidated by then. Let denote v_t^j as the amount of donations in crypto j (in the cryptocurrency unit) at any instant t , while P_t^j denote the price of cryptocurrency j at time t . Moreover, let refer to the size of the k^{th} outflow of crypto j as $V_{j,k}^{UA}$, and the price of crypto j (in USD) at that time as $P_{T_{j,k}^{UA}}^j$. Our assumption that all crypto assets are liquidated by time T_e implies that $V_{j,e}^{UA} = \sum_t v_t^j - \sum_k V_{j,k}^{UA}$.

For simplicity, we assume that no transaction fee is paid when liquidating the crypto assets. Under the UA scenario, the yield of Aid for Ukraine (in USD) from liquidating all crypto assets is:

$$\mathbf{R}^{UA} = \sum_j R_j^{UA} = \sum_j \sum_{k | T_{j,k}^{UA} \in \theta_j^{UA}} P_{T_{j,k}^{UA}}^j V_{j,k}^{UA} \quad (C.1)$$

Moreover, the total yield of the Aid fro Ukraine under the IM scenario is

$$\mathbf{R}^{IM} = \sum_j R_j^{IM} = \sum_j \sum_t P_t^j v_t^j \quad (C.2)$$

To calculate R^{WS} , first let θ_j^{WS} represent the vector of timing of the local price hikes for cryptocurrency j , where:

$$\begin{aligned} \theta_j^{WS} &= [T_{j,1}^{WS}, T_{j,2}^{WS}, \dots, T_{j,k}^{WS}, \dots, T_e] \\ \text{s.t. } T_0 &< T_{j,1}^{WS} < T_{j,2}^{WS} < \dots < T_{j,k}^{WS} < \dots < T_e \\ P_{T_{j,1}^{WS}}^j &\geq P_{t \in [T_0, T_e]}^j \\ P_{T_{j,2}^{WS}}^j &\geq P_{t \in (T_{j,1}^{WS}, T_e]}^j \\ &\vdots \\ P_{T_{j,k}^{WS}}^j &\geq P_{t \in (T_{j,k-1}^{WS}, T_e]}^j \end{aligned} \quad (C.3)$$

In the above model, $T_{j,1}^{WS}$ is the time where the price of cryptocurrency j (i.e., $P_{T_{j,1}^{WS}}^j$) is maximum within the study period, $T_{j,2}^{WS}$ is the time that the price of crypto j is maximum after the main price hike $T_{j,1}^{WS}$ until the end of the period; the price at this time is $P_{T_{j,2}^{WS}}^j$. Consequently, $P_{T_{j,k}^{WS}}^j$ and $T_{j,k}^{WS}$ represent the largest price hike and its time of occurrence, after the $k-1^{th}$ largest progressive price hike.

The revenue under the WS scenario, which is the upper bound for the NPO's revenue, is calculated as:

$$\mathbf{R}^{WS} = \sum_j R_j^{WS} = \sum_j \sum_{k | T_{j,k}^{WS} \in \theta_j^{WS}} P_{T_{j,k}^{WS}}^j \sum_{t=T_{j,k-1}^{WS}}^{T_{j,k}^{WS}} v_t^j \quad (C.3)$$