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Explaining Variations in Cryptocurrency Ownership: A Cross-country Study

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Abstract

This study investigates how cryptocurrency ownership varies across countries using a set of

variables that reflect a country's overall economic circumstances and long-term outlook. Despite the nascent stage of the cryptocurrency market and the concomitant deficiency of the data on cryptocurrency, a multiple linear regression is fitted as an incipient step towards more advanced future studies. Our empirical findings show that cryptocurrency ownership is more likely to grow in a country with (1) a high human capital stock such as citizens' health and education and (2) a rich endowment of legal property rights. It was also inferred from the regression results that cryptocurrency could be an effective hedge against inflation to some extent.

Keywords: Cryptocurrency, Cryptocurrency ownership, Human capital, Legal property rights

1. Introduction

Since the inception of Bitcoin in 2009, the cryptocurrency market has expanded in its market capitalization as well as in the number of cryptocurrencies. Commonly known as digital or virtual currency, cryptocurrency was welcomed by many individual and institutional investors alike as it was heralding the age of digital currency along with a vast potential of its underpinning technology: cryptography, which is a key element to blockchain technology. The notion that decentralized network-based digital currencies exist outside the realm of governments or central authorities so that they are immune to government currency manipulation made the new decentralized digital currency paradigm even more attractive to buy in. The cryptocurrency market has grown to a capitalization of over 2 trillion dollars at one point in 2022 (https://www.stu.edu/science/crypto-education/) and approximately 21,910 cryptocurrencies have emerged (Hicks, 2022). Although it remains to be seen if cryptocurrencies will be an effective replacement of or a mainstream alternative to fiat currencies or government-backed payment methods, they have increasingly gained acceptance as a financial asset or property over a relatively short period of time.

Inasmuch as cryptocurrency is in its infancy and fast evolving, the legal and regulatory environments for the cryptocurrency markets are still fluid. The future of cryptocurrency may also depend on whether it is classified as a commodity or a security. If cryptocurrency is classed as a security like stocks, it is likely to be subject to more heavy-handed regulations and increased government oversight than when it is classified as a commodity (The Vine Advisors , 2022). A global legal and regulatory consensus on cryptocurrency has yet to be established, and the U.S., one of a few countries deemed best positioned to lead such a global regulatory development, has yet to formalize its own legal and regulatory rules and policies for cryptocurrency (Powers, 2022; Frankenfield, 2022).

One of the essential questions about cryptocurrency is whether or not it will be widely adopted as an alternative to current fiat currencies for a reliable means of exchange (Reiff, 2022; Kelleher, 2022). Although cryptocurrency is not yet a common method of payments in ordinary market transactions and the mainstream adoption of cryptocurrency as a medium of exchange remains to be seen, cryptocurrency functions like fiat money in many ways. Cryptocurrency has already been used as a method of payment on relatively limited occasions and has potential for serving as a unit of account and a store of value. Just as fiat money has

no intrinsic value, the value of a cryptocurrency is determined by its scarcity. While the supply of fiat currency is subject to a country's monetary authority, the supply of a particular cryptocurrency is ultimately capped by a mathematical algorithm that produces the cryptocurrency. It is important to be reminded that a cryptocurrency or a commodity in scarce supply alone is not enough to create its value. The value of a cryptocurrency is also affected by the extent of the public's inclination to own it. It is even more true when the supply or issuance of a cryptocurrency is limited or tightly controlled by a mathematical program or algorithm (Prasad, 2021). Then the follow-up question is: Will the demand for or ownership of a cryptocurrency steadily increase or remain sustainable enough to prop up its value over a long period of time? In a nutshell, since cryptocurrency has no intrinsic uses or value, its value could easily dissipate without sustainable demand for or ownership of cryptocurrency.

High volatility in the value of cryptocurrency may be a threat to the mainstream adoption of digital currency as a reliable means of exchange or a store of value. For instance, "In April [of 2021] the price of a Dogecoin was 20 cents. It tripled in the next two weeks and then fell to half that peak value ten days later. It is as though a $10 bill could buy you just a cup of coffee one day and a lavish meal at a fancy restaurant just a few weeks later" (Prasad, 2021). Another important question about cryptocurrency as a medium of exchange is its scalability. The scalability in the context of cryptocurrency refers to a cryptocurrency's network capacity to process transactions per second or simply how fast the network can process and so on (crypto.com, 2020). For instance, Visa, a major card network, can handle as many as 24,000 transactions per second while Ethereum can process only 20 transactions per second (crypto.com, 2020).

Among many features that make cryptocurrency attractive as a store of value or an asset to invest in, one defining feature is that, unlike fiat currency, it does not stand for debt and it is not subject to an opportunistic manipulation of money supply by a government or monetary authority. Since the novel notion of a peer-to-peer electronic cash system was introduced by Nakamoto (2008) and Bitcoin was first launched in early 2009, cryptocurrency enthusiasts welcomed this new decentralized paradigm as a safe haven against a government's whimsical interventions or manipulation of fiat currency (Chu, 2022; Frankenfield, 2022). For example, when the Federal Reserve came to the rescue of the failed U.S. financial system during the Great Recession and implemented a series of unprecedented quantitative easing, it served as a timely picture prop for cryptocurrency advocates who are critical of the Federal Reserve running its money printing press in high gear (Antoni, 2022). However, such hype about cryptocurrency being digital gold as a stalwart store of value was not always born out in reality. Cryptocurrency sometimes failed in stark contrast to demonstrate itself as a smart investment during actual market volatility (Hyat, 2022). For instance, between 2010 and 2022, Bitcoin recorded 29 episodes of drawdowns of 25% or more while equities and commodities recorded just one each (Hyat, 2022).

A new breed of cryptocurrencies, called stablecoins, emerged as an alternative to highly volatile cryptocurrencies such as Bitcoin. Stablecoin is "a cryptocurrency which has a value that is pegged, or tied, to that of another currency, commodity or financial instrument" (Hayes, 2022). One type of stablecoins is fiat-collateralized stablecoins that maintain a reserve of fiat

currency as collateral to assure its stable purchasing power. It is somewhat paradoxical that government-issued fiat currencies are often used as collateral to make cryptocurrencies more stable in value; thus, cryptocurrencies become more suitable for a medium of exchange or store of value (Hayes, 2022; Prasad, 2021). It's ironic, for instance, that a stable value of U.S. dollar-collateralized stablecoins would not necessarily compromise the leadership of the U.S. dollars as a store of value because the value of stablecoins comes from their backing by the U.S. dollars (Prasad, 2021).

Cryptocurrency exhibits many essential attributes for being a currency such as scarcity, divisibility, acceptability, durability, among others. Just as fiat currency has no intrinsic value, the value of cryptocurrency "is not the value for which goods are exchanged, but the value by which they are exchanged" (John Law, 1720). In that regard, for cryptocurrency to be widely accepted as a method of payment or an asset to invest in, it is critical that its value remains stable over time, regardless of whether the primary purpose of holding or owning cryptocurrency is a medium of exchange or store of value. And the stability of cryptocurrency value in turn is a key to a sustainable long-term demand for or ownership of cryptocurrency.

Unlike a government-backed fiat money, there is no official data on cryptocurrency ownership or demand compiled by an international organization such as the World Bank or the International Monetary Fund. There have only been scant unofficial sources of information about cryptocurrency ownership such as Chainalysis or TripleA. In addition to the lack of publicly available global official data on cryptocurrency, data-driven quantitative studies about the demand for cryptocurrency or its ownership are scarce, especially ones at the level of scientific research conducted by academic bodies. Most of the publicly available quantitative analysis of cryptocurrency transactions focuses on the returns on cryptocurrency investments like security investments. Considering that cryptocurrency is still in its infancy, the lack of scientific research references comes as no surprise.

The main purpose of this study is to conduct an empirical investigation into the ownership of cryptocurrency to gain a rudimentary understanding of people's demand for or ownership of cryptocurrency. Our presumption is that there may be some general economic conditions conducive to the public's inclination to favor or own cryptocurrency, regardless of whether the demand for cryptocurrency is primarily driven by investors' speculative motives or the public's skeptical prospect on the future of current fiat currencies. Using information available from three different sources, we conducted a cross-country study to identify key economic indicators that are hospitable to the public's ownership of cryptocurrency. The rest of this study is organized as follows. In the following section, we discuss the data, regression variables, and theoretical framework. Section 3 presents our regression model and analyzes our regression results, followed by conclusion remarks in Section 4.

2. Data, Variables, and Theoretical Framework

Since no official cryptocurrency data has been compiled globally by an international authority, this study uses a 2020 cryptocurrency ownership data from a Singapore-based cryptocurrency payment service company (TripleA). The data report cryptocurrency ownership from 137 countries, or to be more exact, the number of people who owned or used cryptocurrencies as

of the year 2020. The cryptocurrency ownership data are a derived data which utilized the 2020 Geography of Cryptocurrency Report by Chainalysis and the 2017 Bank of Canada Methods-of-Payment Survey report. In the 2020 Geography of Cryptocurrency Report, each country is given a cryptocurrency score based on three factors as follow: (1) on-chain cryptocurrency value received, (2) on-chain retail value received, and (3) the peer-to-peer exchange trade volume. According to the 2017 Bank of Canada Methods-of-Payment Survey report, about 5 percent of the Canadian population had bought cryptocurrency. To estimate cryptocurrency users or owners per country, the correlation between Canada's Chainalysis score (=0.196) and its cryptocurrency ownership (=5%) was computed first, and then the same rationale was applied to other countries' scores. In our regression analysis, the dependent variable, the number of cryptocurrency owners per country, was measured as a share of the country's population. As shown in Table 1, the mean value of cryptocurrency ownership among 137 sample countries was 2.4% as of 2020, ranging from 0.9% to 12.7%.

For the independent variables, we consider macroeconomic indicators that are deemed relevant to explain variations in cryptocurrency ownership in a country. As summarized in Table 1, Gross Domestic Product per Capita (GDPPC) is measured in 2015 constant U.S. dollars. GDP per capita is a core indicator of a country's overall economic performance and is often used as a broad measure of material well-being per person. Despite its shortcomings that, for instance, GDP per capita does not indicate how GDP is distributed among people, we use GDP per capita as a predictor of cryptocurrency ownership: we hypothesize that the higher a country's GDP per capita, the larger the share of its population who owns cryptocurrency.

Due to decentralized platforms of digital currency transactions, many people still find the cryptocurrency concept difficult to understand. Participating in cryptocurrency transactions itself may not require a full understanding of its mechanism, but long-term or sustainable investments in cryptocurrencies, like securities as a financial asset or store of value, are more likely in a country with sustained and inclusive economic growth. Recognizing that strengthening human capital is a key to such sustained economic growth (World Development Report 2019), we include in the regression the human capital index (HCI) from the World Bank. Ranging between 0 and 1, the index measures the contribution of health and education to the average productivity of a country's citizens and can directly be linked to the prospect of the future average individual income in a country (the World Bank Human Capital Project). It is presumed that variations in cryptocurrency ownership are positively correlated with the human capital index.

A key feature of cryptocurrency is that its supply or production is outside the realm of a government or its monetary authority. Its decentralized platform makes cryptocurrency an attractive censorship-resistant alternative to fiat money, especially for those who believe that a government's opportunistic control of money supply combined with ever-increasing monetized debts is causing the purchasing power of fiat money to decline. It is conceivable that a country with a relatively high rate of inflation could be more hospitable to cryptocurrency ownership as a means of protection from inflation. The measure of inflation used in this study is from the World Bank and is measured as an annual percentage change in

the consumer price index per country.

Even if cryptocurrency uses decentralized platforms, its long-term ownership may be influenced by a country's economy-wide respect for property rights. The cryptocurrency industry or market is still relatively nascent and cryptocurrency regulations have yet to be fully developed. As mentioned previously, cryptocurrency could be subject to varying regulatory rules and tax laws, for instance, depending on whether it is classed as an asset or a commodity. Considering that property rights, especially in financial transactions, can be significantly compromised by regulations and tax laws, we believe that cryptocurrency ownership is more likely to increase in a country where individual property rights are better protected. To that end, we use the strength of legal rights index from the World Bank as a proxy measure of the strength of property rights in a country. The strength of legal rights index ranges from 0 to 12 and measures the degree to which the rights of borrowers and lenders are protected in a credit market. We assume that a country with a high score of the index is more hospitable to the growth of cryptocurrency ownership.

While the use of cryptocurrency as a method of payment has been quite limited in retail transactions, a primary incentive for investments in cryptocurrency appears to be speculative to a great extent. Unlike stocks that represent partial ownership of a company, cryptocurrency itself has no intrinsic value. However, cryptocurrency ownership is driven in much the same way that stock ownership is motivated partly by its capital appreciation or an increase in the share price. We assume that cryptocurrency ownership is more feasible and sustainable in a country where financial markets are well developed. For this reason, we consider the market capitalization of a country's domestic companies as a percent of its GDP.

Lastly, our empirical analysis considers the present value of a country's external debt as a percent of the country's Gross National Income (GNI). We use this variable as a proxy to gauge market liquidity of a country, implying that a lower ratio indicates a higher market liquidity. Just like any financial market, a sustainable growth of cryptocurrency markets is driven by a country's economic growth, and economic growth is in turn fueled by sufficient loanable funds. One of the circumstances that compel a country to rely on external debts is its lack of ability to lend money. Thus, it is presumed that cryptocurrency ownership in a country is expected to be negatively correlated with the country's external debts as a share of its GNI.

Table 2 reports the pairwise correlation among all the variables considered in our regression analysis.

Table 1. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Crypto ownership (dependent variable)	137	.024	.021	.009	.127
GDPPC (in 2015 US$)	135	16957.878	20459.616	388.878	103044.7
Human Capital Index (HCI)	128	.598	.142	.319	.883
Inflation rate	131	5.525	17.352	-.324	188.343
Legal rights index	136	5.4	3.009	0	12
Market capitalization (% of GDP)	74	74.987	147.592	1.771	1245.655
Present value of external debt (% of GNI)	78	33.069	20.311	.132	96.759

Note. The data are from TripleA and the World Bank Data

Table 2. Pairwise Correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(1) Crypto ownership	1.000						
(2) GDPPC (in 2015 US$)	0.040	1.000					
(3) Human Capital Index (HCI)	0.199	0.705	1.000				
(4) Inflation rate	0.306	-0.292	-0.390	1.000			
(5) Legal rights index	0.194	0.076	0.161	-0.182	1.000		
(6) Market capitalization (% of GDP)	0.085	0.262	0.233	-0.121	0.086	1.000	
(7) Present value of external debt (% of GNI)	-0.293	-0.008	-0.112	0.023	-0.042	-0.238	1.000

3. Regression Model and Empirical Results

A multiple linear regression is fitted on the sample data. An ordinary least squares (OLS) regression is not ideal in explaining variations of a dependent variable, especially when the observations of the dependent variable are made across countries. Some unobservable country-specific characteristics as well as missing data could lead to invalid empirical conclusions through omitted variable bias and reduced statistical power. Despite all possible shortcomings, we use an OLS regression to accommodate a limited one-year dataset available of cryptocurrency ownership. In that regard, the regression results need to be understood as a rudimentary step towards more advanced future empirical investigations rather than an attempt to draw any definitive conclusions.

Table 3 shows the OLS regression results. First, Regression (1) shows that variations in cryptocurrency ownership (the number of cryptocurrency owners as a percent of its population) are positively correlated with the human capital index, inflation rate, and the strength of legal rights index. Recall that a country's high human capital index indicates a high productivity of a country's citizens and can also be directly linked to the likelihood of high average individual income of the country. The estimated coefficient is positive and statistically significant, supporting our presumption that countries with a high human capital stock such as education and health provide more hospitable environments for cryptocurrency ownership. The regression result shows that the cryptocurrency ownership could increase as much as 1.79 percentage point when a country's human capital index increases by one standard deviation (0.142).

The supply of cryptocurrency is either predetermined or tightly capped by a mathematical algorithm. Thus, unless the demand for cryptocurrency becomes volatile, the value of cryptocurrency will be better supported by its scarcity. The inflation rate was considered in the regression with a presumption that cryptocurrency was presumed to be an effective hedge against high inflation. Recent market experiences of high volatility in the value of cryptocurrency are clear evidence that cryptocurrency is not a safe haven against inflation. However, we expected that the value of cryptocurrency will be better protected by its capped supply or scarcity, relative to fiat money whose supply can be subject to the whims of a government or monetary authority. The estimated coefficient is consistent with our presumption that cryptocurrency ownership could be more encouraged in a country where inflation tends to run high, implying that a one percentage point increase in inflation could lead to a 0.2 percentage point increase in cryptocurrency ownership.

A country's economy-wide respect for property rights underlies all market transactions and propels market growth, especially when a market is at nascent stage but offers great growth potential. To incorporate such a presumption, the strength of legal rights index was considered. The estimation result shows that there is a better prospect for cryptocurrency ownership in a country with stronger legal property rights.

Contrary to our presumptions, the estimated coefficients of other independent variables were not statistically significant: GDP per capita, market capitalization of domestic firms as a percent of GDP, and the present value of external debt as a percent of GNI. While these explanatory variables are often considered as an effective predictor of a country's long-term economic growth, the statistical insignificance of their estimated coefficients in this study could be attributed to a multicollinearity issue to some extent. As shown in Table 2, there is relatively strong correlation between GDP per capita and other independent variables such as the human capital index, inflation rate, and market capitalization of domestic firms. For instance, the correlation between GDP per capita and the human capital index is as high as 0.705. It is also noticeable that the human capital index is highly correlated with inflation rate, market capitalization, and the present value of external debt.

In Regression (2), we considered only the independent variables that were statistically significant predictors in Regression (1): the human capital index, inflation rate, and the strength of legal rights index. In Regression (2), both the size of each estimated coefficient and the standard error are reduced relative to the results in Regression (1). Nevertheless, the statistical significance of the estimated coefficients in Regression (2) remains the same or higher than in Regression (1).

Table 3. Regression Results

Crypto ownership (dep. var.)	Regression (1)	Regression (2)
GDPPC (in 2015 US$)	0.000 (0.000)	
Human Capital Index (HCI)	0.126** (0.059)	0.034** (0.014)
Inflation rate	0.002* (0.001)	0.001* (0.000)
Legal rights index	0.004** (0.002)	0.002*** (0.001)
Market capitalization (% of GDP)	0.000 (0.000)	
Present value of external debt (% of GNI)	0.000 (0.000)	
Constant	-0.054 (0.036)	-0.008 (0.009)
Observations	35	124
R-squared	0.379	0.113
Prob. > F	0.027	0.002

Note. Standard errors are in parenthesis. ***, **, and * indicate statistical significance at 1, 5, and 10 percent level, respectively.

4. Conclusions

This study attempted to explain how cryptocurrency ownership varies across countries using a set of independent variables that are deemed relevant to investments in cryptocurrency as well as a country's sustained economic growth. Our empirical exploration of the issue is quite rudimentary and limited due to several constraints. First, the cryptocurrency market is still in its infancy and publicly available cryptocurrency data compiled by an international authority is rare or non-existent. A cross-country time series data would produce more reliable and accurate estimates than a one-year cross-country data. Second, our dependent variable, cryptocurrency ownership, is simply the ratio of cryptocurrency users to the population in a country rather than the trade volume or value of cryptocurrency. It only provides a snapshot of how many people participated in cryptocurrency transactions as of 2020. In that regard, the empirical findings of this study indirectly suggest the circumstances that are hospitable to the growth of cryptocurrency market. Despite the limited data on cryptocurrency ownership, this study provides some interesting empirical findings: (1) cryptocurrency ownership is more likely to grow in a country where the human capital stock, especially in terms of citizens' health and education, is relatively high; (2) a country with a rich endowment of legal property rights is more likely to see an increase in cryptocurrency ownership. It was also inferred from the empirical findings that cryptocurrency could be to some extent an effective hedge against inflation.

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