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Bitcoin: Implications for the Developing World

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1 - Introduction

The world has seen drastic advancements in cryptography and computing power over the last few decades and with this advancement has come a new form of currency, cryptocurrency. Bitcoin, developed in 2009, has become the vanguard of cryptocurrencies and is the most viable and most widely adopted to date. The technology operates through a distributed network of wallets and nodes and provides faster, cheaper, borderless transactions as well as complete anonymity if desired. The focus of prior research and attention has been on bitcoin's ability to circumvent financial institutions in developed nations, however the uncertainty surrounding bitcoin's future and its wild volatility have been major barriers to widespread adoption in the developed world. The focus of this paper is on the developing world, where countries with extractive political and economic institutions have been exploiting their citizens for centuries. In these countries a technology like bitcoin has the potential to disrupt financial and government systems and put power and financial autonomy into the hands of individuals.

The early adopters of bitcoin were mostly libertarians, who were opposed to any government, and people selling illegal goods. They wanted to reject government and its involvement in the economy simply because they believed in greater personal freedom. This has tarnished bitcoin's reputation but this paper makes the case that there are legitimate uses for bitcoin in countries where the government's policies are truly antithetical to the needs of the people. In these countries, circumvention of government policies could lead to faster economic growth and development and less corruption by government officials.

This paper will look at the basis for bitcoin as a technology and as a currency and examine some of the positive and negative consequences that will arise if it is widely adopted

in the developing world. While data on bitcoin transactions is limited, there is a significant amount of data available from bitcoin currency exchanges, i.e. where people buy bitcoin with their local currency. Using this data the relationship between the extractivity of a country's economic institutions and the use of bitcoin in that country will be examined to determine whether bitcoin is being used to avoid restrictive financial regulations and irresponsible monetary policy.

2 - Currency and Bitcoin

2.1 - What is Money

Money is the backbone of the modern economy and has allowed civilizations to advance from low efficiency subsistence farming to the highly efficient and highly specialized markets that we have today. Currency, which represents money, serves three main purposes: a store of value, a unit of account, and a medium of exchange.[1] This means that it holds its value over time, establishes prices for goods and services, and can be easily moved from one party to the next, implying widespread acceptance. If any one of these factors is missing, the currency in question loses much of its utility.

Currencies have changed drastically since the beginning of civilization. Initially certain commodities were used as currencies such as salt and barley. These were simple and easy to understand as they had intrinsic value that was guaranteed by their alternative uses. Many of the commodities used were perishable, however, and didn't represent a great store of value, additionally they didn't serve as great mediums of exchange because their value to weight ratios were relatively low. As a result the system shifted to precious metals, which

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[1] Asmundson, Irena, and Ceyda Oner. "Back to Basics: What Is Money? - Finance & Development, September 2012." *Finance & Development*. International Monetary Fund, Sept. 2012. Web. 14 Nov. 2015. <http://www.imf.org/external/pubs/ft/fandd/2012/09/basics.htm>.

were limited in supply and therefore retained a higher value to weight ratio. This also

represented an interesting shift away from a system of intrinsic value. While gold does have a

real market value, that value is not really based on any material use.[2] Beyond some medical

and scientific applications, precious metals have very little industrial use. They have value

because we as humans have given them value. Regardless of where that value originated,

society agreed centuries ago that precious metals were valuable and they therefore served as a

perfect currency. They could be subdivided infinitely without losing any value, transported

relatively easily, and hold value over time.

As things progressed people no longer wanted to carry gold and silver around so they

deposited their precious metals in the bank in return for bank notes guaranteeing their

deposits.[3] Eventually governments began issuing national currency backed by gold or silver.

It was understood that this currency had no intrinsic value but was redeemable for gold held

somewhere in a vault. Recently that link has been completely broken by nearly all countries.

This has led to "fiat currency," materially worthless currency that retains value through our

acceptance of it and a government's backing. The value of the US dollar ultimately comes

down to the fact that you can use it to pay US taxes and it is therefore guaranteed some value

by the US government.

In the past six years we have seen the emergence of a completely new and different

type of currency and the topic of this paper, bitcoin. Bitcoin did not emerge through the same

channels as existing currencies; it was never backed by any commodity and isn't even

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[2] Gobry, Pascal-Emmanuel. "All Money Is Fiat Money." *Forbes*. Forbes Magazine, 8 Jan. 2013. Web. 14 Nov. 2015.

[3] Asmundson, Irena, and Ceyda Oner. "Back to Basics: What Is Money?

represented by any physical object. Instead it is a technology, written in code, which allows

participants to store and transmit value anywhere in the world with the click of a button.

2.2 - What is Bitcoin

The purpose of this paper is not to dive into the technical aspects of bitcoin but rather

to understand the currency's applications in the real world. Nonetheless a basic understanding

of the structure and functioning of bitcoin is necessary to understand its benefits and

drawbacks. Bitcoin is a completely decentralized peer-to-peer network. This means that there

is no central administrator or point of control.[4] All of the bitcoin in the world is held by users

of the network in their own individual bitcoin wallets. These wallets, or bitcoin clients, come

in three main forms: a full client, a lightweight client, and a web client.[5] Each of them allows

different levels of control and anonymity. Lightweight and web clients are administered by

third parties while a full client allows you to initiate transactions directly. Regardless of the

mechanism, these clients allow the user to access his or her wallet and send and receive

bitcoin.

Each wallet is associated with one or more bitcoin addresses, these are similar to an

email address and allow anyone with your address to send you money from anywhere in the

world at any time. Similarly, every wallet has a key that allows the owner of the wallet to

access the bitcoin stored within.[6]

Transaction Verification

Initially one of the most confusing aspects of a peer-to-peer system without any

centralized control is how transactions are recognized and verified. This is where the

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[4] Antonopoulos, Andreas M. *Mastering Bitcoin: Unlocking Digital Cryptocurrencies* (Sebastopol: O'Reilly Media, 2014), 1.
    [5] Ibid., 6.
    [6] Ibid., 1.

ingenuity behind bitcoin really becomes apparent. Rather than relying on a trusted authority to

clear all transactions in the network, which is how credit card transactions are verified, bitcoin

relies on a system of decentralized consensus.[7] Any user running a full client or full node is

participating in this decentralized confirmation system. When a user authorizes a transfer

from their wallet to another wallet in the network, that transaction is instantly registered by

some of the nodes operating in the world. Each receiving node sends the transaction to all of

the other nodes it is connected to and the transaction quickly propagates throughout the entire

ecosystem. Each transaction contains a proof of ownership and can only be unlocked and

spent by the owner of the destination wallet. Therefore it doesn't matter that all of the nodes

in the world see the transaction since they cannot access the value contained within it.[8] The

wallet that received the transaction will register the transaction within a few seconds and will

immediately know that it is an incoming payment because it is accessible by that wallet's key.

As bitcoin moves from wallet to wallet it forms a chain of transactions with each new

transaction referencing the previous transaction as the source of the bitcoin.[9] All of this

information is bundled into blocks, which are confirmed through rigorous computation by all

of the nodes operating in the system. If you are running a full client on your computer you are

allocating some of your computer's processing power to confirming transactions on the

bitcoin network. Computers across the globe race to confirm these blocks and one computer

succeeds about every 10 minutes, at which point all of the computers start over on a new

block.[10] The computer that confirms each block adds it on the public blockchain, a ledger that

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[7] Ibid., 15.
[8] Ibid., 24.
[9] Ibid., 18.
[10] Ibid., 26.

contains all bitcoin transactions that have ever taken place. The difficulty of the computations required to confirm or "mine" a block are adjusted so that it takes about 10 minutes regardless of the processing power being devoted or the number of transactions that have taken place since the last block was mined.[11]

Each new block mined is based off of the previous block, and is a confirmation of the previous block, therefore with each new block the validity of previous transactions is strengthened.[12] In order to undo any transaction (i.e. double spend bitcoin) a malicious user would have to have a node that was able to alter and confirm blocks faster than any other node in the system. Once a transaction is a few blocks deep in the chain that node would have to alter and reconfirm the original block and all subsequent blocks in the same amount of time it takes for another node to just confirm the newest block. This makes confirmed transactions very secure very quickly.[13]

At present the amount of processing power needed to mine a block is immense and there are companies that devote all of their resources to mining. You may wonder why people are willing to allocate processing power on their computers to confirm other people's bitcoin transactions. Each block mined earns the miner 25 newly created bitcoins, worth approximately $8000 USD at time of writing.[14] This not only ensures that there are enough nodes operating to maintain the credibility of the system but also provides a mechanism through which bitcoin is added to the system, equivalent to a central bank printing money in a traditional currency system.

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[11] Ibid., 26.
[12] Ibid., 27.
[13] Ibid., 28.
[14] Ibid., 27.

This controlled and constant increase in the supply of bitcoin is essential for the implications of bitcoin discussed in this paper since it makes bitcoin immune to high inflation. Bitcoin is in fact a deflationary currency because the total amount of bitcoin in the network is capped at 21 million. The system is expected to reach this cap by around year 2140, at which point mining will be incentivized through small transaction fees rather than newly created bitcoin.[15]

Acquiring Bitcoin

While mining is certainly one way that people acquire bitcoin there other ways that do not require the intense computer processing associated with mining. Your typical bitcoin user has three main avenues for acquiring the cryptocurrency, each with its own benefits and drawbacks. The first method is to use a web based currency exchange where you can buy bitcoin with fiat currency. This requires that you provide extensive information in order to comply with regulatory guidelines and as such is unattractive to those that wish to remain anonymous. Alternatively you can buy bitcoin from someone who has it and is willing to sell it. This could happen through a friend or you could be connected with a prospective seller through a bitcoin classifieds website. The final way to acquire bitcoin is to sell a product or service in exchange for bitcoin. There are some companies that pay their workers in bitcoin and some freelance software developers that request to be paid in bitcoin.

The Blockchain

As soon as you make a transaction, your bitcoin address becomes public and can be seen by anyone in the world. Most people associate bitcoin with secrecy and privacy and are

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[15] "Bitcoin Transaction Fees Explained." Bitcoin Fees, 12 Feb. 2014. Web. 18 Nov. 2015. <http://bitcoinfees.com/>.

taken aback when the public nature of the system is explained to them. Every single

transaction along with the amount of the transaction, the time of the transaction, the sender's

address, the receiver's address, and the node that confirmed the transaction is made public on

the blockchain.[16] All information contained on the blockchain can be accessed and explored

by anyone with an Internet connection. The blockchain does not, however, contain any

information on who owns the wallets participating in a transaction or what physical servers

those wallets are stored on. Furthermore, once a bitcoin transaction is made it is completely

irreversible. The anonymity and irreversibility of the system is both incredible and

controversial and the applications derived from them will be important for the implications in

this paper.

3 - Benefits of Bitcoin Over the Existing Financial Systems

Most of the praise awarded to bitcoin centers around the decentralization and ease of

transactions. The original paper published by Satoshi Nakamoto, the creator of bitcoin,

introduced bitcoin as a mechanism to get around the inefficiencies of the current banking

systems. A credit card transaction under the current financial system typically takes 3

business days to get confirmed while bitcoin takes only seconds to be registered globally and

at most 10 minutes to be included in the blockchain.[17] Credit cards also impose significant

fees on transactions, typically 1-3% for a basic, non-international purchase.[18] Credit cards

limit the size of transactions that can be made, barring people from buying things that are

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[16] See https://blockchain.info/ for a record of all bitcoin transactions.
[17] Nakamoto, Satoshi, *Bitcoin: A Peer-to-Peer Electronic Cash System*. 1. https://bitcoin.org/bitcoin.pdf
[18] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order* (New York: St. Martin's, 2015), 99.

below a certain price threshold. Finally, a single credit card transaction often necessitates the collaboration of nine different parties comprised of merchants, banks, card associations, and payment processors.[19] The number of involved parties as well as the fees increase when your transaction takes place internationally or involves exchanging between different currencies.[20]

Prior to bitcoin all of these downsides were necessary to ensure the system functioned properly. The main problems associated with fiat currencies are counterfeiting and double spending. In order to prevent these, banks must confirm and clear every single transaction taking place in the network, this is necessarily an expensive and time consuming process. Through the nature of bitcoin's distributed confirmation system all of this is avoided and the costs are covered, at least for the meantime, through the expansion of the currency. Even once all existing bitcoin has been mined the transaction costs collected by miners as incentive will be significantly lower than those collected by credit card companies.[21]

While this groundbreaking circumvention of financial institutions has the potential to revolutionize our financial systems and is one of the most impressive aspects of bitcoin, this paper focuses more on the circumvention of governments. This chapter will explore the extractive nature of economic and political institutions in some countries and how bitcoin can help to mitigate the negative impacts of those institutions and their policies.

3.1 - Extractive Political and Economic Institutions

A system of fiat currency relies on peoples' trust in the central bank. With the ability to print money and thereby decrease its value, central banks hold the ultimate power in a monetary system. People using that system trust the bank not to devalue the currency. Many

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[19] Ibid,. 98.
[20] Ibid., 100.
[21] "Bitcoin Transaction Fees Explained." Bitcoin Fees, 12 Feb. 2014. Web. 18 Nov. 2015. <http://bitcoinfees.com/>.

countries such as the United States have separated the central bank from political influences in an effort to build this trust and allow the bank to truly focus on the needs of the people. In developed nations these systems generally function properly and breaches of trust are rare. The same cannot be said for many developing countries, which suffer from poor governance and leadership and an undeveloped financial system.

Extensive research has gone into understanding the fundamental factors that have led to massive global inequality. Many theories center on culture, geography, and climate as the main drivers of economic growth or stagnation however, there are many counterexamples to each of these theories. In *Why Nations Fail,* Acemoglu and Robinson develop a theory that centers on the economic and political institutions that were developed at the time of colonization.[22] This theory explains much of the perplexing redistribution of wealth that took place after the colonial era. In terms of wealth of native populations, size of native populations, and amount of natural resources, Mexico and Peru were well ahead of what is now the United States in the 1500's. Today this dynamic has shifted completely and the border between Mexico and the US shows one of the starkest contrasts of inequality in the world.[23]

Acemoglu and Robinson's hypothesis is that because the Spanish used an exploitative method of colonization they destroyed much of the economic potential in the region and caused massive inequality and a lack of incentive to work for the majority of the population. This trend has persisted and has led to economic and political institutions that have reinforced it. Present day US and Canada, on the other hand, faced a very different form of colonization.

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[22] Acemoglu, Daron, and James A. Robinson. *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* (New York: Crown, 2012).
[23] Ibid., 8.

From the first instance of settlement on US soil it was evident that the native populations were not large enough or wealthy enough for the colonists to live off of sustainably. Unable to exploit the native populations, the elite in these new colonies had to instead provide positive incentives for the colonists themselves to be productive. This system paved the way towards inclusive political and economic institutions that foster economic growth.

The theory presented by Acemoglu and Robinson is that nations fail because they lack the inclusive economic and political institutions that foster growth. These institutions protect private property rights, incentivize private investment and innovation, and allow economic opportunities for all people. Extractive political and economic institutions, on the other hand, are characterized by a ruling body that uses its political and economic power to repress and exploit the majority of the population.[24] Once you have fallen into an extractive model it is very difficult to get out because the cycle is reinforcing. Extractive institutions lead to unstable governments, which can easily be overthrown through popular revolt. New leaders are then faced with the same incentives as the old leaders and usually do not change much at all. Few countries have ever been able to break out of the mold of extractive institutions and in the cases in which this was successfully done there was always a confluence of factors that made it possible.

The conclusions of this paper assume that it is the extractive nature of institutions in a country that lead to its economic stagnation rather than factors present in the geography or culture. The next section of this paper will examine the avenues through which bitcoin can help alleviate some of the symptoms of extractive institutions and even contribute to the confluence of factors that can help break the cycle of extractivity.

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[24] Ibid., 76.

3.2 - The Superiority of Bitcoin

While most people in developed countries are wary of bitcoin and do not see it as a viable alternative to the established financial systems that generally operate without incident, the developing world is ripe for a bitcoin revolution. In many developing countries, extractive institutions have led to financial systems that are either nonexistent or inadequate. People living within these institutions have dealt with risky financial arrangements and money transfers and have often held highly inflationary currencies.[25] For these people many of the risks associated with bitcoin are not nearly as daunting. Additionally, the developing world is very entrepreneurial and many of the businesses are small and operate on a small profit margin. For these businesses, cutting costs is essential and bitcoin provides a means to accomplish that goal. Finally bitcoin provides an avenue for money to inexpensively flow into and out of countries and facilitates investment and humanitarian aid from developed nations.

Currency Controls and Inflation

While high inflation may be a thing of the past in the United States and many other developed nations, many countries still experience rampant inflation. An inflationary currency necessarily drives savers in search of a more stable long-term store of value. The problem is compounded by the fact that many countries set their exchange rates artificially high to increase the value of their domestic currency. The result is that no one wants to hold the inflationary, artificially expensive currency and there is a flight to foreign reserves. A country can sustain the high demand for foreign reserves only so long until they must institute restrictions to preserve their reserves. In these countries citizens are either forced to hold

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[25] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 192.

inflationary currencies and watch their savings shrink, or buy foreign reserves on illegal black

markets

Argentina has become a central study subject when it comes to black market currency

exchanges. The Argentinian peso has endured historical inflation rates over 10,000% annually

and in the past few years unofficial inflation rates have hovered around 30%.[26][27] The high

current inflation and history of hyperinflation has led to a culture of saving in a foreign

currency, preferably the US dollar. In 2011, the Argentinian tax agency stopped approving

requests to buy dollars, effectively eliminating any legal option Argentinians had to store their

money in dollars.[28] For many Argentinians this policy was devastating and eliminated the

only real store of value they had available. The reason for the ban on purchasing foreign

reserves is that those reserves held by the Argentinian government were quickly being

depleted. The ban on purchasing foreign currency led to a thriving black market and in 2014

the Argentinian banking system offered an exchange rate of 9.06 pesos per dollar while black

market currency exchanges offered 13.24 pesos per dollar, nearly 50% higher.[29] Many

countries face a similar supply shortage of foreign reserves and these countries represent the

best environment for bitcoin to gain a foothold.

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[26] World Bank, *Consumer Price Index for Argentina* [DDOE01ARA086NWDB], retrieved from FRED, Federal Reserve Bank of St. Louis https://research.stlouisfed.org/fred2/series/DDOE01ARA086NWDB/, November 14, 2015.

[27] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 209.

[28] *The Economist*. The Economist Newspaper, 24 Jan. 2014. Web. 14 Nov. 2015. <http://www.economist.com/blogs/americasview/2014/01/currency-controls-argentina>.

[29] Russo, Camila. "Argentine Black-Market Peso Weakens on Concern Controls to Stay." *Bloomberg Business*. Bloomberg, 23 June 2015. Web. 17 Nov. 2015. <http://www.bloomberg.com/news/articles/2015-06-23/argentine-black-market-peso-weakens-on-concern-controls-to-stay>.

While the illegality of the black market seems to be of little concern to Argentinian citizens, the inefficiencies that are introduced through the use of a black market are incentive to switch to a bitcoin-centric system. An Argentinian wishing to hold his or her money in dollars would have to go to a black market exchange to buy dollars and then return to another black market exchange to turn them back into pesos when he or she needed to buy something. When used at stores, dollars are valued at the official exchange rate and are therefore only valuable when converted back into pesos at the black market rate. Argentina is left without a currency that really satisfies the three main building blocks of a currency. Dollars essentially act as only a store of value not a unit of account or mechanism of exchange while pesos do not act as a store of value. This introduces significant inefficiencies in travel and time in addition to the loss pursuant to the buy-sell spread when exchanging pesos for dollars. While bitcoin is only currently useful in a similar capacity to the dollar (it is a lousy unit of account) the system has room for vast improvement once merchants begin accepting bitcoin payments. If a critical mass of bitcoin accepting merchants were reached, the economy could operate without pesos or dollars and the significant inefficiencies would be erased completely, bitcoin would operate as a store of value, mechanism of exchange and unit of account.

At this point it is appropriate to question the validity of bitcoin as a store of value. Bitcoin is known to be wildly volatile as a currency, even prohibitively volatile. While this is certainly true, bitcoin has been strengthening against both the Argentinian peso and the US dollar for the past five years. So while bitcoin is more volatile that the Argentinian peso, the volatility may be preferable to rampant inflation. At least with bitcoin you are placing your money in a currency that has a history of appreciation. Additionally the volatility in bitcoin has fallen dramatically over the past five years as shown in Figure 1. Historically, price

swings of 100% per month were common, while the past year has seen drastically decreased

volatility.
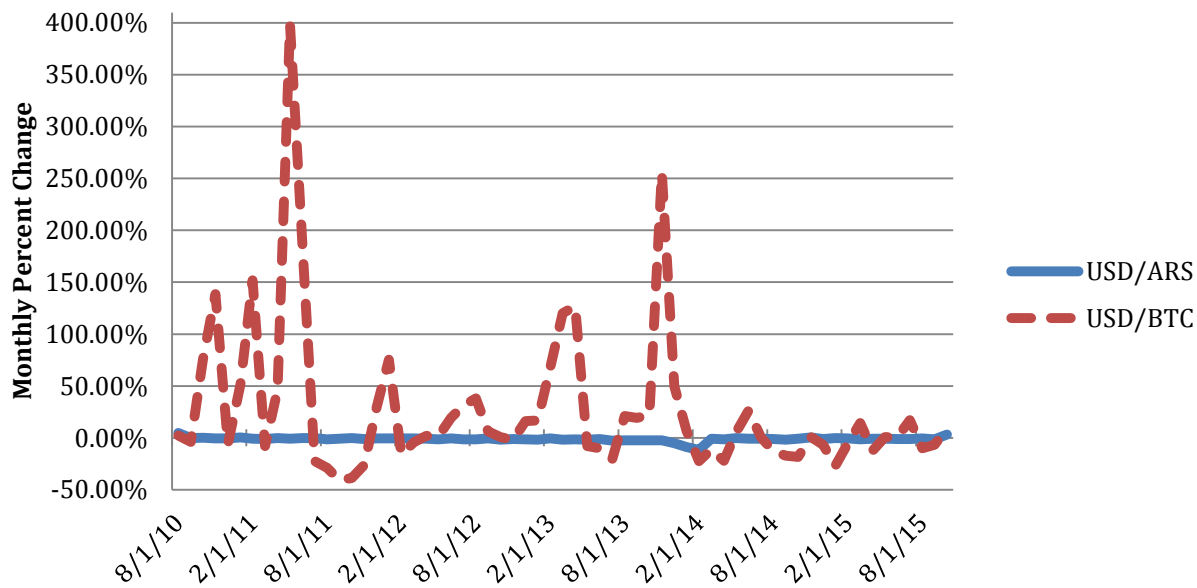
Figure 1: Volatility of bitcoin (BTC) and Argentinian pesos (ARS) compared to the United

States dollar (USD)[30][31]

While volatility is a major detractor from bitcoin, Figure 2 shows the dramatic

strengthening of bitcoin against the Argentinian peso, albeit with a large spike and subsequent

crash.

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[30] "USD vs ARS (CURRFX)." *Currrency Exchange Rates*. Quandl, 14 Oct. 2015. Web. 14 Oct. 2015. <https://www.quandl.com/data/CURRFX/USDARS-Currency-Exchange-Rates-USD-vs-ARS>.

[31] "Bitcoin Price Index." *CoinDesk Price & Data*. CoinDesk, 14 Oct. 2015. Web. 14 Oct. 2015. <http://www.coindesk.com/price/>.
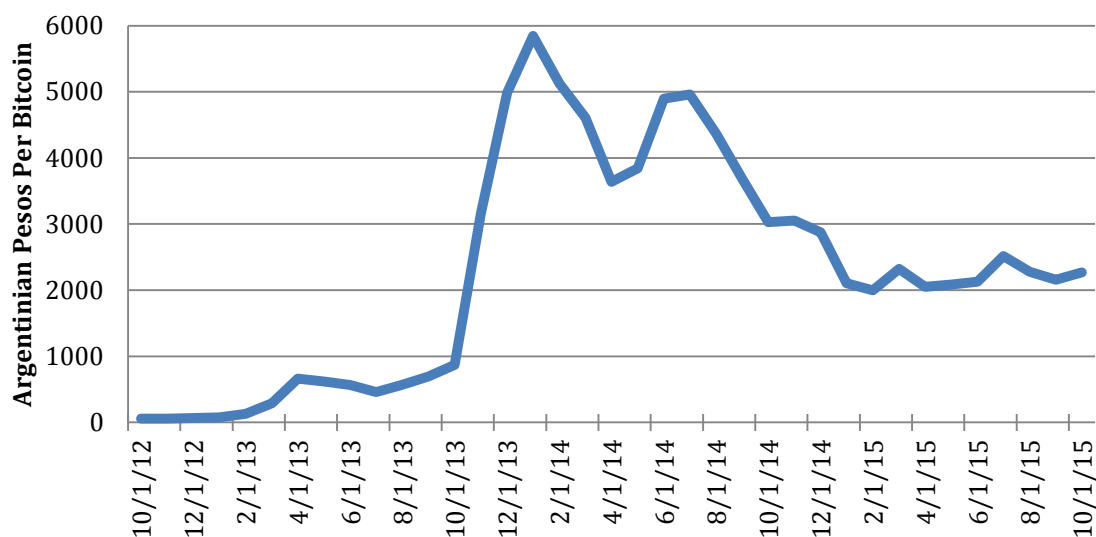
Figure 2[3233]**:** Argentinian peso - bitcoin exchange rate

Although bitcoin carries high risk at least there is the possibility of retaining or
increasing the value of your savings, which is more than can be said for the Argentinian peso.
One needs to find a balance between volatility and inflation and often times this balance
hinges on peoples' views on the future of cryptocurrency. If you are of the opinion that
bitcoin adoption will increase over time and it will become a more accepted currency, then
short-term volatility should not be much of a concern considering the long-term deflationary
trend and increasing stability. If, on the other hand, you are skeptical of the viability of
cryptocurrency, long-term stability is by no means guaranteed. Given this premise, the
problem facing all cryptocurrencies is that each of these predictions is self-fulfilling;
acceptance causes stability while rejection causes volatility.

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[32] "USD vs ARS (CURRFX)." *Currrency Exchange Rates*. Quandl, 14 Oct. 2015.
Web. 14 Oct. 2015. <https://www.quandl.com/data/CURRFX/USDARS-Currency-Exchange-Rates-USD-vs-ARS>.
[33] "Bitcoin Price Index." *CoinDesk Price & Data*. CoinDesk, 14 Oct. 2015. Web. 14
Oct. 2015. <http://www.coindesk.com/price/>.

Expanding the scope of this research to a global scale, it is apparent that many

countries face a situation similar to that in Argentina. Much of West Africa, Eastern Europe

and Central and South America face reported inflation rates of over 15% and have multiple

exchange rates.[34] It is also important to keep in mind that actual inflation rates in some of

these countries may be much higher than reported, Argentina's is estimated to actually be

more than double the reported rate.[35] While few people in developed nations with stable

currencies would choose to keep any real portion of their wealth in a currency that fluctuates

as much as bitcoin, this research shows that there may be a large market for bitcoin in the

countries with highly inflationary fiat currencies.

Decreasing Payment Processing Costs

In addition to helping savers avoid inflation, bitcoin has a lot to offer to merchants on

the flip side of the coin. Payments collected from tourists paying with foreign credit cards

need to be processed by the banking system. In addition to the fees associated with credit card

processing, merchants are charged the official exchange rate for these dollars and lose a large

portion of the prospective value. Merchants accepting bitcoin circumvent both these costs and

convert their bitcoin into pesos at a rate of around 11 pesos per dollar (at time of writing),

saving over 40 percent in all.[36] This is a drastic improvement that may mean the difference

between a small business prospering versus of going under. Argentina's actual poverty rates

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[34] "Inflation Rate." *Trading Economics*. 14 Oct. 2015. Web. 14 Oct. 2015.
<http://www.tradingeconomics.com/country-list/inflation-rate>.
[35] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 209.
[36] Ibid., 208.

are unknown but when unofficial estimates are as high as 30%, any additional savings that

Argentinian citizens can get helps tremendously.[37]

Investment and Humanitarian Aid

In addition to circumventing inflation and payment processing fees, bitcoin solves

many of the problems associated with international investment and humanitarian aid. The

current international financial system introduces a lot of inefficiencies when transferring

money into and out of countries. Fees tacked on to transfers out of the US can reach 10% and

some countries see fees of up to 20%.[38] Once exchange rate costs are added, the loss through

a transaction can be 30%.[39] This injects a lot of friction into the international aid and

remittance systems on which many countries rely. Bitcoin is already at the stage where it can

be used to transfer aid to any country in the world with negligible costs.

Simply used as a mechanism for transfer, bitcoin's potential is not fully realized. If

bitcoin reaches a point where it can be used not only to transfer money for aid but also to

administer aid, money donated in developed countries would go that much further in helping

the poor. There is also an appeal of the public blockchain when it comes to regulating aid

agencies and determining where money is being spent. If an agency was to make its bitcoin

address public, anyone could see where its inflows and outflows of money were coming from

by simply looking up that address on the public blockchain. This provides the perfect way to

limit corruption and embezzlement.

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[37] "Argentina Is Paradise: Poverty below 5% Rate Cristina Fernandez Tells the World." *MercoPress South Atlantic News Agency*. MercoPress, 9 June 2015. Web. 14 Nov. 2015. <http://en.mercopress.com/2015/06/09/argentina-is-paradise-poverty-below-5-rate-cristina-fernandez-tells-the-world>.

[38] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 189.

[39] Ibid.,

Banking the Unbanked

In addition to circumventing extractive political and economic institutions, bitcoin provides a means to greatly expand financial services in the developing world. Approximately 2.5 billion adults in the world are unbanked and are completely cut off from the benefits that financial services offer.[40] These people cannot start savings accounts or use credit cards and are generally excluded from the financial systems that have led to massive investment in developed countries. Cash and other commodities become the only store of value for these people and this greatly reduces the ease with which value can be transferred from party to party without a physical meeting. Generally the reason these individuals are unbanked is that they have no identifying credentials or collateral to open a bank account. None of these factors matter for bitcoin. A number of startups have already started facilitating bitcoin transactions in developing countries through the use of individuals' cellphones, which have become ubiquitous in countries where the majority of the population lacks access to even the most basic financial products.[41]

Enabling all of these unbanked with bitcoin wallets that can be accessed through their cellphones would not only provide the benefits of a bank account but a bank account with negligible fees. We have already seen what mobile payment systems such as M-Pesa can do for developing countries. Bitcoin has all of the benefits of M-Pesa but has lower transaction fees and is borderless. While M-Pesa was a breakthrough in mobile payment technology and showed the world the viability of such a model, it is localized and very limited in its ability to benefit people throughout the rest of the developing world. A mobile bitcoin system would be international and could facilitate both local transactions as well as international transactions.

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[40] Ibid., 186.
[41] Ibid., 189.

Ignore, for a moment, the large aid organizations and their inefficiencies and lack of transparency, bitcoin could potentially create a system in which people could donate directly to needy individuals in developing countries. Like websites such as Tilt, people could initiate personal pleas for money that could be met by individuals in developed nations. Such a system would make international humanitarian aid much more personal and the benefits much more observable. In addition to simple aid, bitcoin could facilitate small-scale investment in projects from anywhere in the world. Widespread use of bitcoin has the potential to break down barriers between the rich and the poor and completely reform the way that aid and investment is conducted on an international scale.

4 - Empirical Analysis

4.1 - Bitcoin Data

Being a fully anonymous system, data on bitcoin is difficult to work with. All of the transactions are publicly available but there is no information on where the transactions are taking place or who is initiating or receiving them. In order to measure the relationship between the extractivity of a nation's political and economic institutions it would be ideal to have data on bitcoin usage within each country. While geolocation of bitcoin transactions is impossible, there are a few other metrics that can be used to measure bitcoin usage. The first is the number of bitcoin client software downloads by country. This represents a relatively good proxy for number of people using bitcoin in a country but excludes all of the third party hosted wallets that are being used. Using downloads also doesn't give any indication of how much money is being transacted.

The second avenue, and the one pursued in this paper, is to look at the amount of each fiat currency involved in bitcoin transactions on exchanges. Bitcoin Charts is a website

devoted to providing data on the bitcoin network. While transactions involving only bitcoin

are impossible to geolocate, transactions involving a fiat currency are recorded when using an

established exchange. Bitcoin Charts aggregates data from over 40 different exchanges in real

time.[42] Data from one of those exchanges, LocalBitcoins, was used for analysis in this paper.

LocalBitcoins is not one of the largest exchanges in terms of traffic but it was chosen

because it operates in the most countries. The exchange is a classifieds website that operates

similar to Craig's List where users post advertisements for buying or selling bitcoin. The

exchange is operational in almost every country in the world and while it represents only

.22% of total bitcoin traffic, it makes up a large portion of the bitcoin usage that this paper is

studying. The vast majority of bitcoin transactions take place through a few large bitcoin

exchanges such as Ok Coin, Huobi, and Bitfinex, which are primarily used as speculative

trading platforms.[43] The purpose of this analysis is to examine whether bitcoin is being used

in a nonspeculative fashion in developing nations. In pursuit of that goal, data from

LocalBitcoins captures a much larger percentage of the bitcoin use I am trying to analyze.

This study does exclude data from other smaller, nonspeculative bitcoin exchanges that would

be of interest, however, for consistency, only data from local bitcoins is used. Data on 21

different countries were collected and are shown in Table 1 below. Bitcoin usage in 2015 was

the final bitcoin variable selected and for the regressions this variable was log transformed so

that the percentage impact of the regressors on bitcoin usage could be measured.

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[42] For all data on bitcoin exchanges through BitcoinCharts visit
http://bitcoincharts.com/charts/localbtcARS#rg60ztgSzm1g10zm2g25zv and load raw data.
[43] Cieśla, Kacper. "Exchanges." *Bitcoinity.org*. Web. 14 Oct. 2015.
<https://bitcoinity.org/markets/list?currency=ALL&span=6m>.

4.2 - Regressors

The purpose of my empirical analysis is to examine the extent to which bitcoin is being used in the real world to circumvent extractive governments. To this end, bitcoin usage is regressed against a number of factors that are indicative of extractive institutions. The two most important are financial openness, as defined by the Chinn-Ito Financial Openness Index, and inflation.

Measuring financial openness across countries is difficult for a number of reasons, many countries, such as Argentina, exercise capital controls without implementing any formal policies, causing artificially high measures of financial openness. Alternatively capital controls can sometimes be easily circumvented by the private sector in which case financial openness is underestimated.[44] In response to this challenge Menzie Chinn and Hiro Ito have developed what they believe is a more comprehensive measure of financial openness. Their measure incorporates the presence of multiple exchange rates, restrictions on current account transactions, and the requirement of surrender of export proceeds.[45] It represents an overall measure of the ease or difficulty with which citizens can acquire foreign currency and transact capital. Two different variables for financial openness are used in this analysis; an average of financial openness over the past 45 years and the most recent financial openness data, which is for 2013.

The second regressor is inflation, which is hypothesized to be one of the main drivers of bitcoin adoption in underdeveloped countries. The inflation rates used in this analysis were derived from the consumer price indices available through the Federal Reserve Economic

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[44] Chinn, Menzie D. and Hiro Ito (2008). "A New Measure of Financial Openness". Journal of Comparative Policy Analysis, Volume 10, Issue 3, p. 309 –322 (September).

[45] Chinn-Ito Financial Openness Index. Download link: http://web.pdx.edu/~ito/kaopen_2013.xls

Data from the St. Louis Fed.[46] Percent change in CPI over the past year was used to get

annual inflation rates. The two variables used are the annual inflation rate in 2014, and the

average annual inflation rate over the past 35 years.

Another hypothesized reason for bitcoin adoption is the lack of bank accounts for a

large portion of the population in developing countries. To measure the correlation between

bank account availability or usage and bitcoin usage, the percentage of the population with a

bank account was included as one of the regressors. The data for this variable was gathered

from the Global Financial Inclusion Database put out by The World Bank.[47]

Table 1: Bitcoin data by country

Country Name	Bitcoin Usage 2015	Financial Openness 2013	45-Year Average Financial Openness	Inflation 2014	35- Year Average Inflation	Internet Penetration	Percent Banked 2014
Argentina	4935.22	-1.89	-0.46		267.56	75.08	50.20
Australia	74843.3	1.61	1.14	6.3	344.75	90.15	98.86
Brazil	2182.84	-0.13	-1.2	2.5	4.38	53.27	68.12
Canada	17574.09	2.39	2.39	1.9	3.51	92.85	99.10
Czech Republic	946.39	2.39	1.76	0.4	3.32	79.19	82.18
Denmark	287.28	2.39	1.3	0.6	3.43	96.09	100
Hong Kong, China	3927.01	2.39	2.35		4.54	79.42	96.15
India	7372.39	-1.19	-1.19	6.4	8.29	27.33	53.14
Israel	11.38	2.39	0.36	0.5	41.10	72.17	89.95
Mexico	5766.32	1.09	0.89	4	27.60	47.21	39.14
New Zealand	3365.78	2.39	1.38	1.2	5.27	92.29	99.53
Norway	4179.65	2.39	1.01	2	3.94	95.32	100
Poland	2932.44	0.04	-0.81	0.1	35.55	67.55	77.86
Russian Federation	73310.03	1.17	-0.19	7.8	78.64	60.82	67.38
Singapore	1636.11	2.39	1.82		1.84	85.07	96.35

[46] World Bank, *Consumer Price Index for Argentina* [DDOE01ARA086NWDB], retrieved from FRED, Federal Reserve Bank of St. Louis https://research.stlouisfed.org/fred2/series/DDOE01ARA086NWDB/, November 14, 2015.
[47] "Global Findex (Global Financial Inclusion Database)." *World DataBank*. The World Bank, 2015. Web. 14 Nov. 2015. <http://databank.worldbank.org/data/reports.aspx?source=1228#>.

South Africa	26879.96	-1.19	-1.21	6.1	8.82	49.70	70.32
Sweden	19101.22	2.39	1.65	-0.2	2.86	95.12	99.72
Switzerland	4092.53	2.39	2.39	0	1.55	87.67	97.99
Thailand	12013.56	-1.19	-0.27		3.44	35.02	78.13
United Kingdom	185877.6	2.39	1.65	1.3	2.35	88.77	98.93
United States	686282.8	2.39	2.39	1.5	3.08	88.05	93.58

Obviously bitcoin usage is heavily dependent on a country's access to Internet and availability of technology. In order to control for the wide variation in these variables across countries, the level of Internet penetration was used as a proxy for overall availability of technology and Internet. Data on Internet penetration by country was collected from the Internet World Stats Website.[48] The data is aggregated by the website from all of the major regional Internet registries which manage the IP address space. The Internet penetration variable is the percentage of the population with access to the Internet. Two additional control variables were added, GDP and Population, each of which was log transformed for the regression. The data for these two variables was gathered from the World Bank Website.[49] [50]

4.3 - Results

Table 2 shows the regression results when the Log of bitcoin usage in 2015 is regressed against different combinations of the regressors. In order to relax the assumption of homoskedasticity, the regressions were computed using robust standard errors.

Table 2: Regression Results. Asterisks represent different significance levels: *-10%, **-5%, ***-1%.

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[48] "The Internet Big Picture." *Internet Usage Statistics*. Internet World Stats, 30 June 2015. Web. 1 Nov. 2015. <http://www.internetworldstats.com/stats.htm>.
[49] "GDP (current US$)." *Data*. The World Bank, 2015. Web. 25 Oct. 2015. <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>.
[50] "Population, Total." *Data*. The World Bank, 2015. Web. 20 Oct. 2015. <http://data.worldbank.org/indicator/SP.POP.TOTL>.

Variable		Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
Log Population	Coefficient	1.502 ***				
	Standard Error	0.278				
	P-Value	0.000				
Log GDP	Coefficient		1.545 ***	1.581 ***	1.48 **	1.257 ***
	Standard Error		0.377	0.378	0.513	0.362
	P-Value		0.003	0.001	0.018	0.010
Inflation Rate 2014	Coefficient	0.368 **	0.378 **		0.468 *	0.516**
	Standard Error	0.120	0.157		0.221	0.193
	P-Value	0.011	0.040		0.063	0.032
35-year Average Inflation Rate	Coefficient			0.00106		-0.00533
	Standard Error			0.00494		0.00392
	P-Value			0.834		0.216
Financial Openness 2013	Coefficient	-1.145 *	-1.473 *	-0.626		-2.194 ***
	Standard Error	0.613	0.690	0.660		0.625
	P-Value	0.089	0.061	0.360		0.010
45-year Average Financial Openness	Coefficient				-0.0761	1.135
	Standard Error				0.7928	0.776
	P-Value				0.919	0.187
Internet Penetration	Coefficient	0.253 ***	0.200 **	0.0151	0.798	0.170 **
	Standard Error	0.0679	0.0729	0.0467	0.103	0.0648
	P-Value	0.003	0.023	0.752	0.457	0.034
Percent Banked	Coefficient	-0.0828 *	-0.0922 *	0.0360	-0.0324	-0.0620
	Standard Error	0.0434	0.0490	0.0278	0.0841	0.0451
	P-Value	0.082	0.093	0.217	0.709	0.212
Intercept	Coefficient	-28.492 ***	-39.809 ***	-37.929 ***	-36.43 **	-32.172 **
	Standard Error	5.724	10.516	11.400	14.664	10.202
	P-Value	0.000	0.004	0.005	0.035	0.016
R-Squared		0.780	0.768	0.546	0.666	0.831

Regression 1 shows the coefficients, standard errors and p-values for a regression when controlling for population and regression 2 shows the results when controlling for GDP. These are the two regressions of most interest as they represent the most significant results and also yield interesting implications. You can see that all regressors are significant at the 10% level in both of these regressions and that all but percent banked and financial openness in 2013 are significant at the 5% level.

When looking at inflation in the first regression we see that a one-percentage-point increase in the inflation rate in 2014 leads to a .368 increase in log bitcoin adoption. When the log is transformed (exp(0.368)-1), a one-percentage-point increase in inflation leads to a 44.48% increase in bitcoin usage in 2015 holding all else equal. When controlling for GDP in the second regression the result is a 45.94% increase in bitcoin adoption when inflation

increases by one-percentage-point. This large coefficient shows that inflation doesn't just have a statistically significant impact on bitcoin usage but also a large economically significant impact. This implies that bitcoin is in fact being used as a saving haven for those confined to inflationary currencies and that a small increase in inflation can lead to a profoundly large increase in bitcoin adoption.

Financial openness, which was hypothesized to have a large negative relationship with bitcoin adoption proves only to be significant at the 10% level but nonetheless seems to follow the expected relationship. An increase in financial openness by one unit leads to a 1.15 decrease in log bitcoin usage in 2015 or a 216% decrease in bitcoin usage, all else equal. This seems impossibly large but when considering that financial openness across the sample only ranged from -1.89 and 2.39 it becomes more reasonable. A one-unit decrease in financial openness is highly unlikely, in fact only two of the countries in the dataset had changes to their financial openness indices from 2012 to 2013, Russia and Australia, and both of them had only a .26 increase to their financial openness indices.[51]

Interestingly the significance decreases dramatically in the second and third regressions when historical inflation rate and historical financial openness are used. When the 35-year average inflation rate is used instead of the rate for 2014 the coefficients for all regressors except for log GDP become insignificant. The same results are observed when 45-year average financial openness is used in place of 2013 financial openness. These results are counterintuitive as it was expected that there would be a significant historical precedent driving bitcoin adoption. Historical inflation and financial openness in a country were expected to have a much larger impact on people's skepticism of government monetary

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[51] Ibid.

policies than the most recent values for each of those measures. The regressions show, however, that recent numbers for both of these variables are much more influential in determining bitcoin adoption. One possible reason for this trend is that bitcoin adopters are more tech-savvy and therefore younger and haven't had to deal with past inflation or financial restrictions. Their decisions are being driven by more recent trends in inflation and financial openness. It would be interesting to examine the impact of financial openness and GDP over different time horizons to see whether this hypothesis holds up.

The variance of inflation was also experimented with as a regressor, the logic being that high variance in historical inflation may also make people wary of their local currencies. It was found that while variance of inflation over the past 35 years had a statistically significant impact on bitcoin adoption, that impact was not economically significant. Including inflation variation didn't much change the impact of other variables.

When examining the impact of percent banked we see that the results are as expected. A one-percentage-point increase in the percentage of people in a country that have a bank account leads to a 0.083 drop in log bitcoin usage, or an 8.65% drop in bitcoin usage, all else equal. This shows that a lack of established banking systems is driving people to use bitcoin wallets in place of traditional bank accounts. This could be motivated by a need to store money electronically or because people lack an efficient way to transfer money in an underbanked country.

It is clear from these results that 2014 inflation rates and 2013 financial openness, as measured by the Chinn-Ito Financial Openness Index, are the most significantly correlated with bitcoin adoption in a country, when all else is held equal. It is also interesting that higher

R-Squared values are observed when controlling for population rather than GDP. This is unexpected as bitcoin adoption was assumed to be more highly correlated with GDP.

I have thus far assumed that the relationships between variables are causal, however there are a number of reasons why causality may not hold. Any one of the four assumptions needed to ensure unbiasedness of the estimators could be violated. The most likely violations would be measurement error in inflation and omitted variables. As was acknowledged earlier, there is known misreporting of inflation for some developing countries. This could most certainly have an impact on the results of the regression but the hope is that very few countries in the dataset are misreporting their inflation numbers.

Omitted variables are a problem with any regression and time was taken to think about the economic drivers of bitcoin adoption. While the economic drivers are generally included, there may also be social drivers that are excluded and could be impacting the results. One example would be the social status bump received from the perceived technical ability that is necessary for using bitcoin. Another possible driver would be the sense of freedom that comes with bitcoin. Both of these factors are definitely significant drivers in developed countries.

While these results are inspiring in that they show that bitcoin can be used as a viable alternative to the monetary systems established by extractive governments, bitcoin has a number of weaknesses that should be addressed as we consider the overall implications of widespread adoption.

5 - Weaknesses of the Bitcoin System

5.1 - Security

One of the main problems with bitcoin is security. The lack of a central authority puts more of the responsibility for security on the individual user.[52] All transactions made in bitcoin are irreversible, there is no way to recall charges if someone gains access to your account and spends your bitcoin without your approval. Bitcoin wallets are susceptible to hacking just like any other account and if your bitcoins are taken there is no recourse. You do have the option of keeping your bitcoin wallet offline and therefore eliminating most of the risk of hacking, but this comes with a number of other challenges.[53] If the wallet is stored on a local hard drive you could lose or damage the device and be unable to access it. If this happens all of the bitcoin in that wallet are similarly lost or destroyed. Additionally if you forget your private key you will be unable to access your bitcoins and even though you still have them in your wallet they can never be spent.

5.2 - Volatility

The second largest concern is price volatility. While the fiat currencies in many countries can be a terrible store of value, bitcoin has shown that its volatility can make it a bad store of value as well. In October and November of 2013 the price of bitcoin rose 800 percent and then proceeded to fall 50 percent in December 2013.[54] The reality is that bitcoin's price volatility will continue in the near future. While this diminishes its utility as a currency, proponents of the system hope that it is merely a transitional phase. Some even argue that

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[52] While bitcoin is risky, holding your savings in cash is also risky and involves security concerns.

[53] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 105.

[54] "Bitcoin Price Index." *CoinDesk Price & Data*. CoinDesk, 14 Oct. 2015. Web. 14 Oct. 2015. <http://www.coindesk.com/price/>.

volatility is positive in these early stages as it encourages speculators and thereby necessitates the creation of more advanced, safer exchanges that will eventually be used in a nonspeculative fashion.[55]

5.3 - Destabilizing Governments

Today's governments play a major role in all aspects of our lives. They provide education, infrastructure, social-welfare, regulation of commerce and security and defense. To provide all of these services they demand that citizens abide by their laws and pay taxes. One of the foreseeable problems arising from widespread bitcoin adoption is that it will undermine a government's ability to provide critical services. While developed countries will likely be able to bring bitcoin into the folds of financial regulation and tax it like they do any other financial system, developing countries may have a harder time. Bitcoin poses a much larger threat to a country that simply prints money to pay off debts and artificially elevates exchange rates. These countries have incentive to ban or limit bitcoin and yet they are faced with a citizenry that benefits from the technology and has little qualms about operating outside of the legal sphere when it comes to personal finances, as is shown by the flourishing black-market in many countries.

In defense of bitcoin the governing bodies of the countries targeted in this paper can often be blamed for the economic situations they face. As outlined by Acemoglu and Robinson, nations fail economically because they are extractive and exploit their citizens for their own enrichment. In this case citizens rightly use all avenues available to them to circumvent their governments. On the other hand, the path to economic prosperity in these countries may not be to simply abandon the government institutions. Circumventing the

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[55] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 110.

governments will further undermine their credibility as well as their ability to maintain what positive contributions they make to society. Ultimately these countries need to see the implementation of inclusive government institutions, not the exclusion of government entirely. The challenge is breaking out of the cycle of extractivity, and this is where bitcoin can help.

Bitcoin can foster short-term economic prosperity that will filter through all levels of society. At the same time it will necessarily undermine the established government and potentially make way for a new system of government that realizes the power of the people to operate independently of the government. Any new system would necessarily have to concede more to the people and be more inclusive in order to gain credibility and buy-in from the citizenry.

There is also the situation where the government is not entirely to blame for economic stagnation. While this may not be the case over the long-term, it can certainly be the case with short-term economic downturns. It is in these situations that bitcoin can play the most detrimental role. If an economy began to rely heavily on bitcoin, economic downturns could be exacerbated. While many countries carry out irresponsible monetary and fiscal policy, in times of crisis these are really the only avenues available to stimulate the economy. The government will still have control over its fiat currency and can still expand the money supply to drive down interest rates or engage in fiscal stimulus. However if a large portion of the country's economy is operating outside of the fiat currency then the impacts of these policies would be much smaller. In an economic downturn credit would dry up and it would be hard for the central bank to be the lender of last resort to an economy that operates largely in bitcoin.

5.4 - Lack of a Banking System

Circumvention of financial institutions has been heralded as one of bitcoin's greatest qualities, however financial institutions play an important role in addition to facilitating transactions and processing payments; they serve as the intermediary between borrowers and lenders. While bitcoin has the potential to liberalize capital in developing nations and make money available to those who want to invest, this usually necessitates some central party matching savers with borrowers. Bitcoin in its raw form lacks any sort of central mediating authority, which presents a problem when it comes to verifying the credibility of borrowers. While it provides an avenue through which the unbanked can easily save, the benefits realized from saving in a traditional banking system do not necessarily exist in a bitcoin-centric system. While this is a downside, it is a problem that will most likely be overcome with time. Large amounts of capital will not sit uninvested in bitcoin wallets for long before someone devises a way to get that capital to people with good investment ideas.

6 - The Future of Bitcoin

6.1 - Internet Penetration

While the results show that bitcoin is being used as a legitimate way to circumvent extractive institutions, there are still some major barriers to bitcoin becoming widely adopted. First, Internet penetration, which had a highly significant impact on bitcoin adoption, is severely lacking in many parts of the world that could benefit most from bitcoin. As discussed earlier, Internet access has increased dramatically in many developing countries through the use of data-enabled cellphones. Even phones without Internet access could be used, in an M-Pesa like system, to access bitcoin wallets managed by a third party company. Considering

these two different avenues, it is unlikely that technology remains the main barrier to adoption in coming years.

6.2 - Government Regulation

The next large barriers to adoption are government regulation and volatility, which are both closely linked. In developed nations bitcoin serves mostly as a means to facilitate transactions and as a speculative commodity. While these are not the uses that many bitcoin enthusiasts have hoped for, they do represent a major source of demand for bitcoin. Large developed nations using bitcoin in this auxiliary capacity could provide enough demand to stabilize bitcoin, at which point it could become a much more viable currency for the developing world. The last few years have shown that people in developed countries are wary of the new, unregulated currency, so this auxiliary market depends heavily on regulation. It is therefore useful to take a look at some of the attempts at and challenges to regulation.

The main challenge posed to regulation is the distributed structure of the bitcoin network. There is no central authority on which to impose financial regulations, this makes it impossible to regulate bitcoin through a top down approach. Alternatively governments could try to regulate it from the bottom up, making it illegal for someone to own bitcoin. While this might be possible in other countries, it would be incredibly difficult in the US. Banning people from owning bitcoin is essentially banning them from owning a piece of computer code, which is really just a form of communication. If a government did find some legal grounds on which to ban bitcoin they would then be faced with the much tougher challenge of policing. The reason bitcoin has surfaced as the main currency in illegal online markets is that it is completely anonymous. It would be very difficult for any regulatory body to determine who is holding bitcoin.

There is, however, an avenue through which regulators can influence bitcoin. As was discussed earlier in this paper there is a certain level of technical ability required for someone to personally maintain a bitcoin wallet. This has led to a large market for bitcoin exchanges and third party platforms. Combine this with the fact that merchants often want third party payment processors to handle any bitcoin payments and it is easy to see that there is a significant need for private companies operating within the bitcoin sphere. These companies are all ripe for regulation and this is exactly the avenue many developed nations have taken. The United States, United Kingdom, Canada and other developed nations have incorporated bitcoin exchanges into financial regulations and now mandate compliance with anti money laundering laws and other financial regulations.[56][57] Barring the libertarian bitcoin contingent, most people view these guidelines not as a restraint but as a validation. Additionally many countries have instituted very favorable regulations or taken a hands-off approach. Bulgaria formally recognized bitcoin and set a 10% tax rate on income generated through bitcoin.[58] Switzerland announced that it didn't intend to impose any special rules on bitcoin beyond the financial regulations that are already in place and a number of island nations in the Caribbean and English Channel are welcoming bitcoin exchanges with little or no regulation to speak of.[59]

While the message has been positive in many western countries, other countries have taken a more blunt approach. In 2014 the People's Bank of China barred all Chinese banks

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[56] "Regulation of Bitcoin in Selected Jurisdictions." *Bitcoin Survey*. Library of Congress, Jan. 2014. Web. 14 Nov. 2015. <http://www.loc.gov/law/help/bitcoin-survey/#_ftn5>.

[57] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 255.

[58] Ibid., 263.

[59] Ibid., 264.

from dealing with bitcoin businesses.[60] There have also been adverse regulatory actions taken

in developing nations. Bolivia and Ecuador have instituted outright bans on bitcoin and

Columbia chose to bar banks from working with bitcoin companies.[61] While these regulatory

actions seem to obsolesce the conclusion that bitcoin will be a major player in the developing

world, this might not be the case. In many countries with currency controls, currency black

markets are in widespread use despite government regulations. This shows that people in

these countries are accustomed to and willing to operate outside of the legal realm when it

comes to personal finances. Users of bitcoin can therefore benefit from the stability pursuant

to legal adoption of bitcoin in developed nations regardless of the regulatory environment

within their home country. Ultimately the fate of bitcoin in large developed markets is still

being discussed, and as such the utility of bitcoin in the developing world is still

undetermined.

7 - Conclusion

Bitcoin as a currency has an unclear road ahead of it. Its success or failure really

hinges on whether it reaches a critical mass to eliminate wild volatility and reaching this

critical mass is by no means a given. One of the main challenges posed to bitcoin is

advancement in current payment technology. MasterCard and American Express are rapidly

advancing in response to digital currencies and if they can provide the same solutions that

bitcoin provides, bitcoin will no longer have any market and will most certainly remain a

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[60] "Regulation of Bitcoin in Selected Jurisdictions." *Bitcoin Survey*. Library of Congress.

[61] Rizzo, Pete. "Bolivia's Central Bank Bans Bitcoin." *CoinDesk News*. CoinDesk, 19 June 2014. Web. 14 Nov. 2015. <http://www.coindesk.com/bolivias-central-bank-bans-bitcoin-digital-currencies/>.

fringe currency.[62] In the developed world where you can swipe your credit card or pay with your phone at a cash register, the masked transaction fees and latency are clearly not a large enough deterrent from established currency systems. The convenience of bitcoin would have to be nearly on par with credit cards and mobile payment systems to generate widespread adoption of bitcoin. This would mean nearly all merchants would have to accept bitcoin, it would have to be easy and fast to acquire bitcoin, and the technology would have to be sufficiently simple for the layperson to use without much training. While this is possible, credit card companies are working to streamline their processes and may be able to stay ahead of the curve and minimize the costs and inconveniences associated with their systems just enough to prevent a critical mass of users migrating to bitcoin.

In the developing world where people lack access to financial products such as credit cards and bank accounts, the race is to be the first to incorporate these people. This is a market that will soon be technologically ready for mobile payment and banking and bitcoin has the potential to fill that need and bring with it all the benefits described in this paper. Conversely if the established credit card companies or telecom companies capture the market first, bitcoin will face the same problems it does in the developing world; it's a superior system than the existing one but it isn't superior enough to cause a revolution.

The results of the regressions show that citizens of countries with extractive political and economic institutions are already adopting bitcoin. While this is promising and demonstrates that some people are beginning to realize the benefits, society has barely even begun to achieve the full potential of bitcoin. Unless it can be adopted on a more widespread

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[62] Vigna, Paul, and Michael Casey. *The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order,* 281.

scale the price will remain volatile and it will be difficult to use bitcoin as a currency in everyday life. The problem remains that the benefits of bitcoin will only be accessible through widespread adoption and yet widespread adoption relies on those benefits being accessible. Until the price stabilizes it is unlikely that the majority of people in developing countries, who are already living on the bare minimum, will risk placing much of their wealth in a currency that could lose half of it's value in one week. If bitcoin can't gain a foothold somewhere it will remain a volatile psudocurrency and never realize its full potential.

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