

What is Bitcoin? Imaginative Control and the Realities of Innovating within Capitalist Markets

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In less than a decade, Bitcoin has gone from being the monetary experiment of a small group of “Techno-Libertarians” to becoming the basis of new multibillion (USD) financial technology and digital asset sectors dominated by the many of the same institutions and actors it was initially intended to subvert. Building upon recent work by Beckert (2017) that has centered the role of “imagined futures” in economic action, this article argues that this developmental trajectory is a natural outcome of innovation in capitalist markets, one that arises from such systems’ inherent bias toward realizing the frameworks of interpretation and valuation possessed by those who are best positioned in the existing order to direct the flow of investment resources. Leveraging the strong conformance to free market ideals that characterized cryptocurrency’s conception and development, this work draws upon an original collection of sources documenting the history of cryptocurrency’s development, automated content analysis of over 7,500 media reports between 2011 through early 2016, and longitudinal trends in venture capital funding over the same time period to demonstrate how this emergent form of imaginative control plays out in real capitalist markets and the impacts this dynamic has on bounding the space of products and solutions that are likely to arise from innovation within capitalist markets.

“The Times 03/Jan/2009 Chancellor on brink of second bailout for banks”

– Comment left in code of the Bitcoin ‘Genesis Block,’ 1/4/2009

“Eleven top investment banks have used blockchain technology to do mock trades with each other, signalling a big step towards adopting the technology first developed for bitcoin into mainstream finance.”

- *Business Insider*, 1/20/2016

1. Introduction

In the comments of the computer code used to generate the first Bitcoin¹, Satoshi Nakamoto, the still unknown creator of Bitcoin, placed a headline from the preceding day’s edition of the *UK Times*: “03/Jan/2009 Chancellor on brink of second bailout for banks.” The

¹ The so-called “Genesis Block.”

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inclusion of this headline reflected an antipathy toward the establishment banking and finance system that motivated the invention of cryptocurrency. Grounded in a specific strand of “Techno-Libertarian” and “Anarcho-Capitalist” politics that has been described as a new form of “digital metallism” (Maurer, Nelms, and Swartz 2013), Bitcoin was originally intended to become the basis of a new, stateless money that emulated the properties of gold backed currencies. The vision motivating this “monetary utopian” (Dodd 2014) project was of a future in which cryptocurrency’s success as a superior, global payment system would subvert the power of central governments and the corrupted alliances that existed between them and big banks (Golumbia 2016; Popper 2015). Just seven years after its inception, however, a very different future had begun to be realized – one driven by many of those same big banks investing

hundreds of millions (USD) in the burgeoning arenas of digital asset trading and blockchain technology. As ironic as this transition might seem, this will work argue it also reflects an inherent, emergent dynamic of innovation within capitalist markets.

Building upon recent theoretical developments on the central role of “imagined futures” (Beckert 2013, 2017) in economic action, this article leverages the unique case of cryptocurrency to interrogate how capitalist markets unevenly realize the visions (Nye 1997; Sturken and Thomas 2004) different constituencies of actors attach to innovations. Rather than being a product of external, social or institutional forces, the model developed herein posits a mechanism of interpretative cumulative advantage (DiPrete and Eirich 2006; Merton 1968) that is endogenous to capitalist markets. Specifically, it develops a model of “imaginative control” as being a native dynamic to capitalist markets in which the imaginaries (Beckert 2017; see also Jasanoff and Kim 2009 for application within national cultural contexts) and associated valuations of those with greater power over investment decisions disproportionately determine the direction of market-based “progress.” This work pays further special attention to how this dynamic manifests in commonly found situations where incumbents in the existing market order (Fligstein 2001; Fligstein and McAdam 2012) have significant power over the allocation of investment resources. In such cases, this model asserts that there should be a tendency toward selection *against* the development of innovations, or versions thereof, that potentially undermine such advantaged actors’ positions.

The ultimate implications to be drawn from this model are that for all their purported democratizing effects, innovation in capitalist markets will be inherently biased toward realizing imagined futures that are conceivable to and valued by advantaged actors in the existing system. Additionally, in many cases market driven innovation will also tend to be consistently bounded

away from products or solutions that could foreseeably undermine the prevailing economic order. These insights will in turn lead to an assertion that there are few a priori reasons to expect capitalist markets to reliably develop products or solutions that are “better” per any valuation criteria that are orthogonal or counter to the valuation frameworks imposed by those who are well-positioned in the existing system vis-à-vis their power over investment decision making.

To empirically demonstrate these dynamics, this article leverages the strategic case of Bitcoin and subsequent development of cryptocurrency and blockchain technology over the first eight years of their existence. In addition to the folk economic (Swedberg 2018) brand of market fundamentalism (Block and Somers 2014) which motivated Bitcoin’s initial creation, concrete factors undergirding its development including its open source and decentralized design, the high degree of multivocality (Padgett and Ansell 1993; Stark 2009) of its underlying technology, and the pronounced regulatory ambiguity surrounding it, combine to make the development of Bitcoin an especially pure realization of idealized conceptualizations of innovation within capitalist markets. Rather than laying the basis for the type of “creative destruction” (Schumpeter 1976) such innovation processes are expected to generate, this work will show how cryptocurrency’s interaction with real world capitalist market dynamics drove it from its original vision of being a radical money that would disrupt the prevailing political and economic order into it becoming the basis of a new asset class and financial technology that could be harnessed to the benefit of many of the same establishment actors it was meant to subvert. To clarify these realities of imaginative control as they played out in the context of Bitcoin, this article applies a mixed-methods approach using qualitative accounts built from an original collection of primary and secondary sources that reflect the first seven years of cryptocurrency’s development as well as the so-called “block-size debate” that began wracking the Bitcoin community in 2015,

consideration of quantitative trends in Bitcoin and blockchain related venture capital funding from 2013 through 2016, and automated content analysis of text scraped from over 7,500 news articles between 2011 – 2016.

2. Imaginative Control and Innovation within Capitalist Markets

Bitcoin arose out of highly idealized conceptions of capitalism and a deep faith in the ability of unfettered markets to achieve the best outcomes for society. The core justification undergirding these idealizations rested on markets' purported ability to select, in a bottom-up fashion, for the best solutions and products available by providing individuals the freedom to structure exchanges per their own personal valuations. Rather than being a static, one-time selection, a further dynamic of "creative destruction" (Schumpeter 1976) is often invoked as being a fundamental driver of capitalist progress wherein that which is dominant today can be overthrown by the superior innovations of tomorrow - not through centralized decree, but as an emergent result of a decentralized process of individuals recognizing and opting into new, superior options. So conceived, unregulated markets are envisioned as being especially democratic and meritocratic vehicles through which societies are able to collectively move toward more optimal futures. As effective as such idealizations may be at spurring groups to action and providing justification for any number of policy stances, it is necessary to consider exactly *whose* visions of progress are, in practice, most likely to be realized through capitalist markets. Such questions centering on the potential for there being *systematic variability* in different groups' conceptions of what constitutes a good or superior market outcome are not often central to economic models, but they land in familiar sociological territory.

One of the most central and important insights that sociology has brought to economic phenomena concerns the constructed nature of such valuations and the inevitable influence of social and cultural forces on those constructions (Lamont 2012; Orléan 2014; Spillman 2012; Wherry 2016). A substantial body of work in this area has authoritatively established that value is frequently not intrinsic, but instead, a feature which is assigned in the course of individual definition and sensemaking. These processes are in turn, shaped by one's social context and position, a fact which engenders a distinct capacity for systematic disagreement between different groups' evaluation of worth. Empirical investigations into the social constructions of meaning and value in economic contexts have run a wide substantive gamut, with prominent examples including applications to categorization in markets (Hannan, Pólos, and Carroll 2012; Zuckerman 1999, 2017), status as derived through consumer goods (Bourdieu 1984), economic valuation of cultural products (Dimaggio 1987; Griswold 1987) and within morally charged contexts (Fourcade 2011; Healy 2006; Zelizer 1978) and to money itself (Dodd 2014; Orléan 2014; Zelizer 1994a). Of special relevance to the current work is a further body of research which has identified the key role of narratives (Nye 1997) and visions (Nye 2004; Sturken and Thomas 2004) in innovation processes and how these sensemaking structures encode groups' priorities for the future into the development of new technologies.

An ambitious program undertaken by Beckert (Beckert 2017) has sought to synthesize much of this heterogeneous body of research under a more general theoretical perspective that centers the place of "imagined futures" (Beckert 2013, 2017) in individual decision-making in economic contexts. This is accomplished by focusing on how decisionmakers construct imagined futures around economic actions that subsequently enable them to develop sets of fictional expectations that they can then use to overcome the ubiquitous uncertainties they encounter in

economic action. Primary examples of such fictional expectations include the projected futures actors develop surrounding innovations and investments as they attempt to anticipate their long term potential and direction (Beckert 2017, pgs. 131 - 187). Rather than being completely atomized and idiosyncratic, these “imaginaries”² are further posited as being fundamentally shaped by the social, cultural, and historical contexts in which individuals are situated.

Synonymous with the foregoing discussion on technological visions and narratives, the priorities and values of different groups can also be understood as being encoded within such imaginaries, especially in situations where such fictions are used to coordinate and mobilize collective efforts toward a shared outcome, such as is the case in the development of a new technology.

The current model builds upon this microfoundation in order to interrogate how capitalist markets differentially realize the imagined futures some groups attach to an innovation³ versus others. The coexistence of different groups’ interpretations and evaluative frameworks (i.e. “heterarchies” of multiple “orders of worth” (Boltanski and Thévenot 2006; Stark 2009)) surrounding new innovations has been well noted, as has the potential for contestation between their associated imaginaries (Beckert 2017; Brown, Rappert, and Webster 2000; Deuten and Rip 2000). In many contexts, this “dissonance” (Stark 2009) between different interpretive and evaluation frameworks has been shown to engender a highly generative and useful type of friction that spurs creativity and enables broad “explorations” (March 1991; Stark 2009) of the space of possible forms an innovation or practice might take. This coexistence of different visions, however, can also give rise to a “politics of expectations” (Beckert 2017, p.184) wherein different actors or groups attempt to assert control over the perceived feasibility and desirability

² See also (Jasanoff and Kim 2009) for relevant treatments of the concept in sociotechnical contexts.

³ The focus of the present work is on innovation and investment related thereto. There are further applications of how the concept of “imaginative control” manifests in other arenas such as the co-opting of countercultural products for mainstream consumption and in philanthropic or social investment arenas that are strongly dependent upon the sensemaking and valuations of well-resourced elites. These constitute important directions for future work.

of the imagined futures attached to innovations in order to secure the resources required to advance their particular conceptions for it. Unsurprisingly, superior access to resources and power advantages groups in asserting their imagined future over others, or as stated by Beckett (2017, p. 185) “[t]he power of the actors advocating a given imaginary has an impact on whether or not it becomes relevant.” A primary objective of the present work is to expand this insight in order to clarify how the dynamics of valuation and investment which are innate to capitalist markets systematically favor the imagined futures those who already well-positioned in the existing order attach to innovations, and in so doing, effectively bounds the space of potential products and solutions that are likely to be developed through such systems.

In canonical understandings of capitalist dynamics, innovation is considered a primary pathway through which existing economic orders are destroyed and new orders are created (Schumpeter 1976, see also Marx 1977). Innovators are conceived of as creating new products or solutions whose superior efficiency or appeal allows them to generate the level of demand required for them to compete with, and possibly overthrow, previously dominant competitors. In practice, the success of an innovation is not just determined by its innate potential to revolutionize the existing order into a more efficient one but also, its ability to secure the material and social resource required for its development. Even in situations where entrepreneurs do not have the capital to get the development of their innovation off the ground, however, investors interested in identifying opportunities for future profit are thought to incentivized to recognize the potential competitiveness of such innovations and direct their resources accordingly. While not every worthy idea or revolutionary technology will necessarily attract the resources that they deserve, the overarching conceptualization of the arena is of it being a meritocratic one in which “the best” ideas and entrepreneurs reliably tend to rise to the top.

Applying a sociological lens to the matter, one sensitized to the constructed nature of value and its relationship to actors' different visions of an innovation, brings into focus questions of how this dynamic operates when there are systematic deviations in different groups' conceptions of *what* an innovation is and *why* it warrants investment. If this contestation exists between relatively well-matched participants, then the healthy competition that is promoted as being an intrinsic element of capitalistic dynamism may well obtain. If, however, this contestation exists between groups that are highly unequal in their access to material and social resources, then we should expect that whichever vision of an innovation is interpreted as most worthwhile to those with greater access will ultimately garner the most investment and thus, have an innate advantage in its development. Furthermore, if a potential innovation is considered valuable to a population that does not have resources to develop it, and also fails to be evaluated as having worth per the interpretative frameworks of those who do have the necessary capital, then the likelihood of it being realized through the market is diminished.

This leads to the assertion that *innovation in capitalist markets will be systematically biased toward producing what actors with decision making ability over the flow of investment consider as having potential value*⁴. Said differently, we should expect capitalist markets to be more prone toward realizing imagined futures that are within the realm of conceivability and desirability to those with greater ability to direct resources than those who have less. Further, this systemic bias need not be the result of any coordinated, or even conscious, collective effort. Instead, it will emerge on its own as a type of interpretive cumulative advantage (DiPrete and Eirich 2006; Merton 1968) wherein the visions of those with influence over investment decisions end up having a higher *de facto* impact on steering the direction of what the system produces

⁴ A critical clarification here is that a product, service, solution, etc. need not be evaluated as personally worthwhile to investors. Said investors must, however, be able to conceive of an innovation as having sufficient worth to some market, audience, customer base, etc. to warrant investment. The question of *how* investors conceptualize groups that they themselves are not part of is an issue that warrants investigation in its own right.

when compared to those who have less control over where material and social resources are directed.

The impacts of this dynamic of “imaginative control” should be most pronounced when there are widespread, systematically structured differences between the evaluation frameworks of those with control over investment resources and those without. Many factors could conceivably give rise to such a cleavage. Imitation among investors in a particular investment arena, for example, may lead to convergence upon a particular set of evaluation schemas on what types of innovations are perceived as being potentially profitable (what Orléan (2014) would refer to as a “valuation convention”). This unintentional emergence of groupthink in how innovations are assessed can in turn lead to market systems erring on the side of overproducing products or solutions that conform to such prevailing frameworks⁵ and underproducing those which do not conform, even when such alternatives may well have a greater latent capacity for market success. Another class of situations that might generate such divisions are those in which there is a strong correlation between individuals in positions to make investment decisions and membership, or lack thereof, in socially salient demographic categories (e.g. race, gender). This widespread underrepresentation of a given categorical group would be expected to translate into an underproduction in capitalist markets of innovations that are of value specifically to that group. Arguably, the potential to break into previously untapped market segments or niches (Hannan and Freeman 1977; Hannan et al. 2012) provides investors with an innate incentive to try and correct for such systematic blind spots via market research. Work in economics focusing on diversity in collective decision making (Page 2007), however, provides reason to be skeptical that such piecemeal efforts by outsiders could replicate the effectiveness of having a more

⁵ If taken to a large enough scale, this tendency may well lay the basis for regular investment bubbles surrounding new technological developments, like the one associated with internet startups in the 1990s.

representative set of investors who are able to draw upon the evaluation frameworks they have developed over the course of their lived experience as members of a given group in their investment decision making.

Another set of scenarios that are likely to be characterized by a systematic division in valuation frameworks corresponding to differential access to investment resources, and the situation of central concern to the current case, are those arising between market incumbents and market challengers (Fligstein 1996, 2001). Conceptualizing markets as fields of social action (DiMaggio and Powell 1983; Fligstein 2001; Fligstein and McAdam 2012) clarifies how there is likely to be a shared interest among incumbents in seeking out innovations that give them an advantage *within* a field and a shared devaluation of any innovation (or version thereof) that would foreseeably disrupt the stability of a the field itself. In contexts in which market incumbents have much greater influence over large scale investment decisions than challengers, we should thus anticipate a *systematic biasing of investments toward innovations or versions thereof that do not disrupt the existing market order* (i.e. the market field's stability). As capitalist systems mature and the effects of capital concentration and centralization (Marx 1977) become more pronounced, and as increasing financialization leads to a greater interpenetration of non-financial firms into the financial sector (Krippner 2005), this class of power differential should only be expected to become more frequent.

The foregoing assertion that social and cultural factors can cause real world markets to reliably deviate from ideals of efficiency resonates with numerous lines of research in economic sociology including political economy (Block and Somers 2014; Polanyi 1957), institutionalism (DiMaggio and Powell 1983; Powell and DiMaggio 1991), market “embeddedness” (Granovetter 1985; Krippner 2001), and the use of external political resources to stabilize market fields

(Fligstein 1996). It diverges from this work, however, by forwarding an *internal mechanism* for the reproduction of economic and power inequality that is native to the emergent dynamics of capitalistic innovation itself and is rooted in the system's default privileging of advantaged actors' frameworks of interpretation and valuation. This model contends that so long as those who are well-positioned in the existing order are also able to act as gatekeepers in assessing what visions of innovations are worth development, *we should expect that market-based progress will remain biased toward supporting visions that are comprehensible and desirable to those gatekeepers*. As such, we should assume that for all the incentivization of entrepreneurship and creative innovation that capitalist markets provide, the futures realized through such systems are likely to resemble the past and present in key respects.

The consequences of this dynamic are significant. It entails that even if certain new products, solutions, etc. are clearly "best" per some criteria that is not prominent in the valuation frameworks of those in advantaged investment positions (e.g. it will help the environment or create good jobs), there is no reason to expect that a capitalist market will reliably select those innovations for development, especially in situations where there are other, "less good" alternatives available that dominant investor groups interpret to be more desirable (e.g. opting for developing ineffective "greenwashing" solutions that garner public approval at lower costs or choosing to pursue technologies that automate tasks due to investors' anticipation that innovations that appeal to "shareholder value" (Fligstein 2001; Lazonick and Sullivan 2000) are most likely to succeed). Furthermore, it also means that if innovations potentially jeopardize the stable position of advantaged investment decisionmakers, which is likely to be the case if the success of an innovation would either purposefully or incidentally disrupt the field in which they are situated, then capitalist markets should be expected to select *against* realizing such potential

futures. Capitalism may be an engine of collective exploration and progress, but this perspective asserts that it is ultimately the valuation frameworks of those who are best positioned within the existing system to direct the flow of capital that steer its trajectory. Consequently, there are no a priori reasons to expect capitalist systems on their own will be capable of reliably identifying and developing innovations that are optimal along dimensions that are orthogonal, or especially counter, to the interests of those who hold the most control over investment decisions. While markets might appear to be free, power remains innately embedded within their structure per their unequal support of different actors' visions of the future.

2.1 The Case of Cryptocurrency and Blockchain Technology

The case of Bitcoin and subsequent development of cryptocurrency and blockchain technology offers an unparalleled opportunity to further our understanding of how capitalist markets privilege the development of certain groups' imagined futures over others. In both conception and execution, the development of Bitcoin offers a uniquely pure realization of market fundamentalist (Block and Somers 2014) ideals of a market-based, Schumpeterian (1976) style of innovation, a feature which strengthens the key assertion made here that the proposed dynamics are native to capitalist markets themselves. After providing a brief technical primer on cryptocurrency and blockchain technology, the following subsections describe the particular features of cryptocurrency's development and background – specifically, its decentralized and open source design, the highly multivocal (Padgett and Ansell 1993; Stark 2009) nature of the underlying technology, and persistent regulatory ambiguity surrounding it – that make it an exceptionally ideal context within which to observe how imaginative control plays out in real world market contexts.

2.1.1 Technical Overview

On a technical level, the definition of Bitcoin and the thousands of other digital currencies based upon its original open source design is unambiguous, if not necessarily straightforward to those unfamiliar with the computer science it is based upon. A simplified version of this definition might begin with the so-called “blockchain” that underlies all Bitcoin exchanges. The blockchain may be thought of as a massive ledger of all the transactions that have ever occurred using Bitcoin. For every single instance a bitcoin⁶ has been exchanged in the history of the currency, there exists a corresponding entry for it on the blockchain. To protect the privacy of individuals using Bitcoin, this ledger does not contain names, only the public addresses of individuals’ “wallets.” To send or receive bitcoins with these wallets, individuals use a “private key” only they can access to generate a signature for the transaction via a cryptographic process that to date, cannot be circumvented or faked.

The truly innovative aspect of Bitcoin comes with how the ledger is maintained. Of primary importance to Nakamoto, the anonymous creator of Bitcoin and blockchain technology, was the development of a so-called “trustless” system wherein economic transactions did not have to rely upon trusted third parties to verify them (Nakamoto n.d.). To accomplish this, the blockchain was built to be maintained, not by a single computer, but by every individual computer participating in the Bitcoin network. On every computer or “node” in the peer-to-peer network, there exists a copy of the confirmed ledger to date. To update this ledger, all new transactions are first grouped together into “blocks” that are then broadcast out to the whole network. Computers in the network, in a process known as “mining,” then compete to verify and confirm the transactions in those blocks by using a complex cryptographic “proof-of-work”

⁶ This work follows the burgeoning convention of capitalizing “Bitcoin” when referring to the system or community itself and using the lower case “bitcoin” when referring to actual units of the digital currency itself.

protocol to officially record and order the transactions which have occurred. Nodes who participate in this verification process are probabilistically rewarded in Bitcoin, thus incentivizing decentralized, individual participation in the network. Once blocks are confirmed, they are sent out to the whole network, collectively validated as legitimate, and then added to everyone's current copy of the blockchain. Via this process, the decentralized network achieves a consensus on the official record of Bitcoin transactions without any need of a centralized third party such as a bank or government.

2.1.2 Open Source and Decentralized System Design

The development of cryptocurrency and blockchain technology represents a massive and decentralized collective undertaking. Bitcoin began and continues to operate as an open source project. What this entails in practice is that anyone is free to access and suggest changes to the underlying code Bitcoin is based upon. Furthermore, individuals are also allowed to copy the underlying technology's design and modify it to create their own projects, a feature which has led to the subsequent development of thousands of other cryptocurrencies (i.e. "alt-coins") and other blockchain technology applications. In addition to its source code being open, the "peer-to-peer" system upon which Bitcoin is based is explicitly designed such that there is no central entity in control of the system. This means that there no single individual or group holds ultimate authority over how the system continues to develop, a fundamental design feature which has been replicated in many but not all subsequent cryptocurrency and blockchain technology applications. At this point in its maturation and adoption, the Bitcoin system now has a team of core developers, Bitcoin Core, that is responsible for coordinating the on-going maintenance and development of the Bitcoin project. Even so, all significant changes to the underlying computer

code of Bitcoin still require approval by the majority of individuals participating in the network, per consensus mechanisms that were built into the system protocol at its outset (Nakamoto n.d.).

In contrast to the development of innovations via established firms or organizations with strong institutional mechanisms for asserting a particular vision of an innovation, these open source and decentralized design features has led to an exceptionally high level of democratization in the development of cryptocurrency and blockchain technology. Any individual or group interested in a particular conception of what this technology might be and how it might be applied has been free to pursue the realization of that vision, usually with quite low barriers to entry. This unusually wide and even playing field for creative innovation offers a special opportunity to observe a proliferation of imagined futures centering around the same core technology, as it has arisen from a broad diversity of constituent groups⁷. Further, in enabling even fringe conceptions of the technology to be brought to the table for potential development, this context allows for an unusually clear insight into what does and does not get selected for further investment within the market context itself.

2.1.3 High Multivocality

While the above speaks to the technical definition of Bitcoin, it does little to define what this object represents in terms of social and economic life. Is it money? A payment system or a speculative asset? The locus of a radical political movement or a criminal currency? A challenge to the existing financial system or its future? As will be explored in greater detail in the subsequent analysis, to various groups at various times, cryptocurrency and blockchain

⁷ It should be noted that this diversity of constituents is relative to the narrower context of centrally organized firms undertaking research and development. The demographic profile of the cryptocurrency and blockchain technology development, though not fully knowable, is widely understood to be overwhelmingly white, male, and educated, with an additional over-representation of individuals expressing fiscally conservative views.

technology has represented all these things and more in the near decade since its inception⁸. This high level of multivocality (Padgett and Ansell 1993; Stark 2009) surrounding cryptocurrency and blockchain technology is partly an artifact of its aforementioned decentralized and open design. Another significant factor contributing to it, however, is arguably inherent to the technology itself.

In terms of its core functionality, the blockchain is a secure, fraud-resistant public ledger that protects the anonymity of its users without requiring a trusted third party to maintain or verify it. Though its original application centered on an attempt to create an electronic equivalent to cash (Nakamoto n.d.), the potential transposition of cryptocurrency and blockchains into a vast array of other contexts has been acknowledged since the beginning of the technology's development. Essentially, any process in social or economic life that has traditionally depended upon a trusted third party to verify and maintain official records of exchange (e.g. escrow services in contract execution, stock trading, voting, certification of items' original provenance) or the digital transfer of value (e.g. remittances, payments for online content, online purchases), could potentially be redesigned to replace the third party with a blockchain or cryptocurrency system instead⁹. The multitude of potential applications for the underlying technology has made the imaginative arena surrounding blockchain and cryptocurrency an exceptionally fertile one that arguably embodies one of the purest settings that has existed to date for cultivating the type of "creative destruction" (Schumpeter 1976) dynamic purported to be the engine that drives capitalist systems forward.

2.1.3 Regulatory Ambiguity

⁸ See also (Vergne and Swain 2017) for another recent exploration of this "categorical anarchy" surrounding Bitcoin.

⁹ Whether a given system *should* be moved to such an alternative blockchain design is a different, usually highly debatable matter.

In a final, further fulfillment of idealized conceptions of what an unfettered field of capitalist innovation should look like, the continued regulatory ambiguity surrounding cryptocurrency and blockchain technology applications has by default, left it unusually free from the influence of the state in its development. A decade since its creation, there remains no formal institutional consensus on what Bitcoin, or cryptocurrencies and blockchain tokens more generally, constitute a case of. For instance, for the purposes of the U.S. Commodity Futures Trading Commission (CFTC) cryptocurrency has been ruled a commodity that is covered by the Commodity Exchange Act (CFTC 2015) and the U.S. Internal Revenue Service has congruently ruled that it is considered property for tax purposes and investments in digital currencies are subject to capital gains taxes, while also acknowledging that it functions in ways resembling “real” currency in certain contexts (IRS 2014). In the European Union, conversely, a ruling from the highest courts has established that digital currencies are to be treated as currency, not a commodity or property, and should be accordingly exempted from consumption taxes in the same way that other currencies are (Court of Justice of the European Union 2015). More recently, the emergence of “Initial Coin Offerings” (ICOs) wherein new companies sell cryptocurrency “tokens” as a means of raising capital has led to the U.S. Securities and Exchanges Commission to assert that such tokens should be treated and regulated as securities but can only be ruled as being such on a case-by-case basis (SEC 2017).

The foregoing constitute only a handful of examples of how widely variable the classification of cryptocurrencies and blockchain tokens continues to be across both national and subnational regulatory bodies. Beyond the standard difficulties inherent to the classification of radically new innovations, these regulatory difficulties are further compounded by the features of decentralized design and high multivocality just described. As has been the case with other peer-

to-peer systems such as those used for online pirating of media content, even when governing agencies prohibit cryptocurrency or certain uses thereof, the lack of any central locus of the system makes shutting down such projects very challenging. Furthermore, given the rapid pace of development and innovation occurring within the space, enterprising entrepreneurs have been able to take advantage of certain level of institutional arbitrage wherein they are able to build workarounds to existing institutional strictures at a much faster pace than slower moving, governing bodies are able to define their authority over these new iterations of the technology¹⁰. While the regulatory environment surrounding cryptocurrency and blockchain technology has undoubtedly become more structured as the technology has matured, in relation to more established and clearly defined arenas of development, it remains a very open arena in which the imagination is able to run much freer from government intervention than is usually possible.

3. Data and Analytical Approach

In order to create an empirically grounded reconstruction of cryptocurrency's trajectory of development, as well as a more in-depth account of the "block-size" debate which first emerged in the Bitcoin community in 2015, I began by compiling a baseline account that drew upon a combination of the limited available social science research on Bitcoin at the time of this study's outset (Dodd 2014; Hout and Bingham 2013; Maurer et al. 2013), early, authoritative journalistic investigations of its rise (Popper 2015), and accounts produced by the cryptocurrency

¹⁰ This gap is arguably a major contributor to the high number of frauds and scams that have continued to characterize activity in this field.

community itself¹¹. Having established an initial trajectory of adoption and development from these sources, the next phase involved locating primary sources (e.g. government rulings, technical papers, community forum posts) and reliable secondary sources (e.g. media coverage from multiple mainstream news outlets) to corroborate and enrich this first pass account of cryptocurrency's adoption and development trajectory. Key information I considered in this reconstruction of cryptocurrency's early history of development included identification of important individuals, communities, companies, and events involved in establishing new variants of how cryptocurrency came to be used and defined, as well as descriptive characteristics of adoption audiences. This data collection process resulted in the set of over 40 primary and secondary source documents cited herein.

Data on venture capital funding in Bitcoin and blockchain related startups came from the public venture capital funding database maintained by CoinDesk, a central and well-respected online news outlet for cryptocurrency and blockchain reporting,¹². The database included aggregated data from several venture capital reporting sources (i.e. Venture Scanner, Venture Source, and Crunchbase) as well as data collected through CoinDesk's own research. The available data captured information on close date, amount, and round of venture capital funding, location of startup headquarters, and investors (unless undisclosed), and reflects the outcomes of 227 funding events for 146 unique companies between January 2012 through April 2016.

In addition to this data, CoinDesk also provided its own classification of startups into categories that were roughly congruent to the ones of interest to this study (i.e. startups focused on payments, financial and business applications, and exchanges). In order to confirm findings

¹¹ Bitcoin Wiki (https://en.bitcoin.it/wiki/Main_Page), History of Bitcoin (<http://historyofbitcoin.org/>), and BitcoinTalk (<https://bitcointalk.org/>).

¹² <https://www.coindesk.com/bitcoin-venture-capital/> (Updated on April 26, 2016, downloaded in May 2016)

and to specifically ensure that CoinDesk had not undercounted payments related startups, I undertook an independent recoding of startups that was blinded to the amount of venture capital funding associated with each. The recoding was based on my own independent research into each of the companies self-described purpose with the goal of classifying them as being focused primarily on payments, non-payments based financial and business applications, exchanges, or other category (e.g. mining infrastructure), as well as additional coding of whether the company was primarily oriented toward Bitcoin-based versus alternative cryptocurrency or blockchain based applications. The results of this independent classification were not identical to CoinDesk’s categorization in the cases of some very general startups which were characterized by high degree of multifunctionality. Nonetheless, the resulting classification was sufficiently similar that the main findings of interest regarding overall trends in the absolute and relative amounts of venture capital funding trends remained robust to either categorization process.

In conjunction with venture capital funding data and the qualitative accounts of its development, I also constructed and analyzed an original corpus built from publicly and freely accessible online Bitcoin news coverage from the beginning of 2011 through early 2016. To build the corpus, I wrote scrapers using the Python Scrapy package that collected text and metadata from 6 news sources in total, with two sources each reflecting three primary audiences of interest: core cryptocurrency participants, financial and business sector, and the tech sector (see Table 1). For the two cryptocurrency focused news outlets, I scraped all articles available between 2011 through 2016. For the remaining 4 sources, I scraped all articles returned in search queries for “Bitcoin.”¹³

[Table 1 About Here]

¹³ A notable and important feature of media coverage on cryptocurrency and blockchain applications during this period is that even when Bitcoin was not the main topic of interest for an article, it was frequently mentioned as a reference point for explaining the subject at hand.

The primary objective in analyzing this corpus was to identify changes through time in how Bitcoin and cryptocurrency was being discussed at the collective level and the relationship of those trends to the involvement and influence of different groups in its development. Toward that end, I use a combination of automated content analysis methods to characterize the corpus through time. First, I consider the relative frequencies with which key terms appeared in each source's coverage over a series of six-month periods. In order to get a more comprehensive understanding of the general topics and themes being covered in the media, I also then ran a series of structural topic models (Roberts et al. 2014; Roberts, Stewart, and Tingley 2017) on the whole corpus which enabled me to extract emergent themes that related to different ways in which these subjects were being discussed and estimate the relative prevalence of those different topics over the course of the five year period (see Technical Appendix for more detail on corpus processing as well as for further details on model selection and robustness checks).

4. From Politically Subversive Money to Mainstream Financial Technology

There are many ways to tell the story of cryptocurrency's complex and often sensational first years. The priority of the present investigation is to provide an account of this period that identifies the role of key constituencies in its developmental trajectory and the relationship of these groups' different forms and scales of investment with the realization of their respective visions for it. The following subsections begin with a qualitative exposition of cryptocurrency's early development, beginning with the community context of its inception in January 2009 through its first major entrance into popular attention in mid to late 2011. The next section then continues this account through the continued maturation of cryptocurrency from 2011 through

2015 as it moved from the societal fringes into more mainstream market and investment contexts. Of chief concern here will be the coalescence of three central visions for the technology's development: as a digital asset, as a payment system, and as a technology for existing business and finance applications. The final section of this analysis will then use a combination of venture capital funding data, automated content analysis, and an account of the fallout from Bitcoin's "block-size" debate to demonstrate how the contestation between these visions played out and the determinative influence that late arriving, well-resourced actors from the established banking and finance sector exerted over this process.

4.1 Cryptocurrency's Early Imaginaries

The capacity of money to be socially meaningful and a tool the expression and reinforcement of collective identities (Zelizer 1994b, 2011) is strongly evidenced in the origins of cryptocurrency. Bitcoin originally emerged out of a contemporary, "monetary utopian" (Dodd 2014) project led by a group of "Cypherpunks" that sought to create a new type of money which could check the power of central banks and governments (Prisco n.d.). Cypherpunk as a movement began in the early 1990s and was primarily focused on preserving individual freedom through the protection of personal privacy and the ability to engage in anonymous transactions (Hughes 1993). Composed in part by "Techno-Libertarians," the early cypherpunks prioritized the use of coding and cryptography to resist government and corporate intrusions into privacy and the development of a form of electronic cash that could be spent anonymously like cash but also sent and received electronically. The often cited conceptual predecessors of Bitcoin such as the crypto-anarchist "b-money" proposed by Dai (1998), the proposal for trustless "bit-gold" from Szabo (2008), or the anonymous "Hashcash" of Back (2002) were generated by known

members of this movement and often discussed in the mailing lists and personal blogs that served as touchstones for these communities. Given this context, it is unsurprising that the first public dissemination of the original Bitcoin white paper (Nakamoto n.d.) occurred on such a mailing list.

Many of the design elements of Bitcoin, such as the ultimate cap on its supply, are specifically meant to emulate the properties of specie backed currencies. These properties along with the anti-central bank, Libertarian politics surrounding Bitcoin's creation, have given rise to what Maurer, Nelms, and Swartz (2013) refer to as a "digital metallism" which resonates significantly with the beliefs and views of fiscal conservatives who advocate a return to the gold standard. This resonance, along with the anger many in this group felt in the wake of the Great Recession toward the Federal Reserve and governments' bailing out of big banks, created an early entrée for Bitcoin into circles which extended beyond the highly specialized cypherpunk community. This politically charged quality of Bitcoin was also responsible for motivating several founding figures to invest the large amounts of uncompensated time, energy, and resources that was required in the first year to get the Bitcoin project up and running (see (Popper 2015) for an in-depth account of this period).

Some of the first major uses of Bitcoin also act as a further testament to its politically radical origins, such as its being used to circumvent federal restrictions on donations to WikiLeaks (Matonis 2012) and the early promotion of Bitcoin donations by the Electronic Frontier Foundation, a leading nonprofit in the protection of digital rights from government encroachment and malfeasance (Reitman 2013). Investment in Bitcoin and other cryptocurrencies has also been touted as a stateless recourse for individuals during national currency crises, such as those which have occurred in Cyprus (Farrell 2013), Greece (Darwish

2015), and India (Wells 2013). Even though the politically charged rhetoric of its origins has receded as other, more dominant constituencies have become involved in cryptocurrency and blockchain technology, the main online communities surrounding Bitcoin such as [Bitcointalk.org](http://www.bitcointalk.org)¹⁴ and the [Reddit Bitcoin](http://www.reddit.com/r/bitcoin)¹⁵ group continue to be characterized by discourses on money and value which are associated with digital metallism and a persistent mistrust of centralized institutions and regulations (AUTHOR CITE).

Without this politically based “account of worth” (Boltanski and Thévenot 2006), it is unlikely that Bitcoin could have achieved the early buy-in of a core of devoted individuals that was required to start overcoming the startup problems associated with innovations for whom production and supply are highly uncertain (Lee, Struben, and Bingham 2018). If its founding vision of being a decentralized challenger to state-backed currencies was the only interpretation Bitcoin could support, however, its immediate appeal would very likely have remained confined to a small, politically specialized audience. It is thus significant that early in its history, another, less divisive, facet of Bitcoin’s identity came to the fore - that of being a technically interesting and innovative, open source software project. Open source constitutes a movement in its own right, one centered on making software source code freely available for individuals to see, modify, and redistribute. At its heart is a communitarian ethos which encourages collaboration between programmers and often fosters the emergence of engaged groups of contributors who are willing to invest their time and talent in community software projects for little to no initial monetary compensation. For many adherents, the open source framework is considered to be a pathway for facilitating unbounded innovation.¹⁶

¹⁴ <http://www.bitcointalk.org>

¹⁵ <http://www.reddit.com/r/bitcoin>

¹⁶ <https://www.wired.com/insights/2013/11/open-source-a-platform-for-innovation/>

Due to overlaps with the cryptographic and Techno-Libertarian communities, Bitcoin was readily able to spread into the wider open source community and in so doing, come to the attention of individuals who did not necessarily share the utopian vision which began the project, but who were nonetheless compelled to opt into its development on the basis of it being a technologically and conceptually innovative community project¹⁷. A little more than a week after the original white paper was released to the original cryptography mailing list, Nakamoto registered the Bitcoin project to the open source software development and collaboration website, SourceForge¹⁸. Within the year, the first Bitcoin Internet Relay Chat (IRC) channel, #bitcoin-dev¹⁹, was created for bitcoin development discussion on Freenode, a site devoted to supporting open source peer-directed project communities.

The most notable phase of early adoption by the open source software community came as a result of coverage Bitcoin received from tech insider news websites. In May 2010, an InfoWorld article (McAllister 2010) brought digital currency to the awareness of many open source community members, including Gavin Andresen, one of the main figures in Bitcoin's subsequent rise and eventual head of The Bitcoin Foundation, a nonprofit founded in 2012 which was meant to support the Bitcoin undertaking in a manner resembling the Linux Foundation's relationship to the open source operating system of the same name. Though Andresen claims to be of a political orientation that aligned well enough with the foundational principles behind Bitcoin's development, he describes himself as having gotten involved primarily due to his strong interest in the "nuts and bolts" of Nakamoto's "elegant" design (Popper 2015). The most

¹⁷ Among these people was Laszlo Hanyecz, a Hungarian programmer living in Florida who would become known not only for making the first real world purchase using Bitcoin, a large Papa John's pizza for 10,000 BTC, but also for being the first individual to develop a radically more computationally powerful way of mining Bitcoins with Graphics Processing Units (GPU) that has become standard for Bitcoin miners today (Popper 2015).

¹⁸ <https://sourceforge.net/projects/bitcoin/>

¹⁹ <http://irc.lc/freenode/bitcoin-dev/>

massive early influx of attention from the larger programmer community came immediately after a small mention of Bitcoin's most recent version release reached the front page of the popular tech website, Slashdot²⁰. The subsequent wave of new programmers downloading the mining software and inundating the online Bitcoin communities was sufficient to briefly overload the Bitcoin network, and the valuation of Bitcoin increased by a factor of 10 shortly thereafter. This period of expansion was sufficient to not only keep Bitcoin going but significantly expand and refine the underlying technology. This phase also enabled the project of cryptocurrency to gain sufficient size to come to the attention of notable players in a number of software communities including those working on Peer to Peer (P2P) platforms, electronic payment systems, and ultimately, the heavy hitting tech crowds of Silicon Valley. Currently, the core Bitcoin project is now housed on the programming collaboration website, GitHub²¹, and boasts a history of having over 16,000 "commits" of code modifications and refinements by individuals participating in the project. Beyond the main project, the original open source code for Bitcoin has subsequently been used to develop hundreds of other blockchain applications as well as independent cryptocurrencies, which taken on their own, are estimated to have a market capitalization well over \$100 billion (USD)²² at the time of this writing.

Much of these initial phases of primarily in-kind investment in Bitcoin were driven by motivations based in what might be characterized as civic orders of worth (Boltanski and Thévenot 2006) embedded within either the specific monetary utopian vision that spurred cryptocurrency's creation or the community ethos that underlies the open source movement. In this regard, the reenvisioning of Bitcoin into a sort of "criminal currency" marks a notable, instrumentalist turn in its developmental trajectory. The first major player to mobilize Bitcoin to

²⁰ <https://news.slashdot.org/story/10/07/11/1747245/bitcoin-releases-version-03>

²¹ <https://github.com/bitcoin/bitcoin>

²² <https://coinmarketcap.com/>, accessed on 12/28/2018.

this end was Ross Ulbricht, the creator of the infamous Dark Web black market, Silk Road. Ulbricht was an early member of the Bitcoin community and expressed a number of views consistent with techno-libertarian thought, including a belief that the use and purchase of drugs should not be illegal (Popper 2015). His choice to make Bitcoin the default currency of the Silk Road was based in great part on the much higher level of anonymity it provided in transactions for illegal goods and is a decision which to this day, has created a relatively modest but stable baseline market demand for cryptocurrencies used on online dark markets. The use of Bitcoin in these arenas proved seminal in expanding awareness of it beyond the tech communities of origin. Most directly, its usage brought Bitcoin to the awareness of participants in illicit online markets²³. More widely, coverage by publications such as *Gawker* (Chen 2011), *Time* (Brito 2011), and *The Guardian* (Whippman 2011) of Silk Road in the spring and summer of 2011 is widely cited as being responsible for first bringing Bitcoin to the general public's attention.

While its emergence as a criminal currency was essential to spreading awareness of Bitcoin and establishing a wider basis of demand for it, the stigma of cryptocurrency's association with such criminality has threatened to undermine its legitimacy in the eyes of formal institutions and mainstream audiences. In a set of developments that arguably marked some of the earliest signs of major contestation between different groups' visions for the technology, prominent actors who have been particularly invested in more socially acceptable applications of blockchain and cryptocurrency have undertaken efforts to undercut its usage as a criminal currency by proactively working with legal and regulatory bodies to police its usage. Examples of such efforts include the emergence of advocacy groups such as the Chamber of Digital Commerce²⁴ and the Blockchain Alliance²⁵, organizations devoted to proactively working with

²³ See (Hout and Bingham 2013; Martin 2013) for more in-depth accounts of these users experiences.

²⁴ <http://www.digitalchamber.org/>

²⁵ <http://blockchainalliance.org/>

law enforcement on cryptocurrency and blockchain related issues. Given the anti-state and anti-regulation perspectives that predominated during Bitcoin's beginnings and continue to persist amongst a vocal minority today, these efforts have brought with them no shortage of controversy.

4.2 Three Coalescing Visions for Cryptocurrency

Cryptocurrency may have arisen at the societal fringes, but its potential appeal to wider, more mainstream audiences began to become clear only a few years after its inception. Though these newly arriving constituencies often lacked the ideological commitments or criminal instrumentality that characterized Bitcoin's early adoption and development, the same qualities of decentralized and open design, high multivocality, and regulatory ambiguity that enabled its expansive field of initial innovation also gave license to later entrants to continue developing and reworking collective understandings of what the technology was and why it might have value. While these visions did not always resemble the ones responsible for the birth of the technology, many enthusiasts hoped that the influx of high status, establishment actors into the "Bitcoin ecosystem" that marked this period would bring greater legitimacy to the whole undertaking and substantially increase the resources available to its further realization. At the broadest level, these visions ultimately coalesced around three main understandings of the technology: as a new type of digital asset, as a disruptive new generation of online payment systems, and as a technology that could be harnessed toward increasing the efficiency of existing business and financial applications.

4.2.1 Digital Asset

The potential of Bitcoin to be understood as a speculative asset became abundantly clear in the late spring and early summer of 2011. During this time, the price of Bitcoin rose from an exchange rate of \$.86 (USD) = 1 BTC to a then high of near \$30 (USD) = 1 BTC, only to fall back down and hold at a level near \$2 = 1 BTC within a matter of months (Lee 2011). This event would ultimately become known as “The Great Bubble of 2011” and is usually regarded as being the result of the sudden influx of popular attention the cryptocurrency received after mainstream news sources published stories on it and Silk Road. This would not be the last time that mainstream news coverage and the popular attention it brought with it would be associated with a rapid rise followed by sometimes precipitous declines in its exchange rate.

This volatility in valuation might be considered a threat to the long-term ability of Bitcoin to attain its original vision of becoming a real, alternative money. For many, however, the ability to turn a quick profit on Bitcoin arguably served as a bridge to adoption and awareness among individuals who had no innate interest in it as a political undertaking nor any need to acquire it for the sake of making illicit online transactions²⁶. On another front, the recharacterization of Bitcoin as a speculative investment created some surprising avenues to legitimation vis-à-vis its ability to attract the interest and involvement of high-status actors in the business and finance arena. As Bitcoin continued to persist through its volatile price swings, it managed to transition in the eyes of many from being a one-time, faddish bubble to a potential new arena of “digital assets” trading. Some of the earliest and primary actors in this regard were the Winklevoss twins of Facebook notoriety. In addition to being eager investors in Bitcoin as early as April 2013, they

²⁶ A major example of this is the degree to which Bitcoin became established in China. The run up to its highest exchange rate before the spring of 2017, \$1,242 (USD) = 1 BTC, occurred in November 2013 and is often cited as being in great part due to the associated boom of interest among casual Chinese speculative traders (Popper 2015; Wood 2013). Until the fall of 2017, BTCC (formerly BTCChina), an originally Shanghai-based Bitcoin exchange who subsequently moved to Hong Kong after the Chinese government suspended fiat-to-crypto trading in the last quarter of 2017 (Zhao 2018), remained one of the largest exchanges in the world, in spite of strong rulings by the People’s Bank of China that Bitcoin could not be considered currency, could not be used for purchases, and should be treated as nothing more than an online trading commodity (Mullany 2013).

were also responsible for creating one of the first fully regulated digital assets exchanges, Gemini, and putting forward the first proposal of a Bitcoin Exchange Trust Fund (ETF), a product designed to resemble investment vehicles used for precious metal commodities, for Securities Exchange Commission (SEC) approval. Though they were the first to file for approval of a Bitcoin ETF, they were ultimately beat to the punch when Billy Silbert, founder of the prestigious private stock market SecondMarket, launched his own private version of the similar vehicle, the Bitcoin Investment Trust, in the last part of 2013 (Primack 2013a).

These developments marked the beginning of a new period in Bitcoin and cryptocurrencies' evolution that was characterized by an increasing number of prominent Wall St. and financial industry players entering into the Bitcoin ecosystem who were specifically interested in the development of this new digital asset class. Notable early examples include the decision of by prominent investment management company, Fortress Investment Group, to launch a Bitcoin investment fund in 2014 (Primack 2013b) and the New York Stock Exchange (NYSE)'s multi-million dollar investment into the major digital currency exchange, Coinbase, in 2015. This period also saw a variety of other formal and informal markers of Bitcoin's legitimization as a tradeable asset including Bloomberg's listing of Bitcoin's exchange rate in 2014 (Bloomberg 2014) and the ruling in 2015 by the U.S. Commodity Futures Trading Commission classifying virtual currencies as commodities (CFTC 2015).²⁷ In subsequent years, the movement toward classifying Bitcoin and cryptocurrencies as, in and of themselves, a type of tradeable asset has continued, with some of the clearest evidence to date of this being the aforementioned listing of Bitcoin futures on the CBOE and CME at the end of 2017 (CFTC 2015; Davitt 2017).

²⁷ In contrast, just a few weeks after this decision was released in September 2015, the EU officially ruled the opposite by declaring that virtual currencies should be treated as currencies, not commodities (Court of Justice of the European Union 2015).

4.2.2 Payment System

A prevailing feature of interpretations of cryptocurrencies as being in of themselves a new type of speculative asset is a level of agnosticism (AUTHOR CITE) concerning what undergirds current and future demand for them. Nevertheless, the development of them in this direction has helped to establish their potential for acting as “stores of value,”²⁸ one of three often cited criteria that proponents feel must be achieved in order for them to achieve the status of real money. The fundamental design of Bitcoin, however, was first and foremost as a system of transferring payments between individuals – that is, as a “medium of exchange” or form of “peer-to-peer electronic cash” (Nakamoto n.d.). In terms of this core functionality, cryptocurrency has done remarkably well for such an innovative technology, and its actual processing of payments has remained impressively secure throughout all the fraud and turmoil that has surrounded its development. Taken solely on the basis of its technical features, there are many respects in which Bitcoin’s or other cryptocurrencies’ further development as a payment system could, if developed appropriately, represent a potentially major disruption to the current dominance of online payment processors such as PayPal and credit card companies like Visa, as well as to more traditional banking institutions. Notable among these features are its potential ability to move large amounts of value across countries many times faster than current systems allow, the fact that it does not require companies to be responsible for managing and storing sensitive customer information such as names and physical addresses, and its ability to handle transactions smaller than existing payment processors are currently willing to process. While politics may have gotten Bitcoin started, many investors and developers have hoped that it would

²⁸ The three main economic criteria ordinarily invoked to define an object as money being that it can function as a “store of value,” a “medium of exchange,” and a “unit of account.”

be these practical advantages of Bitcoin as a payment system that would ultimately bring it into widespread use and adoption.

Toward this end, a substantial amount of capital and effort has been poured into making Bitcoin more attractive to mainstream merchants. Two major issues have needed to be addressed when it comes to adoption in this arena: 1) creating easy to use, secure, and reliable platforms which will allow merchants to accept cryptocurrencies and 2) protecting merchants from the risks associated with cryptocurrency price volatility by streamlining the processes through which they convert digital currencies into national currencies. Some of the most prominent services which arose in response to these needs are Bitnet²⁹, BitPay³⁰ and Coinify³¹, all digital currency based start-up companies who have received tens of millions USD in venture capital funding during the initial years of existence (Dougherty 2014; Rizzo 2014). Other efforts which also facilitated merchant adoption have been experimental inclusions of Bitcoin payment processing capacities by major existing payment companies such as Stripe (Alby 2015) and Square (McMillan 2014). Other Bitcoin based companies, most notably the Bitcoin currency exchange Coinbase³², have also extended their existing capabilities to facilitate merchant adoption.

For a period, the prospects of Bitcoin becoming a new, revolutionary payment system seemed promising. Between 2014 to present, several major retailers began to accept Bitcoin as payments including Dell, Overstock.com, Expedia, and Microsoft (Ember 2014; Smith 2014). Accompanying these high profile examples was also a proliferation of smaller online and “brick and mortar” businesses who chose to accept Bitcoin out of both a belief in its potential to rival existing payment systems and as a Zelizarian (1994) means of signaling membership in the sorts

²⁹ <https://bitnet.io/>

³⁰ <https://bitpay.com/>

³¹ <https://www.coinify.com/>

³² <https://www.coinbase.com>

of tech communities from which it originated. In spite of this intermediate period of success and enthusiasm, however, it has become increasingly evident that retailers and consumers have not embraced digital currencies to nearly the degree the initial hype around their capacity to disrupt the payments' arena indicated might happen (Chernova 2016; Williams-Grut 2015). Hope nevertheless remains that Bitcoin as a payment system may still yet prevail, albeit more slowly than initially expected and potentially via more unexpected avenues such as becoming more dominate in the arena of international payment transfers and remittances (Ombok 2013) or in the emerging arena of “nanopayments” for online content (Prisco 2016). As will be shown, collective interest in cryptocurrencies and blockchain has definitively shifted away from this vision of them and toward a different view of how the technology might be harnessed in the future.

4.2.3 Finance and Business Technology

The vision of cryptocurrency as providing the basis for a radical alternative to existing payment systems that could circumvent both governments' and established financial institutions' centralized power did not, for obvious reasons, hold much appeal to many in the mainstream banking and finance sector. The potential to use blockchain design to help increase the efficiency of their existing applications, however, has. Examples of such possible uses of blockchains in financial and business applications include developing automatically executable “smart contracts”, tracking exchanges in securities markets, and for currency clearing and settlements. Chief selling points for using blockchains in these applications is the efficiencies companies gain by eliminating third party intermediaries and the rapidity and security with which such transactions can occur. As a result of these possibilities and the prior introduction of the

technology into major investment spheres per the previously mentioned reconceptualization of cryptocurrency as a digital asset, by 2015, a tidal wave of interest in blockchains by major banking and finance companies such as Goldman Sachs, Bain Capital, the New York Stock Exchange, Mastercard, and American Express had driven the estimated total of venture capital which has been invested in Bitcoin and blockchain startups past the billion dollar (USD) mark (Pagliery 2015).

Research on blockchains and their potential financial and business applications is still early, with different private, public, and academic groups exploring different ways of bringing them into practice. Of notable significance for this present work are the varying degrees to which these new applications are being built in ways that do and do not involve Bitcoin and the original blockchain it is based upon. One proposed set of approaches involves using “sidechains” that are “pegged” to the actual Bitcoin blockchain to develop new business and finance applications. Other approaches abandon Bitcoin entirely either through the creation of “private chains” and “distributed ledgers” which are completely internal to a given company or the use of blockchains based on other cryptocurrencies such as Ether that act as incentivizing tokens for blockchain-based apps but are not meant to become currencies in their own right. Associated with all these different blockchain development approaches came the founding of a slew of startups, business consortia, and non-profits such as Blockstream³³ with the development of sidechains, R3 CEV³⁴ with distributed ledgers, Chain, Inc.³⁵ with private blockchains, and the Ethereum Foundation³⁶ with the use of alternative cryptocurrencies. In total, this new class of “blockchain technology” ventures had received hundreds of millions (USD) in funds from an impressive number of

³³ <https://blockstream.com/>

³⁴ <http://r3cev.com/>

³⁵ <https://chain.com/>

³⁶ <https://www.ethereum.org/>

establishment banks and finance companies by the end of 2015 (Hope 2015; Metz 2015). As the next section more fully elaborates, this powerful contingent's massive inundation of support and investment for this *particular* imaginary of the technology ultimately set the stage for an intense struggle over what the future of cryptocurrency.

4.3 Imaginative Control and the Transition from “Bitcoin” to “Blockchain Technology”

The coexistence of multiple imagined futures for cryptocurrency did not, at the outset, entail a significant contestation between them. Some inherent frictions undoubtedly existed between different constituencies' evaluations of the technology, not the least of which being the aforementioned tensions between those promoting its usefulness for illicit activities and others' pursuit of more widely legitimated usages of it. Initially, however, it looked as if there might be a real possibility that different aspects of cryptocurrency and blockchain technology could become mutually supportive of each other in their development. This was a potential not only for the three main visions of the technology that had come to the fore by 2015, but also, the original vision of it in as far as success in realizing these more mainstream interpretations of it might inadvertently help establish Bitcoin as both a “store of value” and a “medium of exchange,” and in so doing, bring it that much closer to becoming money in its own right.

As this final part of the analysis will demonstrate, however, this harmonious picture of technological progress is not the one that came to pass. With the entrance of well-resourced, establishment actors from the banking and finance world into the arena, there came a sweeping reconfiguration of innovational priorities and imaginations away from visions that might undermine or disrupt the stability of those actors' advantaged positions and toward imagined futures for that technology that would reinforce their current dominance. This shift was clearly reflected not only in dramatic changes in venture capital funding with the entrance of these

actors, but also in profound shifts in the collective discourse surrounding the technology that followed these investments and the resulting “civil war” (Hern 2015) that arose within the Bitcoin community over what future goals should be prioritized in needed upgrades to its underlying code.

4.3.1 Shifts in Venture Capital Funding

When the collective undertaking of cryptocurrency began, the resources being put into it were largely in the form of individuals’ volunteered time, energy, and expertise. With the entrance of both Silicon Valley and major finance and business groups into the field, however, this changed. Between the end of 2013 to the beginning of 2016, increasingly substantial amounts of venture capital began to pour into the digital currency arena. The businesses which received funding ran the gamut from digital currency exchanges, Bitcoin ATMs, mining pools and computer hardware, wallet services, and the development of distributed ledgers for businesses, to name just a few examples. These different categories of startups reflected different imagined futures for what began as Bitcoin. Ventures focusing on facilitating merchant adoption of Bitcoin, for instance, inherently support an understanding of cryptocurrency’s usage as a payment system. Similarly, currency exchanges provided support for the view of digital currency as a type of asset class, whereas startups devoted to using blockchains or distributed ledgers for business applications advanced the idea of it as an innovative finance and business technology.

Figure 1 presents a breakout of publicly reported rounds of venture capital funding for cryptocurrency related startups, organized by type of business. The three identified categories of businesses received the majority of venture capital funding are “exchanges,” “payments,” and “financial/business applications,” which are reflective of the previously discussed “digital asset,” “payment system,” and “finance/business technology” facets of digital currency’s identity. Of

primary note are the levels and changes in funding through time. In the quarter of Bitcoin's highest exchange rate in its first seven years, November 2013, the venture capital funding for digital currency companies increased dramatically, with most of the funding being invested in exchanges. Over the course of the following year, funding then shifted primarily toward companies involved in payments, with more resources beginning to modestly move into financial and business applications in the last quarter of 2014.

[FIGURE 1 ABOUT HERE]

In the first quarter of 2015, a dramatic shift occurred with a substantial influx of funding into financial/business applications and a concurrent drop in payments funding. In total, the approximately \$129 million (USD) that went into financial/business applications in the first quarter of 2015 was almost as much as payments had received in the preceding three quarters (\$139 million). Simultaneously, funding for payment startups declined from around \$60 million in the last quarter of 2014 down to just \$5.6 million in the first quarter of 2015, a decline of over 90%. Though funding for payment ventures rebounded to its highest levels to date of nearly \$68 million in the second quarter of 2015, subsequent funding for this category was ultimately dwarfed by another, even more massive influx of around \$135 million of capital into financial and business applications at the beginning of 2016. Despite the early lead funding for payment startups had, the total for this class of companies stood at near \$321 million over the same period, 33% less than what has been received by financial and business applications.

Another way of getting at shifts in the venture capital funding priorities is to look at differences between funding for companies which are based upon Bitcoin (e.g. exchanges

centered around Bitcoin, applications utilizing the original Bitcoin blockchain, and payment software for Bitcoin transactions) and those focused on the development of alternative digital currency tokens and other utilizations of blockchain technology (e. g. private blockchains, the development of decentralized app development tokens such as those used by “Ethereum”, and payment systems based on non-Bitcoin currencies). Figure 2 presents the same funding data as the prior figure, but broken down by Bitcoin versus non-Bitcoin based companies.

[FIGURE 2 ABOUT HERE]

Up through the first quarter of 2015, Bitcoin based companies clearly dominated. Given the first-mover advantage the original digital currency had along with its much greater degree of development and familiarity, the fact that it initially attracted more is unsurprising. Notably, Bitcoin was the basis of many of the financial and business applications companies which received the massive influx of funding in the beginning of 2015. Over the course of the next year, however, another notable shift occurred with the quarterly totals for non-Bitcoin based businesses outpacing funding for Bitcoin based companies for the first time. This trend subsequently held for two of the four quarters in 2015 and most significantly, for the second massive wave of funding into business and financial application startups in the first quarter of 2016.

The aforementioned shifts in venture capital funding in 2015 were strongly driven by increasing involvement of firms such as J.P. Morgan, Citi Ventures, Visa, Goldman Sachs, and IBM as well as the founding of new digital currency related companies by Wall St. and finance industry insiders, such as the founding of the Digital Currency Group investment firm by the

previous founder of SecondMarket, Barry Silbert, and the founding of the blockchain technology company Digital Asset Holdings by the former head of Global Commodities at J.P. Morgan Chase and purported creator the credit default swap, Blythe Masters (Leising 2016; Vigna 2016). Along with the substantially larger amounts of capital these actors brought into the Bitcoin and blockchain arena came their priorities for the future of technology. These players were not interested in the radical visions of a non-state backed currency that were essential to cryptocurrency's creation and initial development and adoption. Furthermore, these trends also clarify that many of them also were not as interested in the truer-to-its-origins conception of Bitcoin as a payment system. This diversion of massive amounts of resources into a particular imagination of cryptocurrency has not entailed that the older facets of its identity have automatically fallen away. However, as will be further borne out in the proceeding sections' discussions of collective discourse trends and conflicts over scaling, the presence and actions of this influential and well-resourced audience has had a profound influence on determining which shared vision of this innovation is most likely to be collectively realized.

4.3.2 The Rise of "Blockchain Technology" in Collective Discourse

The channeling of material resources into particular lines of development matters in that it strongly affected which visions of cryptocurrency become developed fastest and most comprehensively. It also had profound effects on which *interpretations* of the technology ended up becoming most prevalent. Initially, discussions of Bitcoin did not necessarily distinguish between the currency, the payment system, and the computer protocol underlying it. As the proliferation of "blockchain technology" startups began to outpace the founding of startups dedicated to payments, however, an increasing distinction began to be made between Bitcoin and

the blockchain technology that it and other cryptocurrencies are built upon (Tillier 2015). This effect is especially evident in the unequivocal shifts that occurred in Bitcoin reporting immediately following the dramatic shifts in venture capital funding discussed above.

In the last half of 2015 and continuing through to the beginning of 2016, Bitcoin saw a new wave of coverage from high-profile publications. These publications were not just tech-oriented ones such as *Wired*, but also major finance publications such as *The Wall Street Journal* and *Forbes*. One of the most prominent examples of this wave of reporting was Bitcoin making it to the cover of the October 31, 2015 issue of *The Economist* (The trust machine 2015). This trend in coverage was undoubtedly a sign of an increasing legitimization of the Bitcoin endeavor and a signal of its successful movement into the mainstream. Looking more closely into the nature of this coverage, however, yields a more complicated picture involving a systematic trend toward drawing new lines of distinction between the politically loaded “Bitcoin” concept and the more instrumentally useful concept of “blockchain technology.” To quote from “*The Trust Machine*,” the aforementioned cover story in *The Economist*:

“Bitcoin itself may never be more than a curiosity. However blockchains have a host of other uses because they meet the need for a trustworthy record, something vital for transactions of every sort. Dozens of startups now hope to capitalise on the blockchain technology, either by doing clever things with the bitcoin blockchain or by creating new blockchains of their own”

“... the blockchain is an apparently mundane process that has the potential to transform how people and businesses co-operate. Bitcoin fanatics are enthralled by the libertarian ideal of a pure, digital currency beyond the reach of any central bank. The real innovation is not the digital coins themselves, but the trust machine that mints them—and which promises much more besides.”

This distancing of Bitcoin from blockchain and the associated raising up of the latter and the expense of the former is so characteristic of coverage during this period, evidence of it is detectable at the aggregate level, captured here using text scraped from all online pages returned

for a search on the term “bitcoin” from two high profile finance and business publications, *Bloomberg News* and *The Wall Street Journal*’s blog, and two tech oriented publications, *Wired* and *Gizmodo*, as well as all online articles available from two prominent Bitcoin reporting sites, *CoinDesk* and *Bitcoin Magazine*, between May 2011 through April 2016 (n = 7,903 individual documents; see Table 1 and Appendix A for more details on text collection and processing).

Figure 3 depicts the relative frequencies with which the term “blockchain” and “payment” appear in Bitcoin related coverage in the preceding six months of coverage for a set of six different news sources for the period extending between 2013 through 2015. In both graphs, the red-dashed vertical line indicates the beginning of the first quarter of 2015, the midpoint of the 6-month period in which the first massive influx of venture capital funding into financial and business applications began.

[FIGURE 3 ABOUT HERE]

One of the most striking features of these results is the several-fold increase in 2015 in the frequency with which the term “blockchain” appears across news sources. Prior to this point, mentions of “payment” tended to be more frequent than “blockchain” across the board, though some early indications of where the language surrounding Bitcoin was headed are evident in the uptick in the frequency of the term “blockchain” in the coverage by *WSJ* and *Bitcoin Magazine* in the second half of 2014. In the second half of 2015, following the major shift in venture capital funding toward business and financial applications that began in the first quarter of the year, the frequency with which “blockchain” appears dramatically overtakes those levels across all publications. Changes in the frequencies of the term “payment” also decline between the beginning of 2015 and the beginning of 2016 for five of the six publications.

These shifts in discourse are also detectable via a more thematically comprehensive view of the same corpus, which I get at through the use of topic modeling (Grimmer and Stewart 2013), a computational method that has become increasingly acknowledged as important tool in sociological analyses of cultural and social construction processes (DiMaggio, Nag, and Blei 2013; Mohr and Bogdanov 2013). More specifically, to extract emergent themes in the afore described corpus and examine expected degree of prevalence of those themes through time, I use a structural topic modeling approach (Roberts et al. 2014; Roberts, Stewart, and Airolidi 2016).

[TABLE 2 ABOUT HERE]

[FIGURE 4 ABOUT HERE]

Table 2 presents the 15 most strongly associated words with the three topics that are most clearly reflective of the “payment,” “digital asset,” and “blockchain technology” definitions of cryptocurrency that are of primary interest to this analysis. Figure 4 represents the estimated proportion of documents within which each of these three topics was present throughout the period under consideration, controlling for source. As before, the vertical dashed line is used to indicate the period that saw massive shifts in the types of digital currency businesses receiving venture capital funding (see Appendix A, Table A1 for description of other topics and process used to determine topic labels and estimate proportion through time).

These results corroborate the story told by the relative frequencies of the terms “blockchain” and “payments” offered in Figure 3. Before 2014, coverage related to “blockchain technology” and its use specifically for business and financial applications was notably less prevalent than discussions containing language that reflected the investment and payment

potentials of Bitcoin. This begins to shift over the following year, however, as the blockchain technology topic begins to catch up and slightly overtake the digital asset related topic. Notably though, over most of this year the payment related topic still continues to predominate. The first quarter of 2015, the same quarter that saw the massive shift of venture capital into financial and business application, marks a distinctive inflection point in coverage. Most dramatically, we see a sharp climb in the proportion of blockchain technology related coverage in which it moves from a level comparable to that of the payment and digital asset topics, being present in around 8-10% of the corpus, to clearly dominating by the middle of 2016 to nearly 30%. Over the following year, this is also accompanied by a marked decline in the proportion of the payments related topics to its lowest levels of the entire period under consideration. The digital asset topic remains more variable with distinct upticks and down turns through the same period, but on the whole, continues to maintain levels near where it began the year.

These results strengthen the argument that shifts in how Bitcoin was being discussed after the entrance of major business and financial interests not only reflected a simple rise in popularity of the term “blockchain,” but also, a deeper shift away from envisioning Bitcoin as a payment system and toward understanding Bitcoin as new finance technology. These longitudinal view of changes in thematic dominance provide an unusually clear insight into how the contestation over cryptocurrency played out in the media through time. The unequivocal shift in discourse away from “payments” and toward “blockchain technology” act as indication of which, and most specifically *whose*, visions of the underlying technology were being collectively realized. Further, the highly decentralized and unregulated nature of the technology’s development and the concurrence of this change in discourse with the entrance of powerful establishment actors into its investment arena provides evidence for the presence of imaginative

control in its development. As the following section will show, these powerful constituencies' ability to disproportionately influence which imagined futures for cryptocurrency ultimately advanced was more than a matter of mere semantics but an influence which ultimately had real material consequences for the technology.

4.3.3 The “Block Size Debate”

By the last part of 2015, the same year which saw the aforementioned change in venture capital and media coverage, the highly contentious “block size debate” had overtaken the Bitcoin community. At issue was the number of transactions that the Bitcoin blockchain was able to process in a single “block” and its implications for the scalability of Bitcoin. Early on, Nakamoto arbitrarily set a 1MB limit on how many transactions could be included in any given block. At the time, this limit was far more than was required to handle the rate of transactions occurring on the network. The dramatic increases in investment and usage of Bitcoin in 2015, however, made it abundantly clear that the rate of transactions was on track to exceed this capacity in the foreseeable future (Hearn 2015). While all major parties agreed that something needed to be done immediately to address this imminent issue, the controversy over *what* should be done proved so intractable that two years later, a solution had still not been implemented. Consequently, the Bitcoin system was not prepared to handle the explosion in usage that accompanied its historic climb in valuation during the last quarter of 2017 and the resulting network congestion caused by the still too small blocks led to the long transaction confirmation times and high processing fees that caused the temporary breakdown in Bitcoin's functionality as a payment system (Lee 2017).

This impasse was as philosophical as it was technical. On one side were the “big blockers,” representing those who were most interested in seeing Bitcoin fulfill its original

intention of becoming a global payment system and who supported substantially increasing the block size limit immediately. Significant figures in this camp included Gavin Andreson, an aforementioned original lead developer of Bitcoin and founder of the Bitcoin Foundation and Mike Hearn, another well-established figure from Bitcoin's early days and major contributor to the original development of its software (Pearson 2015). Others, however, placed less priority on Bitcoin's functionality as a payment system and more on its usefulness as a digital asset and a structure on which settlement systems could be built. For these so-called "small blockers," the way forward was to leave the current block size close to its original levels and instead, pursue the development of "sidechains" and "off-chain" solutions that would rely on systems run by intermediate entities or organizations that would handle higher volumes of small transactions between parties directly, and once settled, have that data returned back to the main Bitcoin blockchain (i.e. the intermediaries' sidechains would be "pegged" to the Bitcoin blockchain). A notable proponent of this approach has been Blockstream, a well-funded blockchain technology company with deep-pocketed backers such as the aforementioned Digital Asset Holdings and Digital Currency Group (Rizzo 2016). Significantly, one of Blockstream's main areas of focus has been the development of its own set of sidechain protocols.

The resolution of these different camps' approaches proved so intractable that it was frequently characterized as a "civil war" (Hern 2015). Impassioned rhetorical appeals to the ideals upon which Bitcoin was founded (e.g. decentralization, free market dynamics, democracy) were mounted on each side, and serious accusations of conspiracy, censorship, and manipulation abounded between the groups. The degree to which this conflict was driven by irreconcilable aspects of different constituencies' visions of what Bitcoin was also explicitly and widely acknowledged, as evidenced in an August 2015 article from CoinDesk (Caffyn 2015):

“As it has unfolded, the block size debate has touched on many pain points for the currency as it seeks to grow. Bitcoin is many things to many people – anarchists, speculators, entrepreneurs – which, until now, hasn’t been much of a problem.

However, as proposals and counterproposals emerge, the question of the currency's future remains. Will it compete with the likes of Visa as a cheap, fast payment channel? Or should it remain an ultra secure, premium – and scarce – store of value to which other services can be pegged?”

If Bitcoin had been a more standard type of product, one whose development was controlled by a strong central producer, there is every reason to believe that the decision on which of these scaling solutions to implement would have been made well before the 1 MB block size became a problem in practice. Changes to Bitcoin’s main code were built to abide by a consensus-based protocol that reflected its founding ideals of decentralization, however, and require at least 75% agreement from nodes on the Bitcoin network to go into effect. In the two years following the eruption of the “block size debate” in 2015, several international “Scaling Bitcoin” conferences were held involving prestigious academic institutions such as Stanford and MIT and a variety of viable proposals for changing the protocol (e.g. BitcoinXT, Bitcoin Classic, SegWit) were developed, promoted, and discussed across the community. In spite of these efforts, however, no solution achieved the required level of agreement by the last half of 2017.

It was against this backdrop that on August 1, 2017, a significant contingent of “big blockers” took the drastic step of executing a “hard fork” which effectively split the existing Bitcoin blockchain into two branches – the legacy branch, currently still referred to as Bitcoin (BTC), and another branch operating under the name Bitcoin Cash (BCH). The new blockchain fork included an updated protocol that allowed for an immediate upgrade to an 8 MB block size and the capacity to automatically increase block size in the future in response to increased demand (Popper 2017). Both Bitcoin and Bitcoin Cash share the same history of transactions up until the fork, but from that point forward, they became two separate cryptocurrencies: one still

bearing the identity of the original Bitcoin, the other more clearly focused in its definition as an object meant to offer a decentralized, effective alternative to existing digital payment systems³⁷.

At the time of its creation, Bitcoin Cash was initially valued in the \$400 (USD) range while Bitcoin maintained its levels near \$2,700 (USD) (Titcomb 2017). Over the following months, its price movements continued to loosely track those of the general cryptocurrency market but remained far short of Bitcoin's price levels. In spite of some notable victories such as decisions by a few major cryptocurrency exchanges to support Bitcoin Cash wallets and trades (Bovaird 2017), its adoption and use also remained far behind that of the legacy Bitcoin, even during the latter's aforementioned dramatic failures as a payment system in late 2017. After the "exit" (Hirschman 1970) of the Bitcoin Cash faction, enough dissension persisted in the main Bitcoin community that by the end of 2017, the "small blocker" contingent was still unable to achieve enough network consensus to implement its proposed changes in time to prevent this failure. Nonetheless, at the beginning of 2018 Bitcoin continued to reign supreme in the world of cryptocurrency and blockchain related enterprises were reported as already having received near \$400 million in venture capital funding in the first two months of the year, over 40% of the total funding they had received in the entirety of 2017 (Rowley 2018). In such a way, the cryptocurrency project has continued to successfully develop as a financial and business technology while simultaneously, falling increasingly behind in its early aspirations of becoming a payment system capable of disrupting the existing system.

5. Discussion and Conclusion

³⁷ In its own words, Bitcoin Cash has declared itself "the best money in the world" which is "fulfilling the original promise of Bitcoin as 'Peer-to-Peer Electronic Cash'." <https://www.bitcoincash.org/>

Using trends in venture capital funding and collective discourse, along with an examination of the “block-size” debate that wracked the Bitcoin community from 2015 through the end of 2017, this analysis has sought to shed light on the messy and contentious social realities involved in market-based innovation and how those with the greatest influence over investment decisions exert a form of emergent, imaginative control over such processes. As the history of Bitcoin’s first eight years demonstrates, the highly decentralized context within which cryptocurrency emerged enabled a particularly broad diversity of groups to opt into the development of cryptocurrency in accordance with their own interpretations of what the technology was and what made it worthwhile. This wide proliferation of different visions for the technology arguably affirms the ability of markets to foster creativity through the voluntary participation of individuals in developing new products and solutions. This meritocratic picture of capitalist markets is complicated, however, when we take seriously the realities of who determines which of these visions are most worth investment.

In cases such as this, an analytical difficulty often arises from the lack of counterfactual developmental trajectories. Are there alternative scenarios in which these different technological visions might have found a way to coexist in a mutually supportive fashion? Would the same degree of bias in investment toward one particular set of imagined futures over others still have arisen given a more even playing field? There is no way to know these answers. What can be said for certain, however, is that the development of cryptocurrency has been a site of major conflict between those supporting the original vision of Bitcoin as a decentralized alternative to establishment banking and finance systems and those supporting a vision aligned with the interests of a more recently arriving, highly resourced constituency of investors. This conflict has manifested into a macro-level selection process of which form of the innovation will be realized

through the market. The main purpose of this analysis has been to demonstrate that this realization was not a neutral process in which an objectively “best” version of the innovation was selected, but rather, one which was strongly biased toward realizing the imagined futures that were conceivable to and valued by those with greater control over investment capital. This was true even though cryptocurrency’s development met the ideals of a pure market innovation process to a much greater degree than is often practically achievable – a fact which points to this emergent dynamic being native to capitalist systems.

The context of markets and economic valuation make it easy to essentialize the selection of a given innovation or form of an innovation as being a natural (Douglas 1986) outcome arising from the innate superiority of it. It may be that the only times we can really understand what other futures might have been realized are in the moments before the question of what an innovation is has been fully answered. Though the fate of the Bitcoin endeavor continues to unfold, its evolution to date has already illuminated a significant irony at the heart of capitalist innovation: while the such systems may democratically empower individuals to conceive of new realities, the actualization of those visions remains bounded to their ability to make sense and appeal to those who already well-positioned in the existing order. If we accept that the determination of “better” or “progress” is a multi-dimensional problem whose solution is subject to the evaluation criteria individuals impose upon it, then in capitalist markets the decision of what innovations or versions thereof are worthy of collective support will ultimately be structured by the interpretative frameworks of those who hold power over investment decisions. Consequently, while capitalist markets may well provide a powerful vehicle through which to explore the vast space of products and solutions which might potentially exist, left to their own

devices, their trajectories are unlikely to veer toward any futures that are inconceivable or undesirable to those who already privileged within the existing order.

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Figures

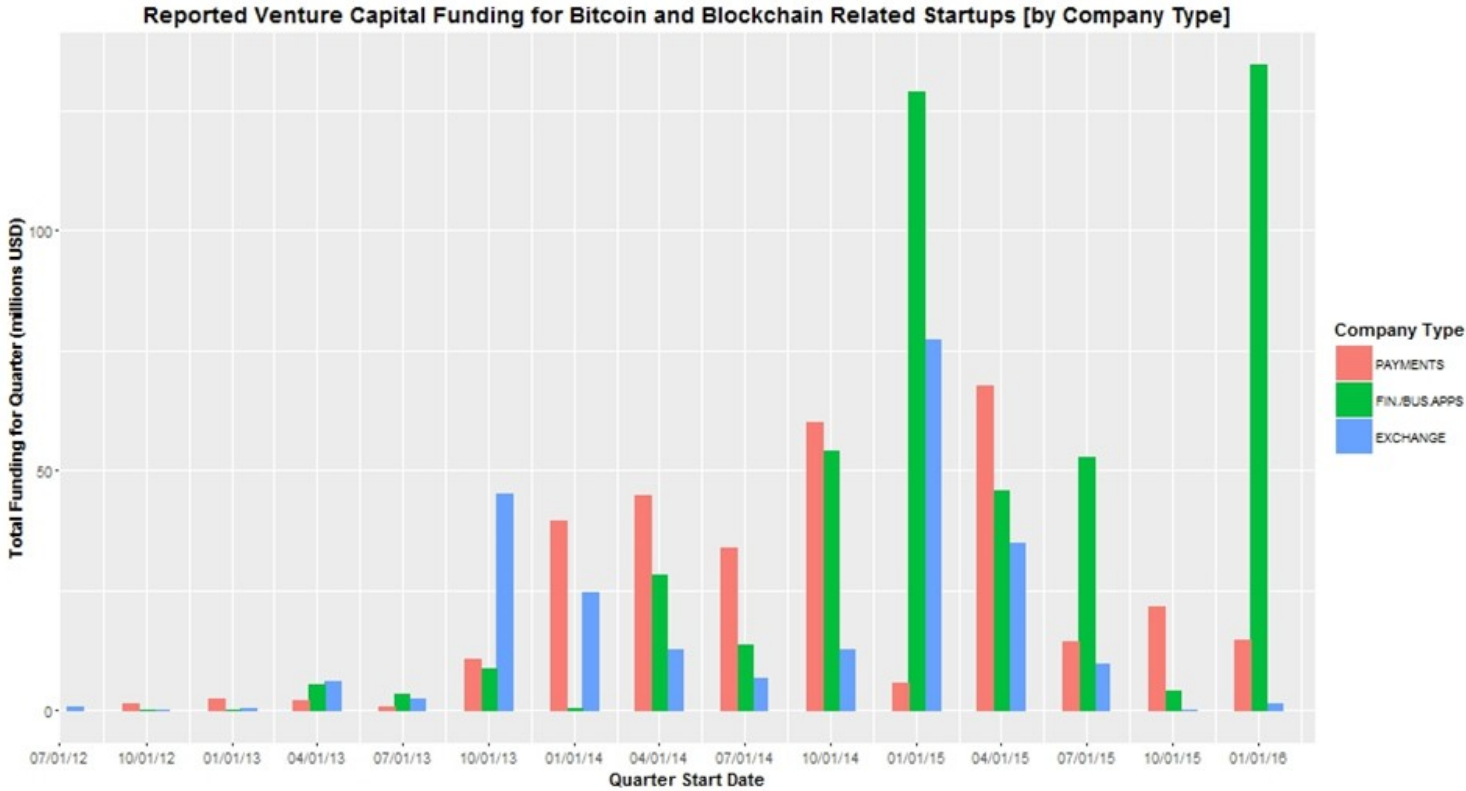


Figure 1: Reported venture capital funding (millions USD) by type of digital currency startups.

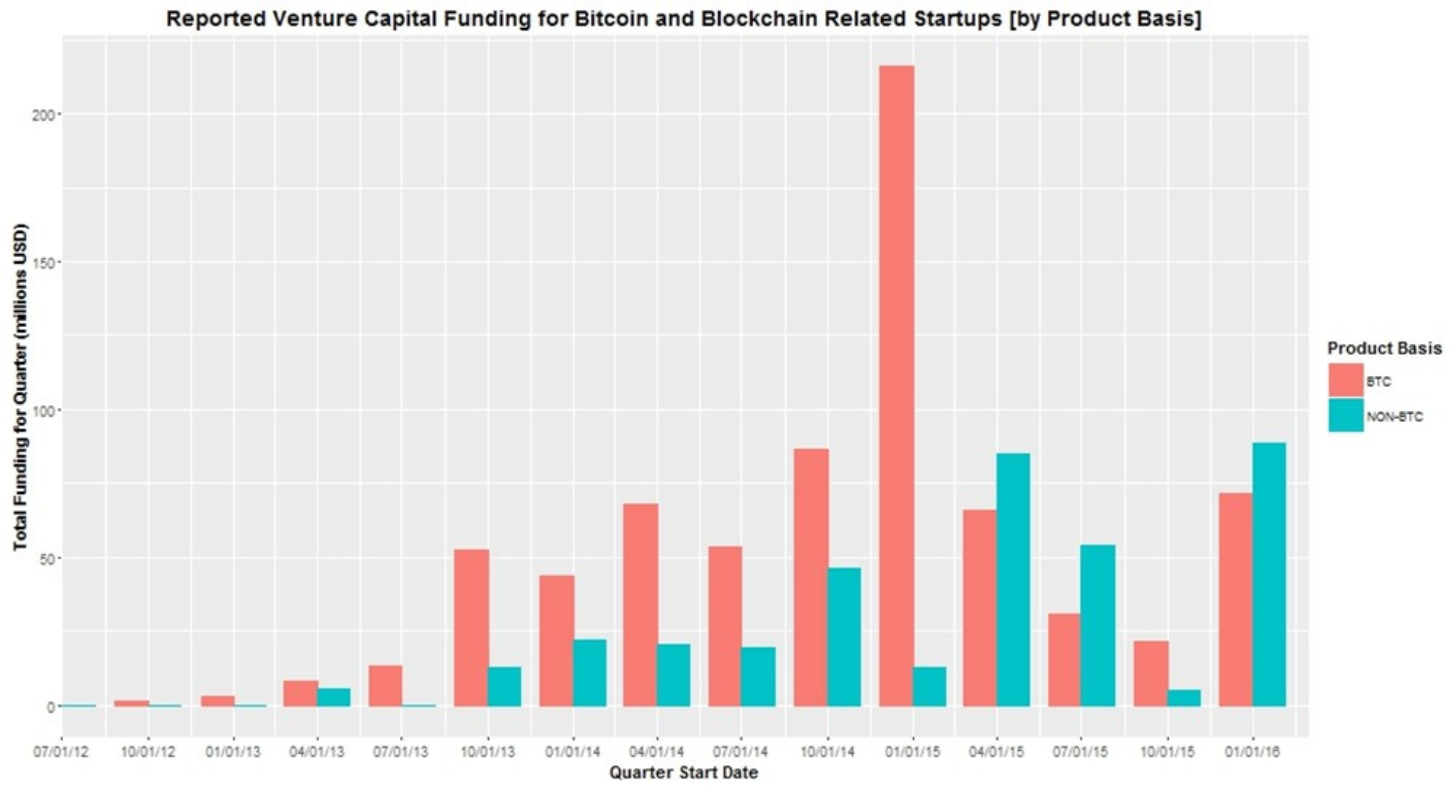


Figure 2: Reported venture capital funding (millions USD) for Bitcoin vs. non-Bitcoin digital currency startups.

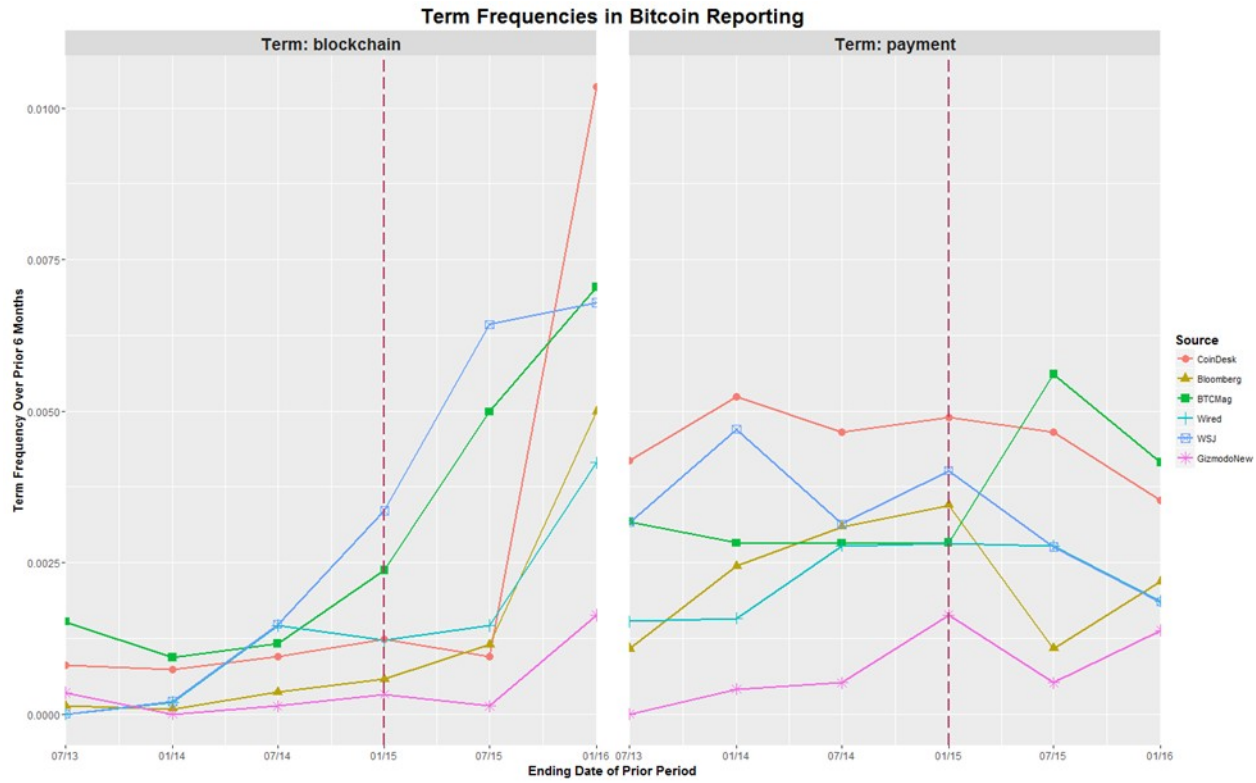


Figure 3: Trends in relative frequency of terms “blockchain” and “payment” to total terms produced by each source over the preceding 6 months. Vertical dashed line indicates the beginning of the quarter (Q1 2015) which saw major shifts of venture capital funding into business and financial applications.

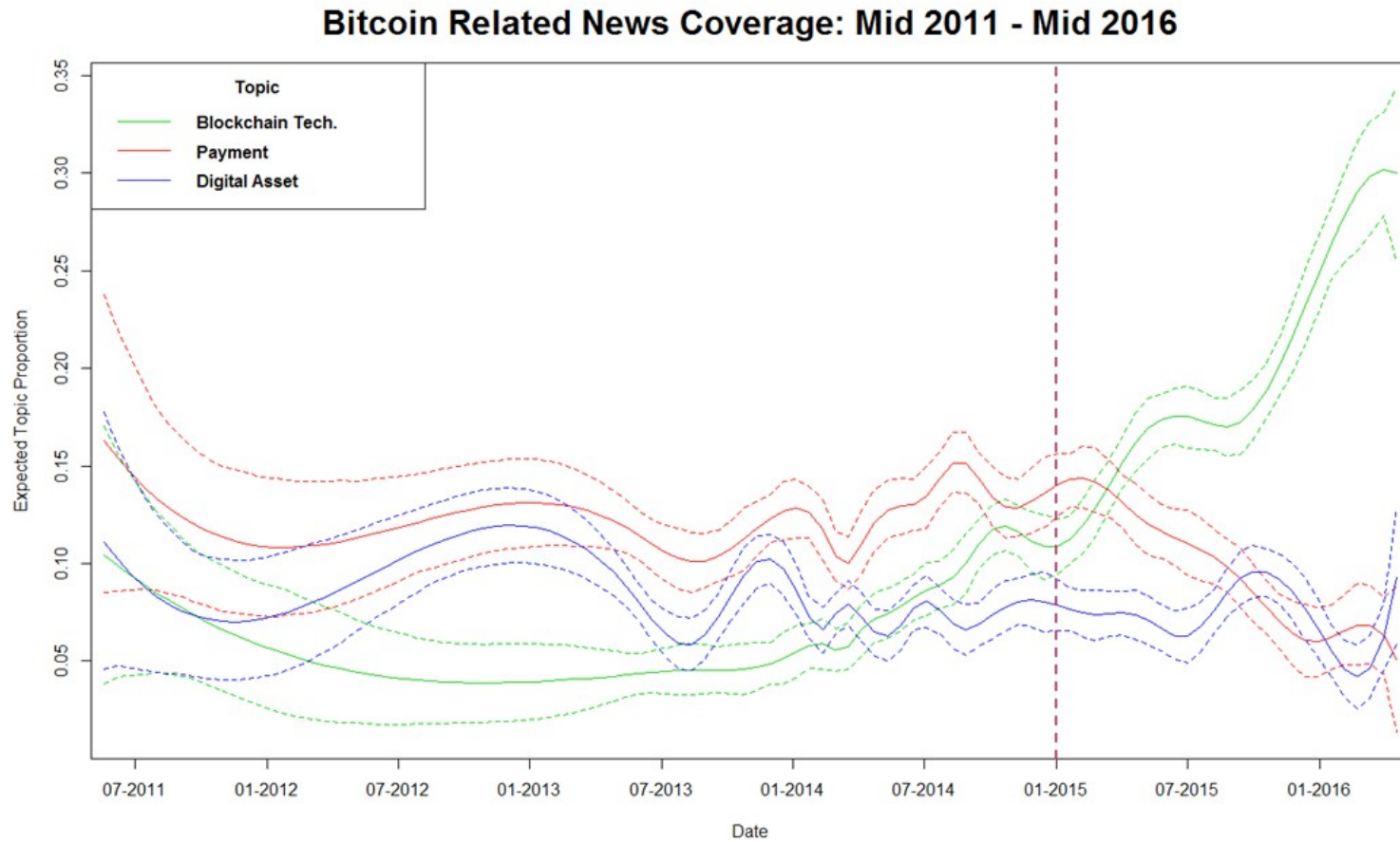


Figure 4: Estimated topic proportions for selected topics, mid-2011 through mid-2016, for entire corpus (7,903 documents, 6 sources). Vertical dashed line indicates the beginning of the quarter (Q1 2015) which saw major shifts of venture capital funding into business and financial applications.

Tables

| Constituency | Sources | Selection Criteria | Number of Articles |
|--|--------------------------|--|-------------------------------|
| Cryptocurrency insiders and community participants | Bitcoin Magazine | All articles | 1678 |
| | CoinDesk | All articles | 4454 |
| Tech Industry | Wired Magazine | All articles containing term "Bitcoin" | 437 |
| | Gizmodo | All articles containing term "Bitcoin" | 214 |
| Finance and Business | Wall Street Journal Blog | All articles containing term "Bitcoin" | 419 |
| | Bloomberg | All articles containing term "Bitcoin" | 701 |
| | | | Total documents: 7,903 |

Table 1: Corpus of scraped Bitcoin related news coverage between April 2011 through April 2016

| Topic Number | Topic Label | Top 15 Words (by FREX score) |
|--------------|------------------------------|---|
| 10 | Blockchain Technology | blockchain, technolog, project, ledger, rippl, distribut, ethereum, smart, contract, applic, innov, platform, infrastructur, decentr, build |
| 7 | Payments | card, merchant, coinbas, payment, mobil, accept, fee, appl, app, paypal, option, credit, pay, bitpay, processor |
| 3 | Digital Asset | price, china, trade, chines, volum, trader, percent, investor, invest, stock, index, market, liquid, volatil, winklevoss |

Table 2: Topic labels for "Blockchain Technology", "Payments", and "Digital Asset" topics with top 15 words associated

Appendix A – Technical Appendix

A.1 Text Collection and Processing

Text and metadata for articles and posts were collected criteria using web crawlers and scrapers built using the Python Scrapy package and web addresses and tags were removed using the Python “BeautifulSoup” package. Consistent with standard practice, common “stop” words (e.g. “the”, “will”, “been”) along with frequently occurring author names, names of the respective sources, and picture attributions were removed from the corpus. The terms “bitcoin” and “bitcoins” were also removed due to the fact that they were used as the search criteria for four of the six sources used.

To generate the relative word frequencies for each source shown in Figure 4, the “nltk” Python package was used to first stem all words and then compute the frequencies with which the terms “payment” and “blockchain” occurred relative to the full number of terms appearing in each source’s coverage over the preceding 6 months. Data is only shown for mid-2013 onward due to low levels of coverage by several sources prior to that time.

A.2 Structural Topic Modeling

Well-known aspects of topic modeling include the requirement that the user exogenously specify the number of topics (k) to use in the model and the probabilistic nature of the modeling process which leads to a degree of variability in the composition of the topics which the model will “find” across different runs of identically specified models. To address the choice of number of topics to use and which model’s results to present, I conducted a series of tests provided by the ‘stm’ R package (Roberts et al. 2017) to ascertain which models had the best balance between semantic coherence and exclusivity (see Appendix A for more detail). These tests led to

the choice of a $k = 13$ model. I also ran a series of other models with different number of topics and additional $k = 13$ models to verify the robustness of the presented findings and concluded that both the extracted topics and the estimated topic proportions through time of these models were in strong accordance with those presented here.

The structural topic model used incorporated both text as well as metadata on source and date in its estimation. In order to choose number of topics (k), the `stm` package's "searchK" function was used to evaluate models ranging $k = [10,30]$. A model of $k = 13$ was found to strike the best balance between the provided diagnostic criteria. Once determined, the "selectModel" function was used to evaluate 20 different topic models of $k=13$ in terms of their balance between measures of exclusivity and semi-coherence. The top four performing models in this regard were then considered in terms of their interpretative legibility and relevance of the topics they estimated as assessed through top words and documents most strongly associated with each topic. All models produced distinct topics related primarily to the "payment" and "blockchain technology" categories, though three of the four also produced topics which seemed to contain either some combination of multiple categories or secondary topics related to each. The model with the cleanest division between the categories of interest was ultimately chosen (see Table A1 for full results). Further checks were performed by using the "findThoughts" function of the 'stm' package which returns the top articles associated with each topic. Using this function, the first ten articles related to each of the identified target topics were retrieved and reviewed and in all cases, were determined as faithfully reflecting the collective definition and categorization of cryptocurrency as asserted in the analysis. This set of thirty articles is available upon request. Once selected, the model was then used with used to regress topic proportion as a function of date, controlling for source and using the default Global uncertainty method. A series of

robustness checks were performed using the other top three models to estimate topic proportions through time and in each, the main qualitative pattern of interest involving shifts in category related topic proportions was present.

| Topic Number | Topic Label | Top 15 Words (by FREX score) |
|--------------|---------------------------|--|
| 1 | Regulations | regul, regulatori, tax, virtual, complianc, licens, rule, bitlicens, senat, fincen, law, guidanc, state, agenc, legal |
| 2 | Mt. Gox Fraud | gox, withdraw, japan, claim, bankruptci, report, file, request, comment, custom, karpel, statement, bitstamp, updat, deposit |
| 4 | Bitcoin Foundation | foundat, director, donat, member, campaign, organ, presid, board, univers, elect, group, student, vote, mit, educ |
| 5 | Conferences | confer, atm, event, citi, panel, hotel, speaker, startup, draper, attend, robocoin, entrepreneur, valley, founder, silicon |
| 6 | Silk Road | silk, ulbricht, drug, road, arrest, prosecutor, fbi, shrem, pirat, robert, agent, crimin, dark, investig, charg |
| 8 | Economics/Politics | gold, central, bank, economi, econom, monetari, countri, reserv, money, currenc, euro, russia, nation, metal, govern |
| 9 | Generic | simpli, problem, reason, even, fact, actual, certain, exampl, might, much, rather, perhap, mani, differ, although |
| 11 | Mining | mine, miner, block, pool, ASIC, node, hardwar, chip, altcoin, hash, power, size, litecoin, core, butterfly |
| 12 | Generic | realli, that, there, think, lot, got, thing, theyr, get, dont, your, know, someth, pretti, peopl |
| 13 | Security | address, wallet, key, encrypt, privati, attack, code, messag, server, privat, password, storag, data, download, user |

Table A1 – Topic labels and top 10 words associated with each topic.