

The Meanings of New Money: Social Constructions of Value in the Rise of Digital Currencies

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Abstract

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In the wake of the Great Recession, a novel monetary object was introduced to the world: Bitcoin. As its collective valuation has risen into the billions (USD), it has brought with it a sustained disruption to some of the most deeply taken-for-granted aspects of modern life: money and value. This dissertation undertakes a set of interrelated investigations into the collective processes of social construction and valuation that have been part of this ascent.

The first study begins by considering the challenge that digital currencies pose to established economic models of the origins of money and value. Using a series of agent-based models (ABM) based on Bayesian updating agents, it shows how sociological models of value

construction may be able to help solve this theoretical problem. Specifically, it shows how treating valuation as a process of learning under uncertainty clarifies how “something” can legitimately come from “nothing” in social valuation processes. It also shows how this model can be used to systematically explore the differences between social versus non-social valuation processes, the dependency of social valuation processes on time, initial states, and early actors, and how a mix of non-social and social feedbacks can impede a system’s ability to arrive at the “correct” assessment of an object’s underlying value.

The second study uses text gathered from 100,000s of messages posted by individuals in the main communities surrounding Bitcoin and a combination of automated and traditional content analysis to explore the “talks” (Swidler 2001) of money and value that individuals have employed to make sense of this new monetary object. The resulting analysis traces the manner in which the initial metallist views that first inspired Bitcoin’s creation continue to influence the discourses surrounding it, and then goes further to unpack the ways in which members have had to go beyond those founding ideas in order to account for how the new digital currency has come to hold value. In exploring these variegated, sometimes contradictory, discussions of the economic, political, and social origins of money and value, this analysis sheds light on the ways the individuals at the advent of digital currency are making sense of this new arena of economic activity and how they are creatively reworking established notions of money and value in order to understand what Bitcoin is and where its worth comes from.

The final study takes on the puzzle of how Bitcoin has gone from being an obscure monetary experiment of a small group of “techno-Libertarians” to becoming the basis of a new multi-billion dollar financial technology industry – an industry dominated by the very same actors it was initially intended to subvert. Using the documented history of Bitcoin’s evolution,

the application of automated content analysis and topic modeling methods to thousands of news reports, and analyses of trends in quantitative measures of Bitcoin related Google searches, venture capital funding, and price and market transaction volumes, this chapter shows how Bitcoin's multivalent identity has facilitated its adoption by a multiplicity of groups, but also, ultimately left it vulnerable to being preferentially defined in ways that benefit powerful actors. In charting the rise of Bitcoin and linking it to the collective definitional processes that have surrounded it, this study chapter examines the social dynamics that surround "robust objects" and the role that these processes play in the reproduction of power structures in new social and economic fields.

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DEDICATION

To my mother, who was unable to complete this journey with me but without whom I would never have arrived. I love you mom, and wherever I may go, I will always be carrying a part of you with me.

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Chapter 1: Introduction

In late 2008, immediately in the wake of the “Great Recession”, an individual or group operating under the pseudonym “Satoshi Nakamoto” released a white paper to a cryptography list-serve which proposed a design for a new, peer-to-peer electronic cash system known as Bitcoin (Nakamoto n.d.). By early 2009, Satoshi and a small group of fellow programmers were able to use this design to “mine” the first Bitcoins. For most of the rest of that year, Bitcoin development and mining remained a side-project for this growing body of programmers, with many in the community connecting the activity to a part Libertarian, part Anarchist, part hacker amalgam of worldviews sometimes referred to as “cypher-punk.” The first exchange for Bitcoin was not established until fall 2009, with the initial rate published at 1,390 BTC = \$1 USD - the estimated cost of the computing power required at the time to produce a single Bitcoin.

Within four years, on November 29, 2013, Bitcoin reached its highest exchange rate to date of just above \$1,124.76 USD = 1 BTC. This unsustainably high valuation fell by 70% within a matter of weeks, but in the years since, the exchange rate for 1 Bitcoin has held consistently above \$300, and in the first half of 2016, recovered and sustained at an exchange rate about \$600. In the wake of this progenitor currency, there has also been a proliferation of other, alternative digital currencies. Using both the initial open-source code that underlies Bitcoin as well as faster and purportedly more reliably modifications to the initial design, hundreds of these so-called “Alt Coins” have been created in the years since Bitcoin’s initial introduction. While many of these alternative, digital currencies have failed to take off to any significant degree, some have succeeded to an impressive degree. As of this date, the total

market capitalization of all digital currencies is above \$10 billion (USD), with the majority of that being in Bitcoin.

In addition to the rise in the exchange value of digital currencies, there has also been a concurrent proliferation of new businesses and services related to all aspects of digital currency, from the computing hardware required to mine it, the processing of transactions, payment platforms for merchants, legal services devoted to navigating the still ambiguous and contradictory regulatory environments surrounding it, and both online and print publications devoted to covering significant events and promoting its use. Though the exact number and valuation of these businesses is unknown, they are arguably numerous and prosperous enough to constitute their own sub-industry at this point in time. And as the continuing influx of hundreds of millions of dollars of venture capital will attest to, many expect the industry to only expand further in the coming years.

This meteoric ascent of digital currencies in the six years since their inception is both a historically unprecedented and extraordinarily complex phenomena. There are many perspectives, including technical, financial, and economic ones, that have begun to be applied to the subject of digital currency and its rise in value. The necessity of deepening our sociological understanding of this phenomena, however, is unmistakable. From its early existence as an ideologically motivated community project, the definition, adoption, and valuation of digital currencies has been a profoundly *social* process. In a manner that resembles what occurred during historic shifts in the institutional backing of national currencies and the invention of local currencies by politically motivated social movements, the rise of digital currency has again called to the forefront, for both participants and observers, the inherently social nature of money.

As of now, there has only been limited coverage of this emerging economic object within the sociology, with the main published research to date on it being the consideration of Bitcoin as it relates to monetary utopian projects (Dodd 2014) and highly relevant work which has been done in anthropology on the semiotics of it (Maurer, Nelms, and Swartz 2013). This dissertation addresses this current gap in economic and cultural sociology by undertaking a series of studies that demonstrate how the emergence of digital currencies connects to and carries implications for established research on the social basis of money and value. In particular, these studies focus on the social construction and collective sense-making that processes have been an instrumental part of the adoption and valuation of digital currencies. This investigation will be structured around three major research questions:

- 1) How is it that seemingly valueless objects, like the “strings of bits” that constitute digital currency, come to achieve and hold value in social life?
- 2) How has the emergence of digital currencies like Bitcoin disrupted the “taken-for-grantedness” of money and value? What are the discourses that have been employed to address this disruption in order to make sense of how Bitcoin has attained its value and whether it qualifies as money?
- 3) What are the different categories groups in the “Bitcoin ecosystem” have employed to make sense of this emergent monetary object and what role has this diversity of categorizations played in Bitcoin’s adoption, valuation, and development?

Addressing these research questions will entail undertaking three independent but related analyses. The first will focus on research question 1 and will employ agent-based modeling to

demonstrate how reconceptualizing valuation as a process of learning under uncertainty clarifies how we can have “something” can arise “out of nothing” in social valuation processes. The second part will address research question 2 and employ a “text as data” approach (Grimmer and Stewart 2013) to explore some of the overwhelming amount of online discussion that Bitcoin’s rise has generated. For this section, the main focus will be on using automated content analysis techniques to understand the “talks of money”¹ that the advent of digital currencies has evoked from groups and individuals and relate these findings to prior research in the sociology of money. Finally, the last section will address research question 3, and will be used to situate this work in dialogue with the burgeoning subarea of the “sociology of value” (Lamont 2012; Zuckerman 2012). Specifically, it will use a combination of topic modeling, automated content analysis, and analysis of quantitative metrics to demonstrate how the multivalent identity of the “robust object” of Bitcoin has not hindered but in fact *facilitated* its adoption and valuation by a variety of groups and actors, while also leaving it vulnerable to being coopted by powerful actors in established power structures.

These investigations will entail an engagement with work in several subareas, including economic sociology, cultural sociology, and the emerging literature on the sociology of value and evaluation. It will also involve a varied set of methodological tools including agent-based modeling, several automated content analysis techniques, and analysis of quantitative financial metrics. The goal of this dissertation will be to offer theoretical and methodological contributions to existing research on the social basis of money while also potentially generating new insights that are more generally relevant to the emergence and change of major social institutions and the

¹ This is a direct reference to Swidler’s much lauded work on the “talk of love” (Swidler 2001) that explored the varied and sometimes contradictory, culturally supplied discourses that individuals applied in their attempts to understand and explain romantic relationships.

social construction of value. The following sections provide further detail on the theoretical context within which these chapters are situated and the methodological approaches that each of them will be utilizing.

1.2 *Research Question 1*

The existence of money presents a fundamental problem for traditional models of *homo economicus*. Paraphrasing the classic paradox presented by Menger (Menger 1892), most orthodox economic perspectives offer little insight into why every rational, self-interested actor within an economy would be willing to exchange their valuable goods for apparently “useless” metal disks. If we were to replace “metal disks” with “string of bits” in this statement, we would have almost the exact question that has been posed by so many since the advent of digital currencies.

Though economic theorists from a variety of traditions have attempted to address the historical origins of money and explain why it holds value, their models have not been able to satisfyingly account for the emergence of alternative currencies more generally. As many have pointed out, (Carruthers and Babb 1996; Ingham 2001; Orléan 2014; Zelizer 2000), this is due to the inability of economics’ highly atomized and individualistic models to handle the inherently social basis of money. Those working at the intersection of economics and sociology have had more success in addressing the social processes via which money is constituted. The two most prominent examples of this within contemporary American sociology have been organized by Polillo (Polillo 2011) under the headings of “circuit-centered micro-sociology” (CC-MS) and “state-centered neo-chartalism” (SC-NC) accounts of money.

To summarize these models briefly, CC-MS accounts focus on how individuals “ earmark”(Zelizer 1994) existing moneys with meanings and constitute new currencies in the course of personal interactions (Zelizer 2000). More specifically, Zelizer emphasizes the emergence of alternative currencies from “circuits of commerce” (Zelizer 2011), systems of economic exchange that are not captured by models of either markets or a hierarchies and that are characterized by rich social relations among specific individuals, shared meanings, and well-defined boundaries between the circuit members and nonmembers. In this account, alternative currencies, and specifically local currencies, are understood as instances in which groups have developed particular exchange media to mark their circuits, and thus, the media are able to hold value for that group.

Contrary to the circuit-centered account of the constitution of new moneys, SC-NC approaches emphasize the creation of money through the backing of central institutional authorities, and most specifically, the state (Ingham 2001, 2004; Knapp 1924). For these models, the most important aspect of money is its functionality as a “money-of-account” (Keynes 1930; Knapp 1924), that is, as a standard means of measuring and storing abstract value (Ingham 2001, 2004). While it may benefit all actors in a system to establish such a money-of-account, there remains a major issue of coordination and agreement on what shall be used to represent it. For state-centered accounts, the solution to this problem of how such money-of-accounts are established invariably lays in the, often coercive, power of central governments (Ingham 2004; Knapp 1924; Polillo 2011) to unilaterally declare that a certain object will be money, and thus, will have value.²

² See (Fine and Lapavistas 2000; Ingham 2001; Polillo 2011; Zelizer 2000) for an overview of the on-going tensions between these two lines of theorization.

In spite of the popularity and analytical traction these sociological models of the origins of money have, digital currencies present issues for both. Given the premium that the design of digital currencies has placed both on anonymized, “trustless” transactions and the wide-scale adoption of the currencies far beyond the boundaries of the initial group of developers, the circuit-centered account is unable to address the expansion and rise of digital currencies. The emphasis this model places on personalized interactions, shared meaning, and strong boundaries, while well suited to some aspects of the digital currency system such as online “tipping”³ and the ideological fervor that characterized its initial creation, it is not able to address the much the maturation of Bitcoin into an increasingly *depersonalized* and widespread medium of exchange and store of value. Meanwhile, the fact that digital currencies were explicitly created toward the end of developing a form of decentralized money that was completely *independent* of any government backing (Nakamoto n.d.), places them unambiguously outside the scope of the SC-NC set of models. While these models may prove useful in considering some aspects of digital currency such as the fixation most users maintain on its exchange rates with established fiat currencies or the effect of government actions on its valuation, they cannot fully explain why these currencies have achieved a state wherein they have acquired and sustained real world economic value, even in the absence of central political authority backing them. The anomalous nature of digital currency, while not necessarily invalidating either of these two dominate lines of economic sociological theory, does indicate the need for an alternative theoretical approach.

The first substantive chapter of this dissertation will endeavor to craft an alternative theorization of how objects such as new digital currencies can acquire value in the absence of

³ “Tipping” refers to the act of gifting, usually quite small, amounts of Bitcoin or another digital currency to other online forum participants for providing high quality input or content to community forums. This form of exchange is particularly popular on Reddit sub-forums and is usually facilitated by the use of “bots” (small computer programs that automatically run when users specify them).

either strong community ties or political authorities through the development of a set of computational models of social valuation processes. Specifically, it will show how reconceiving of valuation as a process of individual learning under uncertainty allows us to systematically model and explore the differences between non-social, social, and mixed valuation scenarios. Through the development of a simple, learning actor which resonates simultaneously with both contemporary economic and sociological theories of value, this work will aim to not only provide a bridge between these historically separated lines of thinking, but also, demonstrate in a more precise fashion how standard economic models of market dynamics are likely to falter in scenarios where social forces play a role in the valuation of objects or products.

Methodology

Agent Based Modeling (ABM) is, among other things, a tool for systematically exploring the unintended and unexpected macro-level phenomena that arise from individual-level “agents” behaving according to simple sets of rules (Epstein J. , 2006; Macy & Willer, 2002; Hedstrom & Ylikoski, 2010). ABMs have been used to explore and explain a host of natural phenomenon including swarm behavior in animals (Reynolds, 1987), forest fires (Bak, Chen, & Tang, 1990), and gene regulation networks (Kauffman, 1993). Their use in the social sciences arguably dates back to at least Schelling’s demonstrations of the unintentional emergence of segregation in neighborhoods (Schelling, 1971), and recent decades have seen their rapid adoption in research areas across sociology (Macy & Willer, 2002; Hedstrom & Ylikoski, 2010; Epstein J. , 2006)). Of particular relevance to this work will be the appropriateness and usefulness of this method for bridging the so-called “micro-macro” gap in social theory (Coleman 1990; Hedström and Ylikoski 2010).

In this chapter, I use ABM in order to develop a computational model of valuation processes and explore how varying the levels of social vs. non-social sources of information that individuals rely upon for their valuations leads to different macro-level outcomes for the system. In accordance with this work's reconceiving of valuation as a situation of individual learning under uncertainty, these models rely upon a set of agents who use iterative Bayesian updating in order to arrive at an estimate of the value of unseen parameter, a task that is analogous to attempting to determine the value of a new object, based upon their interactions with other agents.

In order to get at the differences between social versus non-social versus mixed valuation dynamics, this chapter will look at how emergent system level behaviors are affected when agents rely upon either other socially learning agents, non-social fixed agents, or some mix of the two. From these baseline results, this chapter will also then be able to consider a set of other questions including how initial conditions affect the state of valuation systems and how individual agents with strong priors can drive systems toward different outcomes. Most importantly, these models will be able to shed light on how the interplay of non-social and social valuation processes gives rise to a complex set of dynamics which challenge the feasibility of certain conceptions of efficient markets in cases where both non-social and social information are being used to determine the value or price of objects.

1.3 *Research Question 2*

Of all social facts, money and the value it holds is undeniably one of the most powerful as well as one of the most thoroughly taken-for-granted. In so-called “settled times” (Sewell 2005; Swidler 1986, 2001), there are few reasons to consciously question how pieces of paper or entries in an electronic ledger have the power to determine such fundamental questions as

whether one will eat and be housed, control the operation of a government, or have autonomy over the course of daily life. Money, like many of the most powerful institutions in society, is something that matters regardless of whether or not people are thinking about why it does. In point of fact, many have asserted that it is just because such questioning of money or of similarly entrenched institutions happens so infrequently that such structures are able to hold onto their stability and power (e.g. (DiMaggio 1994; Douglas 1986; Sewell 2005)).

A foundational assertion in contemporary cultural sociology is that these most deeply entrenched aspects of social life are inevitably the ones that are most likely to evade the conscious consideration of both individuals and researchers (Bourdieu 1992; Sewell 2005). Though individual acceptance of the “commonsense” (Swidler 1986) and “natural” (Douglas 1986) character of such institutions is thought to be a fundamental requirement of their operation and a key source of their power (Bourdieu 1977; Foucault 1977; Habermas 1984), it is just their taken-for-grantedness that causes them to be the least articulated aspects of social life. As contemporary work in this subarea has also asserted, however, during moments of significant social disruption we as researchers receive a unique opportunity to see explicit expressions and active reworkings of the logics that have undergird such massive social institutions (Sewell 2005). During so-called “events” (Sewell 2005) and “unsettled times” (Swidler 1986), the reliability of the most regularized aspects of society is jeopardized and people are most likely to be forced into consciously grappling with the aspects of social life what had heretofore been handled in an unconscious, heuristic fashion (Shaw n.d.; Vaisey 2009).

Within the sociology of money, we see a recognition of this fact in the small but influential body of work that has been done on the social construction of mainstream currencies (Carruthers and Babb 1996; Ingham 2004; Orléan 2014; Polillo 2011). Though these works

cover a number of periods, their research is united by their focus on historic moments of economic crisis and disruption. The motivation for this preference in case selection is clear. Referencing both DiMaggio and Powell's (DiMaggio and Powell 1991) and Douglas' (Douglas 1986) assertion of how institutions derive their stability from people's perception of them as natural, Carruthers and Babb (Carruthers and Babb 1996) motivate their decision to study the social construction of money in the significantly unsettled environment of Postbellum America in the following fashion:

“When money is problematic because of a changing or highly uncertain value, exchange becomes more difficult, and people may revert to barter. Such circumstances are rare in most modern economies, but they can force people to question the value and function of money. Taken-for-granted beliefs are challenged, and people articulate their previously implicit expectations about money and its purpose. The interpretations they advocate are significant, for when settled questions become unsettled, when closed issues get reopened, there is a greater awareness of alternatives and future lines of action.” (p. 1557)

While the global financial crisis of 2008 did not instigate a mass reversion to barter, it did generate a profound level of uncertainty in national currencies generally, and more specifically, in the U.S. dollar. During this moment of social rupture, the question of money and the basis of its value was brought closer to the forefront of individuals' minds than it normally resides. Though the subsequent recovery of the U.S. and other economies has, arguably, curtailed the potential for more large scale and widespread debates on the nature money, the 2008 crisis did directly lead to one of the most novel alternative “lines of action” that has existed with respect to the institution of money: the invention of digital currencies⁴. Begun by a group of individuals who identified as part of the techno-Libertarian, “cypher punk” movement, Bitcoin was created as an explicit attempt to liberate money from its dependence on government backing. In the years since its advent, the number of digital currency users has far exceeded the bounds of this original

⁴ Nakamoto's white paper's explicitly references the 2008 crisis (Nakamoto n.d.)

small group of techno-activists. With its arrival into the awareness of individuals across different social spheres and contexts, it has continued to force into more explicit consideration questions concerning the nature of money and value. This portion of the dissertation will offer a novel contribution to both the sociology of money and cultural sociology by undertaking an analysis of how individuals have responded to these questions and the conversations they have spurred.

Previous research on the origination of new money and collective challenges of existing ones has been primarily limited to considering historical moments of economic upheaval. This investigation hopes to update this area of work by taking advantage of digital currencies' ongoing disruption to money-as-usual to explore *contemporary* understandings of the nature of money. More specifically, this work will seek to apply and extend the "macrocultural" approach that Carruthers and Babb (Carruthers and Babb 1996) used in their analysis of the rhetoric surrounding greenbacker and bullionist debates in Postbellum America. Congruent with their analysis, this work will focus on exploring the discourses that have been invoked to define digital currencies, argue for/against their status as "real" money, and explain why it has come to hold value. It will also seek to greatly expand upon this prior work by analyzing a much larger volume of text which has been generated by a much wider variety of sources.⁵

In addition to contextualizing this analysis with respect to existing and obviously related work in the sociology of money and value, I also intend to use this section of the dissertation to directly engage with cultural sociology by situating the analysis in explicit dialogue with Swidler's much lauded "Talk of Love" (Swidler 2001). In congruence with her findings that individuals evoked a wide "repertoire" of culturally supplied meanings when asked to explain

⁵ Their content analyses were primarily constrained to the pamphlets produced by either pro-bullionist or greenbacker groups. While this analysis will involve promotional materials coming from digital currency groups, it will also be able to get at informal conversations occurring in community forums, media coverage and commentary, and documents that have been produced by a variety of formal institutions (see Appendix B).

their romantic relationships and their actions therein, I anticipate this work will uncover evidence of a varied and rich “talks” of money and value that individuals rely upon to make sense of both new digital currencies and existing money. Contrary to the perhaps naïve expectation that individuals and groups express a singular, shared understanding of either digital currency, value, or money, this investigation provides evidence of a rich repertoire of sometimes inconsistent and contradictory explanations of money and value. By uncovering and mapping these discourses, this chapter build an important new bridge between cultural and economic sociology that will both advance our present understandings of the role of culture in money and further expand the applicability of the immensely well-received cultural “toolkit” (Swidler 1986) model to economic spheres of interaction.

Data and Methodology

Recent decades have seen both an explosion in the amount of digital content available to researchers and the development of automated methods that are able to handle large-scale analyses thereof. Though initially these methods were developed primarily by researchers in computer science, they have becoming increasingly popular with scholars in both the humanities and the social sciences. As far as the social sciences go, while these methods have seemed to have made most of their initial headway in the realm of political research (Grimmer and Stewart 2013), the relevance of automated content analysis to sociological research on culture has become the subject of much attention over the past two years. In addition to the number of articles that have appeared in major journals on the subject (e.g. Bail 2014; Mohr 1998) this is also evidenced by last year’s special issue of *Poetics* (Mohr and Bogdanov 2013) which was devoted to the usefulness of topic modeling to cultural sociology. This chapter of the

dissertation extends the use of this type of data and associated methods into the arena of the economic sociology and the study of the sociology of money and value.

This is particularly well-suited approach for the study of digital currency given the fact that it is a movement which has been characterized by an unusually massive online presence. In conjunction with the centrality of internet forums to its development, much of Bitcoin's educational and outreach materials, commentary and reporting, communications from businesses and merchants, and documents from formal institutions are also readily available in digital format. The consequence of these trends is that there is an enormous amount of digital content, and specifically text, related to Bitcoin that is freely accessible online. Of primary interest in this portion of the dissertation are those discourses that concern the definition of Bitcoin and its relationship to the concepts of "money" and "value." A complete survey of the instances in which the subject of Bitcoin has prompted such online discussions is untenable. However, it is possible to take advantage of the fact that from its inception, the development, discussion, and advancement of Bitcoin has been anchored to a main set of very active, online community forums.

This enormous amount of online discourse that the advent and rise of digital currencies has generated provides a unique opportunity to use these methods to generate an unprecedentedly broad analysis of the social construction of money. While much of the previous work in the sociology of money has relied on traditional content analysis methods (e.g. (Carruthers and Babb 1996; Zelizer 1994, 2011)), the sheer volume of text that is available for use in these analyses grant this investigation an unprecedented breadth. For this part of the dissertation, I have built a set of text scrapers to collect the full body of publically available text from two of the largest community forums that have been at the heart of the Bitcoin movement –

“bitcointalk.org” and “reddit.com/r/bitcoin.” From this full set of several 100,000s of messages, I further extract a subset of those messages where key terms such as “money” and “value” appear and then undertake a series of traditional and automated content analyses of this corpora in order to understand the different talks of money and value individuals within which individuals in these communities have engaged, and develop an understanding of the repertoires that these groups have relied upon to make sense of the monetary project they have undertaken. Though the perpetual issues that face all traditional and automated content analyses, those of generalizability and dependency on researcher interpretation, must also be kept in mind with these analyses, the diversity of textual data that this work considers and the inclusion of more systematic analytical techniques alongside more traditional, qualitative coding represents a significant advance for existing literatures in the sociology of money and value.

1.4 *Research Question 3*

The sheer novelty of digital currencies has both hindered and facilitated their ascent. In terms of assisting it, those working in neophilic technology sectors, investors eager to get in early on the next big innovation, and pragmatic actors who are interested in the currencies’ claims to being able to provide unprecedentedly anonymous and low-cost transactions, have all been drawn to the novelty of Bitcoin. Other commentators, however, have been far more pessimistic in their assessments of digital currencies and often cite their persistent lack of a clear definition in either formal institutional arenas or in popular understanding as a deep cause for concern. Nonetheless, though heated debates and confusion concerning the definition of what digital currencies are, what they represent to society, and what the events surrounding them

mean, it is unambiguous that digital currencies are, at least for the time being, objects which hold value.

Understanding how digital currencies have come to attain value is an important, and potentially revelatory, issue for the emerging subfield of the sociology of value and evaluation (Lamont 2012; Zuckerman 2012). Most specifically, the on-going resistance of digital currencies to being unambiguously categorized represents a potential puzzle for the many theories of value that identify categorization as a key component in valuation processes (see Lamont 2012) for overview). In particular, it presents a challenge to Zuckerman's well-established model of the "categorical imperative" in valuation processes (Zuckerman 1999). As Zuckerman and those who have worked on related issues of social valuation processes have established through a sizeable amount of empirical verification (Zuckerman and Rao 2004; Zuckerman 1999, 2000; Zuckerman et al. 2003), the valuation of new objects seems to require that they first be able to be identified as belonging to an existing, legitimate category of objects. After audiences have classified the object, they are then able to evaluate the object against the established standards of the category. Without the ability to determine what category the object belongs in, however, it becomes unclear which evaluation standards should be applied in its assessment. This lack of clarity leads people to default to a lower-value assessment of the object, regardless of its actual worth, resulting in what Zuckerman has termed an "illegitimacy discount" (Zuckerman 1999).

The rise of digital currencies in the past six years significantly complicates this and other accounts that emphasize the necessity of unambiguous categorization in determining value. As this portion of the dissertation will demonstrate, the rising value of Bitcoin has been accompanied not by a final adjudication of how it should be classified but by an *increasing* number and diversity of categorizations that have been applied to it. The major argument that

will be forwarded in this chapter of the dissertation is that it is not in spite of but *because* of the multiplicity of interpretive frameworks that have been successfully applied to it that digital currencies have risen in value. Following from Padgett and Ansell's seminal work on "robust action" and the success of the Medici family in Renaissance Florence (Padgett and Ansell 1993), this chapter will seek to demonstrate that the "robust object" of Bitcoin has succeeded in terms of adoption and investment through its ability to be differently interpreted by a diverse set of actors.

While affirming that categorization is a necessary step in valuation, this work will explore how a multivalent identity can powerfully facilitate "buy-in" from groups coming from a wide range of backgrounds and consider how this definitional robustness has played a critical role in Bitcoin's increasingly widespread adoption. This work also considers, however, how the same trait that was so important to its successful dissemination and development in the years since its inception has also left Bitcoin vulnerable to being co-opted by the very institutions and actors it was initially intended to subvert. By looking at the multiplicity of identities digital currencies has accrued during its ascent and the mechanisms through which powerful actors within established institutions have been able to preferentially select which of those definitions will be supported, this work intends to shed light not just on the adoption of new object, but also, the avenues through which existing power structures are able reproduce themselves in new fields of economic and social life.

Data and Methods

Unlike in prior studies of securities and stocks (Zuckerman and Rao 2004; Zuckerman 1999, 2000), there is not an established body of experts for individuals to refer to in the categorization of digital currencies. As such, this part of dissertation will need to engage directly with the decentralized process of social construction/categorization that has taken place within

and across communities of Bitcoin adopters and with respect to the larger institutional environments within which it exists. Fortunately, the abundance of available documentation, reporting, and text on Bitcoin's ascent that makes it possible to identify some of the various "social screens" (Zuckerman 1999) in its evaluation. Additionally, the wide variety of data available on the historical value of Bitcoin, search trends, and venture capital investment makes it possible to go beyond historical analyses in order to explore more thoroughly the complex relationships between interest, definition, investment, and valuation of Bitcoin since its inception.

While research question 2 focuses specifically on "talks of money," the aim of this part of the dissertation will be to develop a broader understanding of the ways different groups are categorizing Bitcoin. As such, the first part of this analysis focuses on review of historical documentation, online archives, and investigative reporting on Bitcoin during the seven years following its inception to trace the development of its multifaceted identity and the groups how have adopted it at various points in this trajectory. In order to complement this analysis, this section also considers the history of Bitcoin's valuation and transaction volumes, and the tight coupling these metrics have with Google search trends. The second part of the analysis then first uses venture capital funding data to consider how the funneling of resources into Bitcoin's development has changed during its development. Having identified a significant change in these patterns with the entrée of major finance and business interests into Bitcoin, this analysis then uses word frequencies and topic modeling of text scraped from six different reporting outlets in order to show how this shift in resource direction was immediately followed by a definitive change in how Bitcoin was being discussed and defined.

Chapter 2

Something Out of Nothing: a Computational Model of Social Valuation Processes

The recent rise of digital currencies such as Bitcoin has brought in its wake any number of both industrial and conceptual disruptions. One of the most prominent challenges it has posed has been to prevailing models of the origins of money and explanations of how money acquires and holds value. Absent a backing such as gold convertibility or the state, the question of how digital currencies have attained significant real world value remains a major puzzle to standard economic thinking. This work uses a series of agent-based models (ABM) based on Bayesian updating agents to explore how sociological models of value construction may be able to help “solve” this theoretical problem. Specifically, it demonstrates how a reconceptualization of valuation as a process of learning under uncertainty can faithfully unite economic and sociological models of value in a way that easily accounts for how “something” can legitimately come from “nothing” in social valuation processes. Having established this foundation, this work then goes further to more deeply explore the differences between social versus non-social valuation processes, the high dependency of social valuation processes on time, initial states, and the actions of early actors, and the massive delays that a mix of non-social and social feedbacks can lead to in a system’s ability to arrive at the “correct” assessment of an object’s underlying value. This work then shows how these theoretical results provide for a more rigorously developed basis for arguments which assert that social processes provide for a legitimate and stable source of value and that the inclusion of social components in valuation processes requires us to modify our current expectations and assumptions about how real-world markets operate.

One of the most uncomfortable questions that has followed the rise of Bitcoin is how it has managed to achieve real world, economic value. In a December 2013 post to the New York Times opinion pages blog entitled “Bitcoin is Evil,” (Krugman 2013), Noble Prize winning economist Paul Krugman forwarded a commonly found view that Bitcoin is ultimately an

unviable project because it lacks any source of innate value. He, along with many others, have argued that without something akin to the physical usefulness that underlies gold's value or the rooting of fiat currencies' value in the state's commitment to accept it for tax payments, the valuation of Bitcoin amounts to little more than the sort of irrational, speculative bubble that drove the tulip mania that rocked the Dutch economy in the early 17th century. According to this perspective, the valuation of Bitcoin and other digital currencies is ultimately doomed to fall to nothing once this bubble bursts and the market comes to its senses and correctly prices these currencies at their "true" value – essentially nothing.

Nonetheless, the price of Bitcoin in the year since this piece was written has managed to maintain well above not only the rock bottom of nothing, but also well above the valuation it had during the first years of its existence. As shown in Figure 1, while there has been dramatic fluctuations in Bitcoin's valuation through the years, this purported bubble has not yet popped. As also can be seen by looking at the volatility of Bitcoin's price in the past year, there is evidence of a trend toward decreasing levels of volatility in Bitcoin's price, a fact that provides evidence that at least for the time being, the market is stabilizing its valuation of the digital currency.

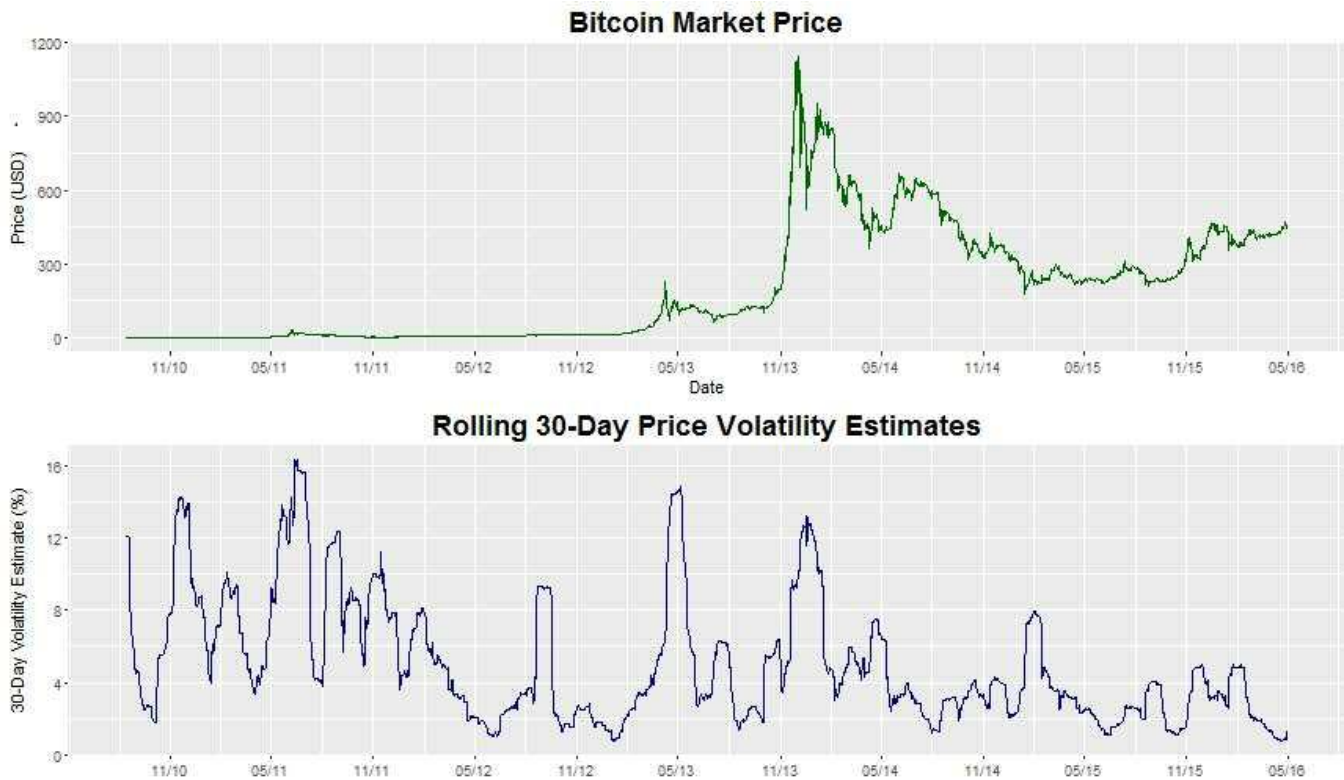


Figure 1: Daily market price and volatility estimates for Bitcoin since its inception

Though time will ultimately be the judge as to the final valuation of Bitcoin, it has no doubt achieved and sustained a level of value that is hard for established economic perspectives to explain. This issue with accounting for the valuation of digital currencies relates on a deep level to other, larger historical difficulties standard economics has had in explaining how money in general comes to hold sufficient worth that individuals willingly trade innately useful goods and labor for “useless metal disks” (Menger 1892) (or slips of paper or digital bits as the case may be). Many have argued that a chief reason for economics inability to satisfyingly explain money stems from deep assumptions their models must make on the independence of value from social processes (e.g. Ingham 2004; Orléan 1995; Simmel 1978; Zelizer 1994). Essentially, these

critiques argue that if one begins from a standpoint of treating value as either existing inherently in objects or as arising from a combination of the subjective preferences of atomized actors and objective supply conditions, then it is very difficult to explain how the value of objects like Bitcoin or money becomes “something out of nothing.” In striking contrast to the traditional economic conceptions of value is a large body of work in sociology that has delved deeply into how social processes influence individual valuations (Boltanski and Thevenot 2006; Lamont 2012; Orléan 2014; Zuckerman 2012). The goal of the present work will be to translate these conceptualizations of value into a set of computational models which will allow us to more systematically explore how value is able to arise out of “nothing” vis-à-vis social processes and how these social valuation processes seriously complicate prevailing economic models.

This work will undertake this task by first developing a review and comparison of dominant treatments of value in economics and sociology. In the course of this comparison, two key points will be clarified – that valuation can often be treated as a process of learning and that the different sorts of objects will entail different dependencies on social vs. non-social feedbacks in that learning. The remainder of the paper will then develop a set of computational models using Bayesian agents in order to demonstrate and explore fundamental differences between social and non-social valuation processes, as well as to investigate the complexities that arise when a mix of feedbacks between social and non-social information is used in value learning processes. Using the insights garnered from these modeling results, it will then discuss their implications for our understanding of value and economic systems.

2.1 *Value in Economic vs Sociological Models*

Historically, there have been two primary approaches to value in economics which might be classified for present purposes as the “objective” and “subjective-objective” versions of value. In classic economics, value was usually perceived as being inherent within goods. The most notable version of this perspective would be the so-called “labor theory of value” that posited that goods gained their primary economic value from the labor that was expended to produce them. This conception of value can be found throughout classic economics thinking including in Smith (1776) and Marx (2011). Later, with the transition to the neoclassical economics that predominates today, understandings of value shifted away from its being an innate property of a good and into it arising from conditions of “scarcity.” In this view, value is seen as being constituted at the intersection of individuals’ personal, subjective preferences and the availability (i.e. supply) of a good. The higher the preference-driven demand for a good and the lower its supply, the greater its value. In either case, value is conceived of as either an objective property of the object itself or as an interaction between atomized individuals’ subjective preferences and the objective conditions surrounding its availability. In neither case are the influences of social processes on individuals’ assessments or perceptions of value considered.

More contemporary work in economics have begun to update these pictures of value and incorporate a larger role for social influences in valuation processes. Two prominent examples of these are work that has followed from Akerlof’s explorations of information asymmetries in markets (Akerlof 1970) and work that has been done on attempting to understand the effects of imperfect information on markets (Rothschild 1973; Stigler 1961). Work on information asymmetries has focused on situations wherein sellers have much more information on the quality of their product than buyers, with the prototypical example being the used car market and the potential risks buyers face in purchasing a “lemon”. In these cases, the role of interpersonal

interactions, including deceit and signaling, plays an important role in buyers' valuation as they rely on this information to overcome their initial state of uncertainty about the value of the product.

The other arena of work that is relevant here comes from the "rational expectations" school of thought (Muth 1961) as it relates to the so-called "efficient market hypothesis." In this case, a "noisy" process of valuation is allowed wherein individual actors may begin with flawed estimates of a product's value due to having incomplete information on the product being valued. This line of thinking proposes that through the marketplace these individual, random (i.e. non-systematic) errors in estimation ultimately cancel each other out and the market as a whole is able to arrive at a price of a product that aligns with its underlying value (i.e. the market is efficient). This view asserts that while individuals may begin with incorrect valuations, in the aggregate, the valuation will be correct provided certain informational criteria are met⁶. Both this and the information asymmetry models represent a development of economic thinking in that they allow for a more nuanced perspective on the role of the collective or social processes in valuations than earlier perspectives did. Nevertheless, it is important to realize that in all these cases, there remains a foundational assumption that objects possess value independent of the social valuation processes surrounding them.

Sociological literatures have presented a much different picture of value. Specifically, they have traditionally placed on much heavier emphasis on the socially constructed or conventional nature of value (Liebersohn 2000; Zuckerman 2012). From such constructionist points of view, value is not seen as being either solely an objective quality of an object or a quality that arises from the interaction between an individual's atomized, personal preferences

⁶ Different versions of the efficient market hypothesis (Strong, Semi-strong, and Weak) define different criteria for the information that must be known and available for the market to achieve efficiency.

and an object. Instead, value is viewed as a feature that is constructed, either partially or entirely, over the course of social interaction and subsequently imposed upon objects by individuals in that group. There are great number of implications that follow from these more “inter-subjective” accounts of value. Of primary concern to many sociologists has been the role that power, status, and class potentially play in the generation and replication of value constructions in a society and how these processes can be used to maintain inequality (Bourdieu 1984). In identifying the innately social aspects of valuation, these perspectives have also cleared a pathway for considering a host of dynamics that are much more difficult to consider from traditional economics perspectives including the roles of social influence in preference formation (Bourdieu 1984), bandwagon effects (Fujimura 1988; Lamont 2012), and diffusions of valuations through imitation (DiMaggio and Powell 1983).

Much of the empirical work in contemporary sociology in the arena of value has focused on valuation in cultural production and consumption such as in the case of literature (Griswold 1987) and art (Dimaggio 1987). A line of research in this area that is particularly relevant to the model under development here is the one that has been undertaken by Salganik et. al. (Salganik, Dodds, and Watts 2006; Salganik and Watts 2008) in their set of Music Lab experiments wherein individuals were asked to evaluate the quality of songs under different conditions of exposure to social information. Economic sociology also contains a number of works on the role of social construction processes in economic valuation (Fourcade 2011; Zelizer 2011). Particularly germane to this present work will be Zuckerman’s (Zuckerman 2012) considerations of the “pure realist,” “pure constructionist,” and intermediate types of valuation processes and Orléan’s (2014) authoritative treatise on the role of social influence and collective representations of value in the constitution of money and the dynamics of real world markets.

2.2 *Valuation as Learning Under Conditions of Initial Uncertainty*

Common to both some of the more contemporary economic treatments of value and standard sociological approaches to it is a conception of individuals who begin in a state of uncertainty about the value of an object but who, via receiving new information about it, can overcome that uncertainty in order to make an ultimate determination of its value. This process is essentially one of learning. The key difference between these contemporary economic and sociological classes of models is thusly not in the valuation procedure itself, but in the *sources* of information feedback that individuals' use in their learning-valuation process. In the economic treatments, these sources are often approached as being non-social in nature. In the sociological, the emphasis is instead more often placed on the social.

To ground this idea in some examples, we can think about an idealized, standard economic conception of how individuals might determine the potential investment value of a new company. Primary information that might be involved in this assessment include the quality of the product the company produces, the efficiency of its operations, its physical assets, and what the existing demand for its products might be. The key component to recognize in this case is that all of these are qualities that either are, or are treated as being, completely independent of the valuations that others have made of the company. Given that value learning in this case relies on a set of features that exist objectively and independently of social opinion, the primary task of investors in this model is to obtain reliable information on those objective features and correctly anticipate how much each will matter. This may not necessarily be an easy task, but it is a relatively straightforward one.

The social case is a far more complicated matter. Take, for instance, the social scenario of anticipating what the most fashionable outfit to purchase for a high profile event might be. Here, the objective features of the clothing will not matter nearly as much as how others are expected to value it. Though two outfits might be of comparable physical quality and comfort, individuals invested in being perceived as fashionable will pay a heavy premium for the outfit whose style is considered to be more “in” or is from a high status brand. Though this might be a relatively trivial example, a comparable logic might also be applied to the valuation of a currency note. Whether a pair of uncomfortable shoes or a scrap of cloth and ink are innately valued by the individual possessing it matters far less than whether others around that individual are willing to assign value to it. In either situation, information on the objective qualities of the actual object are not nearly as relevant as information on what others are likely value it as. Though examples like these help to clarify what will be shown to be a fundamental distinction between social and non-social valuation processes, in reality we can expect there to be many instances in which both social and non-social factors matter in value assessment. One example of this often can be found in the realm of communication technology. While a certain technology, say a fax machine, may initially be valued based on its potential to be of objective utility to its users, the ultimate determination of its value will be driven by its level of adoption. If I personally value the potential usefulness of a fax machine enough to buy one, but few others end up sharing that valuation with me, the ultimate value of that fax machine will inevitably be diminished. Along another track, we can also consider how differences in the valuation models different individuals apply to the same object might also give rise to a mix of social and non-social information in valuation processes. In this regard, one might consider how stocks are traded in real markets. For some, their buying of a stock at a certain price point might be driven by assessments that the

underlying company is likely to increase in performance soon and will as a result, be of higher value in the future. For others, the buying of the same stock might instead be based on noticing an upward trend in what others are willing to pay for it that leads them to expect that others' valuations of it will continue to rise, and thus they should be able to sell it back at a higher price later⁷. These are just two examples of what might be considered the predominant situation under which individuals assess value in real life using a mix of information from social and non-social sources.

On the face of it, the differences between social and non-social learning in valuation processes may seem relatively superficial. As will be demonstrated, however, they are actually quite vital. Though at the individual-level the distinction between social and non-social sources of information may not be particularly salient, when taken in the aggregate, a very different set of collective dynamics emerges under these different scenarios. Understanding these differences will be key to shedding light on how in many instances of social valuation, “something” can quite legitimately arise out of “nothing.” Distinguishing between non-social and social learning will also play a critical role in understanding how, in mixed scenarios, social processes alter the usual dynamics of non-social valuation and why it is important not to assume away their influence in economic models.

2.3 *A Computational Model of Valuation Processes*

It is not a far stretch for any of the views presented so far to conceive of valuation as a process by which individuals attempt to estimate the initially unknown value of an object based

⁷ This example draws directly from the excellent analysis of stock market behaviors provided by Orléan (2014) in his treatment of the role of social and “mimetic” processes in market dynamics and the impact of having collective emphasis placed on liquidity as opposed to the underlying value of a stock. Much of the work developed here relates significantly to his discussions of the social origins of money and value.

on the information they gather about it. Individuals may initially start this process with only a tentative, unsure idea of what the object's value might be. However, via successively seeking out further information about it and incorporating that information into their understanding, they can ultimately arrive at a reliable estimate of that object's worth. We can think here of an individual researching a new product online or finding out from one's friends what they think it might be worth. This particular way of conceiving of valuation is what will allow us to create a conceptual bridge between valuation and formal models of parameter estimation that rely on updating an existing model of reality with information from observed data (i.e. learning). Specifically, we will be able to liken an individual's attempt to arrive at the correct estimation of an object's value to an agent attempting to use the data it observes to estimate an unknown parameter via a process of recursive Bayesian updating. By setting up a series of computational models of such agents and investigating how their collective process of parameter estimation are affected when they use different types of information feedbacks, we will be able to develop a more systematic understanding of the differences between social vs. non-social valuation processes.

Model Design

I begin by situating agents in a system wherein they can exhibit one of two states: "up" and "down". The goal of the agents is to use a combination of their preexisting understanding and their successive observations of other agents in the system in order to hone in on an estimate of a parameter, θ , that captures the unseen probability with which agents within the system will be observed in the "up" state. This estimation process can be thought of as being comparable to

someone estimating the weighting of a coin using a combination of pre-existing knowledge of it and observations of the number of heads or tails it shows over a series of coin-flips.

After creating the initial setup for each simulation run, I allow agents to interact on their own without outside intervention in order to observe what sort of dynamics spontaneously emerge from their processes of learning. Once let loose, each agent independently undertakes a two step-process in which they first “act” and then “learn.”

Step 1: Act

At the beginning of each turn, agents “act” by randomly deciding to be in an “up” or “down” state for that specific turn of interaction, per some individually specified probability. For the sake of being able to include both social and non-social sources of learning within the system, I create two types or “breeds” of agents whose rules for acting are different. The first type, called “fixed,” are non-social, non-learning agents that neither generate estimates of θ nor adapt their actions based on new information. Instead, at the beginning of each turn they decide with a probability equal to θ_{fixed} to choose to be in the “up” state (with the probability of choosing the “down” state of $(1 - \theta_{fixed})$). The value of θ_{fixed} is set exogenously at the beginning of each simulation run, is the same for all “fixed” agents, and does not change over the course of the simulation.

The actions of the other, “social” types of agents is determined by their most current prior distribution for θ . In accordance with standard Bayesian estimation models for binomial processes, agents act according to an implicit assumption that the probability density of θ has the following beta distribution:

$$p(\theta) = \frac{\Gamma(a+b)}{\Gamma(a)\Gamma(b)} \theta^{a-1}(1-\theta)^{b-1} \quad (1)$$

Where a and b are shape parameters that reflect previously observed “ups” and “downs” respectively, and Γ refers to the gamma distribution. At the beginning of each simulation, all social agents, unless otherwise specified, are initialized with flat, uninformative (i.e. weak) priors by setting $a = 1$ and $b = 1$ for each social agent – the equivalent of have only observed two agents, one in the “up” state and one in the “down.”

In order to act at the beginning of each turn, agents choose to be in an “up” state with a probability equal to the expected value of θ they have from their current prior distribution for the parameter. For instance, if an agent estimates that $E[\theta] = .8$, it will then have an 80% probability in that turn of choosing to be in the “up” state and 20% of choosing to be in the “down” state that turn. Agents calculate this value per the following formula for the expected value of a beta distribution:

$$E[\theta]_i = \frac{a_i}{a_i+b_i} \quad (2)$$

Where $E[\theta]_i$ is a given agent’s estimate of the expected value of θ and a_i and b_i are the shape parameters of each agent’s most current prior.

Step 2: Learn

After the “act” portion of the turn, social agents then “learn.” This begins with agents randomly sampling from n other agents in the system and observing the number of “ups” vs “downs” in their sample. Under different learning conditions, agents will sample from different subsets of agents within the system. In the case of purely social learning, agents only sample from other social agents who are also undergoing the same learning process as they are. In the

case of purely non-social learning, agents will only sample from the set of non-learning fixed agents. In mixed scenarios, agents will sample from both the fixed and social subsets according to an exogenously set proportion.

Using the observations from that turn t , agents arrive at a new posterior distribution for θ :

$$p(\theta|y_t) = \frac{\Gamma(a+b+n)}{\Gamma(a+y_t)\Gamma(b+n-y_t)} \theta^{a+y_t-1}(1-\theta)^{b+n-y_t-1} \quad (3)$$

Where a and b are the shape parameters of the agent's current prior, n is the number of agents that were sampled and y_t is the number of the agents sampled that turn who were observed in the "up" state.

At this point, the recursive aspect of the learning process kicks in as social agents then make this posterior distribution their new prior distribution for their next round of interaction. What this amounts to in effect is that agents update the shape parameters of the priors they will use in their subsequent turn according to the following:

$$a_{t+1} = a_t + y_t \quad (4)$$

$$b_{t+1} = b_t + n_t - y_t$$

This updating will then be used to generate the new $E[\theta]$ that agents will use to determine their action at the beginning of their next turn:

$$E[\theta]_{t+1} = \frac{a_{t+1}}{a_{t+1}+b_{t+1}} \quad (5)$$

Exploring the Model

The main purpose behind translating social processes into computational models such as this one is the ability it grants us to systematically unpack and understand the relationships between different aspects of those processes. Having established the basic foundation of the model above, it now becomes possible to translate a number of different questions surrounding valuation processes into the model. This will can be accomplished by examining the effects that variations in a set of key modeling parameters have on the dynamics that emerge in the system.

Proportion Social

The most important modeling parameter to consider in these systems is the proportion of social to non-social sources of information feedbacks agents have in their observation samples. In the pure non-social case, this proportion will be 0 and agents will only use observations of fixed agents in their learning processes. On the other extreme is the pure social case in which the proportion of social agents used in learning processes will be 1. In these cases, no observations of fixed agents will occur, only of other social agents like themselves. Between these two extremes are those cases in which agents draw on a mix of social and non-social agents for their samples. In order to get an understanding of how different levels of social information affect these processes, I will compare the impacts of having 20%, 50%, and 80% of agents' samples contain other social agents.

Sample Size

Given what we know of parameter estimation processes, it is natural to expect that the size of the samples agents draw will impact their estimates. The first pass expectation in this case is that when agents use larger sample sizes, they should hone in more quickly on a stable estimate for θ . Furthermore, in non-social and mixed cases where there is a θ_{fixed} present, the

system of social agents should converge upon that value more quickly and accurately with larger sample sizes. In order to evaluate these expectations, these simulations will vary the size of n , agent sample sizes, between the values of 5, 50, and 100 agent samples across individual runs.

Values of θ_{fixed}

In both purely non-social and mixed information scenarios, there in effect exists an ultimate “correct” parameter estimate for social agents to converge upon. Though social agents begin with a weak prior (i.e. a weak model of what the distribution of the underlying parameter is), there is still a potential that even this uniformed starting point might have an influence at the system level. In particular, given that agents essentially begin with a very tentative “guess” that $E[\theta] = .5$, there is a possibility that this starting point might affect the ability of non-social and mixed systems to find values of θ_{fixed} that are far away from that value. In order to explore this potential effect, both the non-social and mixed scenario models will include series of runs for three different values of θ_{fixed} (.2, .5 and .8)

Initial Social State

Though in the purely social scenario, there is no particular value of the underlying parameter for the system to “find,” there are still potential effects of the system’s initial state to consider. Notably, there is a question of how the effect of the weak priors that agents begin with compares to the effect that the actual observable state of the system is in at the beginning of the simulation. Per their normal protocol for action, agents begin each simulation run choosing to be in the “up” state in accordance with their current estimate for $E[\theta]$, which in the case of the initially flat and weak priors that agents are given, equates to a 50% chance of choosing “up”. This in turn translates into the initial system-wide proportion of social agents being about .5 by

default. What happens, however, if we set these initial conditions somewhat differently? In order to explore this question, I will also undertake a subset of purely social simulation runs that force the initial proportion of agents in the “up” state to be at different levels, ranging in value from 0 to 1. To be clear, though the initial system state will be set exogenously, all subsequent behavior and learning in these simulation runs will carry out as per usual, and all agents will begin with the same weak priors as in other simulations.

Presence of Agents’ with Strong Priors

Along with the potential influence of the initial proportions of agents in the “up” state in the system, there is also an interesting line of questions to consider concerning how variations of agents’ priors might affect system development in purely social learning cases. There are a number of potential ways that this sort of exploration might be done, but for the purposes of this present analysis, the only one I will be considering is the scenario in which there are some agents who begin the simulation run with a particularly strong or “informative” model of what the parameter value should be. I will operationalize this concept by having a set of runs where either 1 or 10 agents begin the simulation with a very strong prior distribution for θ (i.e. have them set their initial values to $a_{strong} = 900$ and $b_{strong} = 1$, which is the equivalent of them having made 901 observations and having had 900 of those observations be of the “up” state). All other agents in the system will retain their flat, uninformative priors. After this initial setup, the simulation will then be allowed to run as usual with both the strong and ordinary agents abiding by the established rules for learning and acting.

Summary of Key Modeling Parameters	
<i>Modeling Parameter</i>	<i>Values Used in Simulation Runs</i>
Proportion Social	Pure Non-social: 0 Pure Social: 1 Mixed: .2, .5, .8
Sample Size	N = (5, 50, 100)
θ_{fixed}	(.2, .5, .8)
Initial Proportion “up” [<i>pure social only</i>]	0 to 1, .1 increments
Presence of Agents with Strong Priors [<i>pure social only</i>]	$N_{strong} = (0, 1, 10)$ $a_{strong} = 900, b_{strong} = 1$ Initial estimate of $E[\theta]$: .999

Table 1: Summary of key modeling parameters

Modeling Outcomes of Interest

In order to find a way of assessing the dynamics of these processes, it is also necessary to define what the key modeling outcomes of interest will be. These measures should seek to satisfactorily capture the most interesting and important aspects of what emerges from these systems while also being able to connect in compelling ways to the substantive issues that motivated the development of the model. To that end, these measures will all focus on different

aspects related to the system of individual agents arriving at a common, stable estimation of the value of the initially unknown parameter.

Convergence

The most basic feature to consider in these systems concerns the ability of individual, learning agents to arrive at a relatively stable, collective estimation of the underlying parameter. That is to say, do these systems converge? This question is particularly important for the purely social scenarios that will be considered given that they do not have any underlying value of θ_{fixed} to “anchor” agents’ learning processes. To assess this question of convergence, two different but related criteria will be used.

In the case of fixed and mixed, it is relatively straightforward to define convergence in terms of the system’s average estimate of $E[\theta]$ arriving at and remaining near the underlying value of θ_{fixed} that was used in that system run. We can consider this as being analogous to a group of individuals who begin in a state of uncertainty of the value of an object but then, via a process of learning from some combination of non-social and social feedbacks, ultimately arrives at the “correct” valuation of it. For the purposes of this present computational model, I will define the convergence of non-social and mixed systems as the following:

$$|\theta_{fixed} - \sum_{i=1}^N E[\theta]_i| < .01, \text{ for } c = 50$$

Where N is the number of learning agents in the system and “c” is the number of consecutive turns for which this criteria is met. Said otherwise, for fixed and mixed scenarios, convergence will be defined as the point at which the average of all individual agents’ estimation of the

expected value of the parameter has remained within .01 of the actual value of θ_{fixed} for 50 consecutive turns of interaction.

Defining convergence in the social case is more complicated as there is no underlying value of θ_{fixed} for the system to converge upon. For purely social cases then, the focus consequently switches to trying to determine whether or not these systems ultimately ever settle down into a stable estimation of $E[\theta]$. This quality will be assessed using a conservative criteria that compares the changes of the system average of $E[\theta]$ estimates over continuous turns of interaction:

$$\left| \sum_{i=1}^N E[\theta]_{i_t} - \sum_{i=1}^N E[\theta]_{i_{t-1}} \right| < .001, \text{ for } c = 100$$

Where t refers to the turn of interaction, N to the number of learning agents in the system, and c to the consecutive number of terms for which the condition holds. What this criteria entails is that in order for purely social systems to be considered as having converged, the average of the estimated expected values of the parameter across agents in the system must remain in a range of .001 for 100 consecutive turns.

Time to Convergence

For systems that do converge, a second question follows concerning how long it takes to reach that point of convergence. By capturing the number of turns that are required for systems to reach a stabilized state, we can gain insight into the overall efficiency of learning in these various systems and better understand the effects of modeling parameter variations. In particular, by paying attention to how time to convergence changes in response to proportion of social information feedbacks used, it will be possible to gain some insight into the manner in which social and non-social processes interact with one another in mixed scenarios.

System Average of $E[\theta]$ Estimates

In addition to considering system stabilization, it is also interesting to look at where systems ultimately end up in their estimation. For this, we will be able to use the same average of individual $E[\theta]$ estimates that was used to establish system convergence. Via this measure, it will be possible to shed light on a number of issues including comparisons of the differences between social and non-social learning, the influence of sample size in system learning, the effect of various values of θ_{fixed} in the non-social and mixed cases, and the impact of initial conditions in social cases. Looking at the variance of estimations across runs of different scenarios will also be useful in thinking about how much variability should be expected in individual instances of social vs. non-social valuation processes.

2.4 *Model Results*

To start unpacking the differences between social and non-social valuation processes, I begin by comparing the trends that emerge over 600 purely social and 900 purely non-social (n=300 for each θ_{fixed} value) simulation runs, across a range of modeling parameter settings. First and foremost, of note is the fact that all purely social and non-social simulations did ultimately converge according to the defined criteria. This means that regardless of the whether or not there was any underlying θ_{fixed} for agents to “find,” all systems were able to reach a

finalized, stable average estimate for $E[\theta]$. Furthermore, as shown in Figure 2, the time required to reach this state was comparable across non-social and social learning runs:

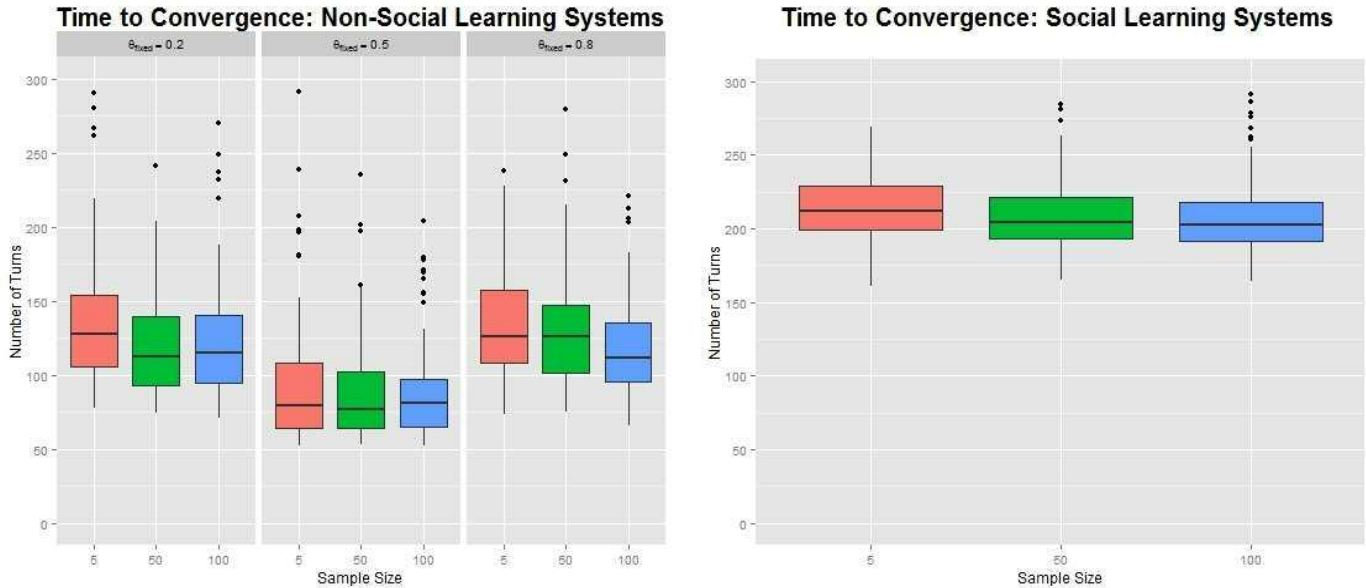


Figure 2: Times to system convergence for social and non-social learning systems

Figure 2 shows the distribution of individual simulation runs by modeling parameter conditions, with the top and bottom of boxes demarcating the edges of the 25th and 75th percentiles of runs, the line in the box indicating the 50th percentile, and dots beyond the visible range lines connected to the box indicating outlier runs.

From these results, a few statements can be made. As might be expected, pure non-social learning systems are able to “find” values of θ_{fixed} that are not next to the weak priors that agents being with, but it takes systems a slight bit more time to do so. Far more importantly, however, is the convergence of social systems. For these, it is clear that social systems may take a bit more time to arrive at a stable collective estimate of the underlying parameter than non-social systems, but not a great deal more. We can also see that this remains true regardless of whether agents are observing either 5% or 100% of the population of other learning agents.

When contrasted against implicit, naïve assumptions that socially constructed value is not as “solid” as non-socially based value, this result indicates that such solidity can and does arise in social learning situations almost as easily as it does in non-social scenarios.

Given that stable collective parameter estimates arise, the next question that follows is what these estimates look like. Begin by considering the average estimates of $E[\theta]$ across the series of non-social runs (see Figure 3):

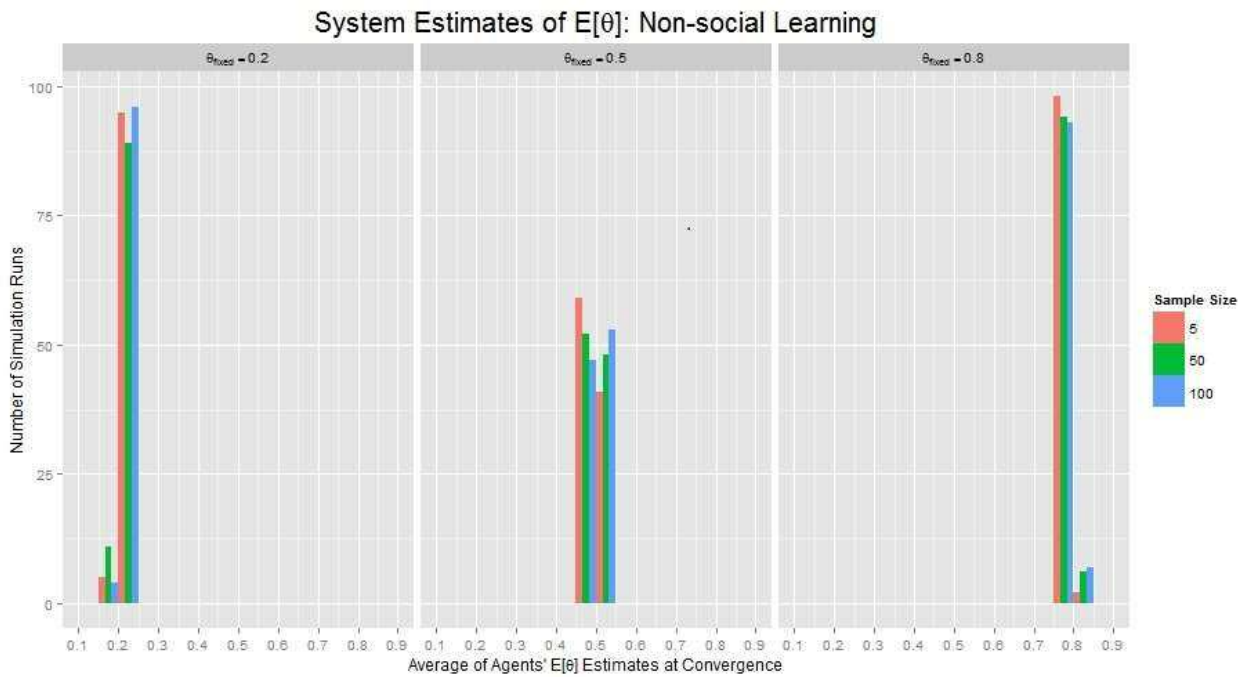


Figure 3: Average of system estimates of $E[\theta]$ for non-social learning systems

Again, as is expected, the final average of agent estimates of $E[\theta]$ in systems of non-social learning successfully converge upon the underlying value of θ_{fixed} . For $\theta_{fixed} = .5$, these average of estimates occurs somewhat symmetrically around the value, while in the extreme θ_{fixed} cases, estimates tend to be more likely to be pulled toward .5 – a pattern that is almost certainly due to agents beginning with an initial estimate of $E[\theta] = .5$ given their starting prior.

In general, system estimates across runs tend to clump tightly around the underlying fixed parameter value. If a more stringent convergence criteria were to be used, one could expect that these system estimate would be even more tightly centered around the underlying values of θ_{fixed} .

The result of non-social systems of learning converging upon “true” parameter values is consistent with our understanding of such processes, and consequently, not surprising. What about the case when there is no initially “correct” answer to find, however? The following results on the average estimates of $E[\theta]$ in purely social runs gives some insights:

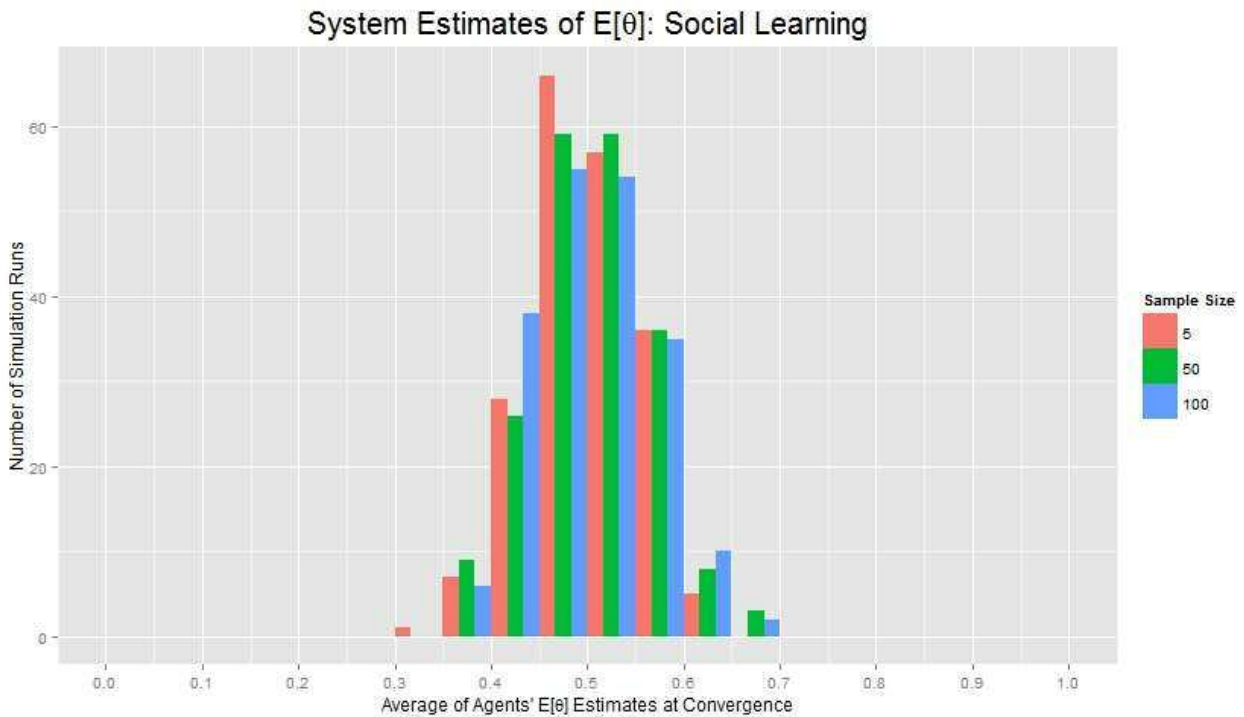


Figure 4: Average of system estimates of $E[\theta]$ for social learning systems

As previously asserted, social systems consistently stabilize on average estimates of $E[\theta]$, just as non-social systems do. This indicates that *within* a given simulation run, no θ_{fixed} is

required for convergence. As the wider spread of averages of $E[\theta]$ estimates in Figure 4 indicates, however, the presence of such fixed values does contribute to consistency *across* simulation runs. This is a feature that is corroborated by the much larger variance of such averages for social systems than for physical systems:

Condition	Variance of Avg. $E[\theta]$ Estimates Across Runs
$\theta_{fixed} = .2$	7.50E-06
$\theta_{fixed} = .5$	2.01E-05
$\theta_{fixed} = .8$	6.28E-06
No θ_{fixed} (i.e. pure social)	0.00349

Table 2: Variance of average $E[\theta]$ estimates across runs

Absent a fixed parameter value to converge upon, how do these systems “choose” where to stabilize? Herein lies the core of how something can arise out of nothing in social learning-valuation systems. As Figure 4 shows, most systems arrive at an average of $E[\theta]$ estimates that remain near the initial conditions in which such systems began, both in terms of agents’ initial estimates of $E[\theta]$ from their weak initial priors as well as to the observable state the system began in of roughly 50% of social agents being in the “up” state. Sometimes, however, estimates end up being much further away, indicating that the fate of any individual simulation run is not completely bound to this starting state.

What is almost certainly occurring in all these cases is that early “noise” in the system gets picked up in agents’ learning process as potentially reflecting some sort of underlying structure or parameter driving the system. As agents adjust their internal model toward that perceived structure, their behavior then changes to act in alignment with it. This behavior then in

turn affects other agents' learning. Before long, the *initially incorrect* guess at not just the value but existence of some underlying parameter driving the system becomes reified and thus ultimately, *becomes correct*. This sort of self-fulfilling prophecy quality is an innate part of social learning processes and ultimately entails for social valuation processes that though objects may begin with an uncertain level of value they can, *through the valuation process itself*, acquire a stable, collectively affirmed and supported level of value.

The sensitivity of these systems to early noise and initial conditions, as well as the transition they go through from an early state wherein the parameter might potentially take on any number of possible values to the “locking-in” and self-reinforcement of one particular value, are all defining features of path-dependency. The high contingency of such systems' development can makes it difficult to predict what any given system will ultimately converge upon. It is possible, however, to get a better understanding of what factors in general will have an influence on this development. In the present circumstance, it is especially important to try and disentangle whether it is the initial observable state of the system or the priors agents begin with (or some combination of both) that matters.

In order to unpack this, we can look at the ultimate converged outcomes of a series of 6,600 social simulation runs in where the starting proportion of agents in the “up” state was exogenously forced at the beginning of the run (see Table 1 for values):

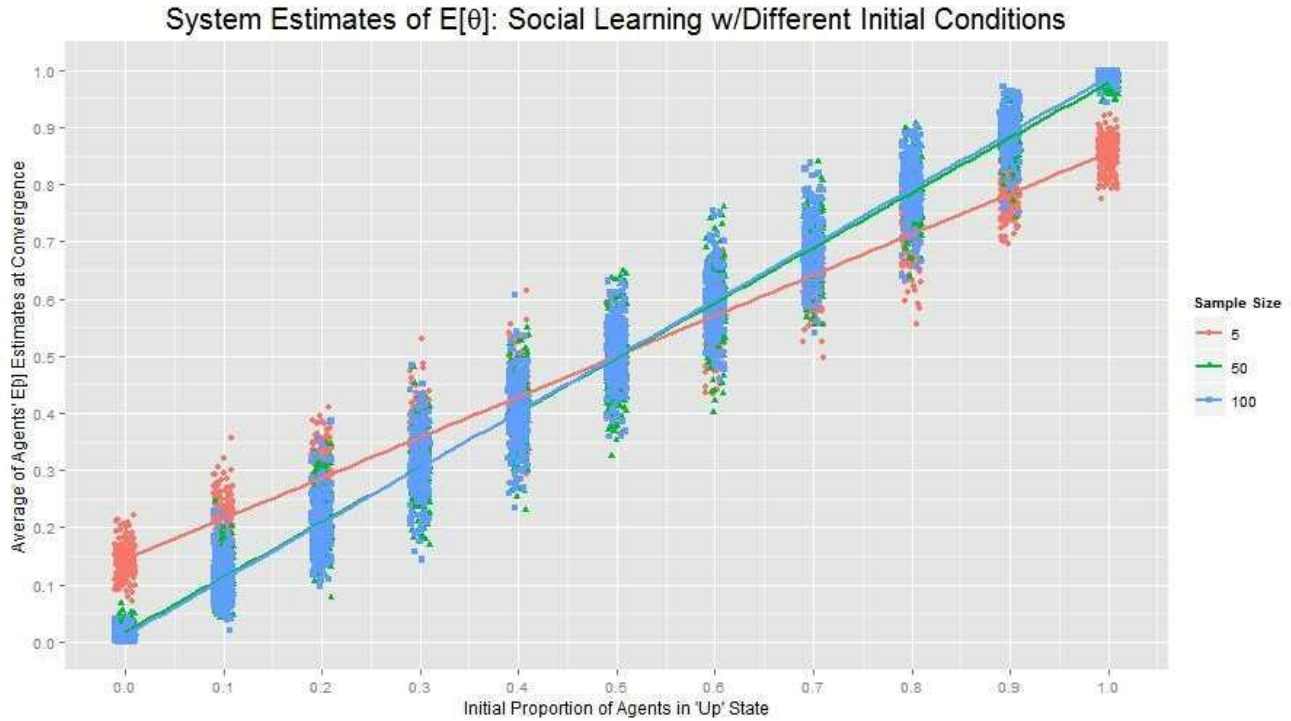


Figure 5: Average estimates of $E[\theta]$ for social systems under different initial conditions

Figure 5 depicts the distributions of the average of agents’ $E[\theta]$ estimates at convergence for individual social simulation runs under various initial proportion conditions and with various agent sample sizes. The most obvious conclusion to take away from this figure is that the initial starting state of the system drives the ultimate outcome of it. Even though agents begin with the same weak priors used in the other series of runs and no agents’ behavior beyond the first turn is determined exogenously, the influence of the systems’ state in that single round of initial interaction persists all the way through to the final stabilization. This fact provides further

support for the idea that in these purely social processes, it is extremely easy for the system to essentially “overfit” on incidental starting arrangements and subsequently reify them into a real structure that determines behavior.

Interestingly though, this effect is actually somewhat attenuated for smaller sample sizes. This can be seen by the fact that with $n = 5$, the final system estimates tend to be pulled back toward a collective estimate of $E[\theta] = 0.5$ on the far ends of the starting proportions considered. This is a feature that suggests that in the smaller sample, there was a more even mixing of information from the initial system state and the priors with which agents initially began. Such a result points toward a counterintuitive conclusion that if one wants to avoid overfitting on incidental initial states in social processes of learning and valuation, using information from *fewer* others instead of the whole system might be better.

Given the translation of these learning and valuation processes into this computational model, it is also possible to start considering what happens when individuals come into these situations with something other than complete uncertainty of an object’s value. This can be accomplished by looking how variation in agents’ initial priors affects where systems converge. Though space limitations prevent a full exploration of this wide area of inquiry, one set of scenarios that we can consider here involves how the initial presence of agents with strong priors influences social learning processes.

Substantively, we might think of this as analogous to scenarios wherein one or a few individuals at the outset of a social valuation process have strong ideas about what the value of an object should be while the rest of the group begins in the usual uncertain state. Regardless of how well-founded such initial ideas about the value of the object might be, there is a potential that the initial certainty and accompanying behavioral consistency of such actors might effectively “seed” the social learning process with enough structure that it ultimately affects the eventual convergence of the system. To get at this, we can look at how the presence of either a single agent or small set of agents with strong priors affects where systems ultimately converge (see Table 1 for prior specification):

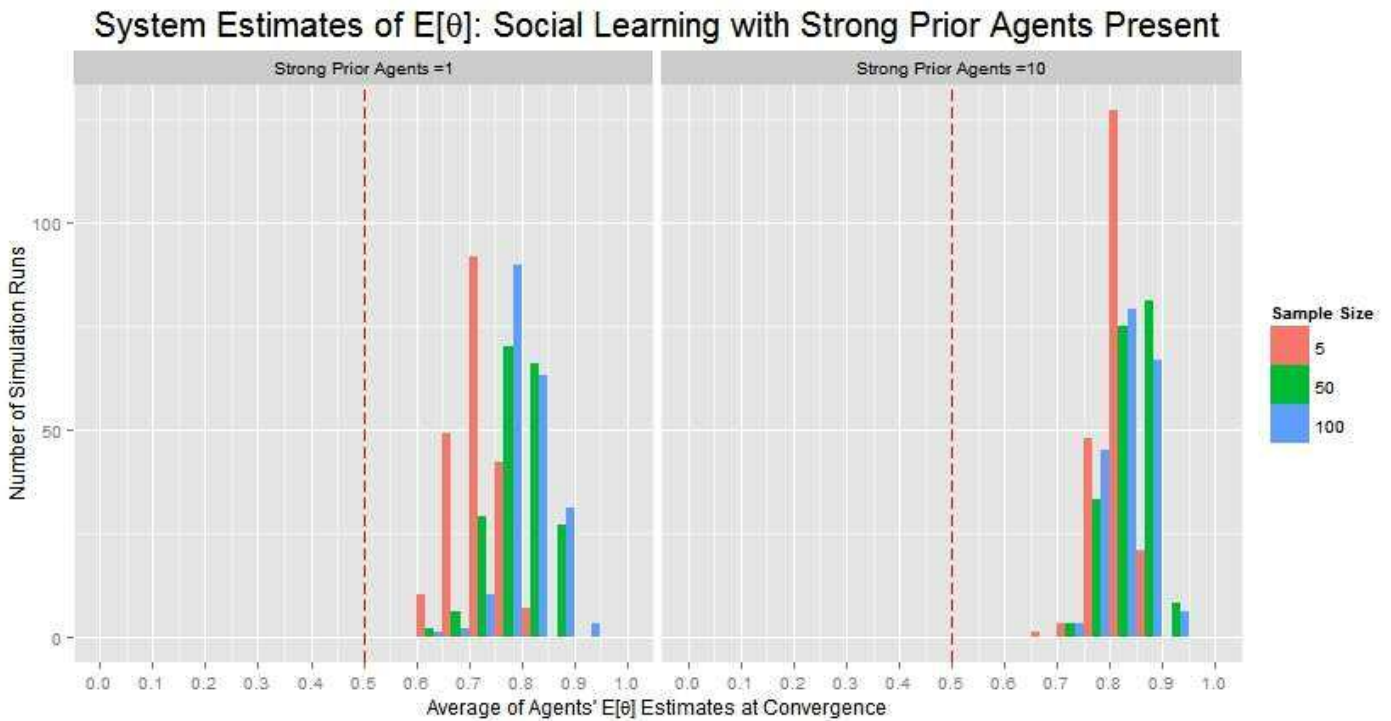


Figure 6: Average of estimates of $E[\theta]$ for social systems with strong priors present

When compared to the distribution shown in Figure 3, the results shown here in Figure 6 are quite striking. Most significantly, they illustrate how the presences of a small set agents, or even a single agent, with an initially strong idea of the underlying parameter value can shift where the entire system ultimately converges. In the 1,200 runs considered for this subset, all systems stabilized in a state wherein the average of agents' estimates for $E[\theta]$ was well above the .5 that the systems without strong prior agents centered around. While few of these runs actually got close to the initial estimate of $E[\theta] = .998$ that the agents with strong priors began with, all runs ultimately were pulled toward that extreme. The influence of sample size is also more marked in these systems, with the smaller sample size seeming to be related to an increased resistance of systems to the initial influence of strong actors. In all cases, however, the message remains clear that in cases of pure social learning, individual actors can have a surprising level of influence on the system as a whole through no other mechanism than possessing certainty from the outset.

The systems looked at so far have considered either purely non-social or purely social scenarios. When it comes to valuation in the real world, however, it seems likely that most valuation occurs via a combination of the two sorts of learning. This is a condition that can also be explored under the present framework by looking at how different proportions of social and non-social information in agents' learning processes impacts the emergent dynamics of these systems. Of key interest will be comparing what sorts of outcomes and statements continue to hold for these "mixed" scenarios as they did in purely social and non-social conditions, and what new sorts of behavior arise that are not found in either of the pure cases.

Unlike the purely social case, these mixed scenarios represent a return to the situation where there is potentially a “correct” underlying parameter value for the system to find⁸, and as such, the criteria for convergence can be conceived of again in terms of systems stabilizing on this value. Based on many lines of prior work that have explored how the presence of social learning can facilitate collective learning processes (Boyd, Richerson, and Henrich 2011; Perreault, Moya, and Boyd 2012), the initial expectation might be set that mixed condition scenarios should be as good if not better at “finding” the values of θ_{fixed} . Furthermore, given the previously explored capacity of early behaviors that are mistaken for structure to influence the development of social systems, it would be natural to assume that the presence of *actual* structure should be as if not more influential. Surprisingly, however, this is not the case.

In considering a range of different proportions of social vs non-social information in agents’ observations, one of the most striking initial results is that only 25% of high proportion social scenarios (i.e. systems where agents’ samples contained 80% social to 20% non-social information sources) were able to converge upon something close to the value of θ_{fixed} before the system runtime cutoff of 30,000 turns. Furthermore, system convergence in these high proportion cases only occurred in situations in which $\theta_{fixed} = .5$, the estimated value of $E[\theta]$ that learning agents begin near. When θ_{fixed} was a more extreme value, the high proportion social systems could not find it.

In the lower proportion social situations, systems did converge but did so much more slowly than they would have in either the pure social or pure non-social case, as can be seen in Figure 7:

⁸ As will be considered more thoroughly in the proceeding discussion section, however, this might not be the only way to conceptualize situations in which a combination of social and non-social valuations matter.

Time to Convergence by Proportion Social

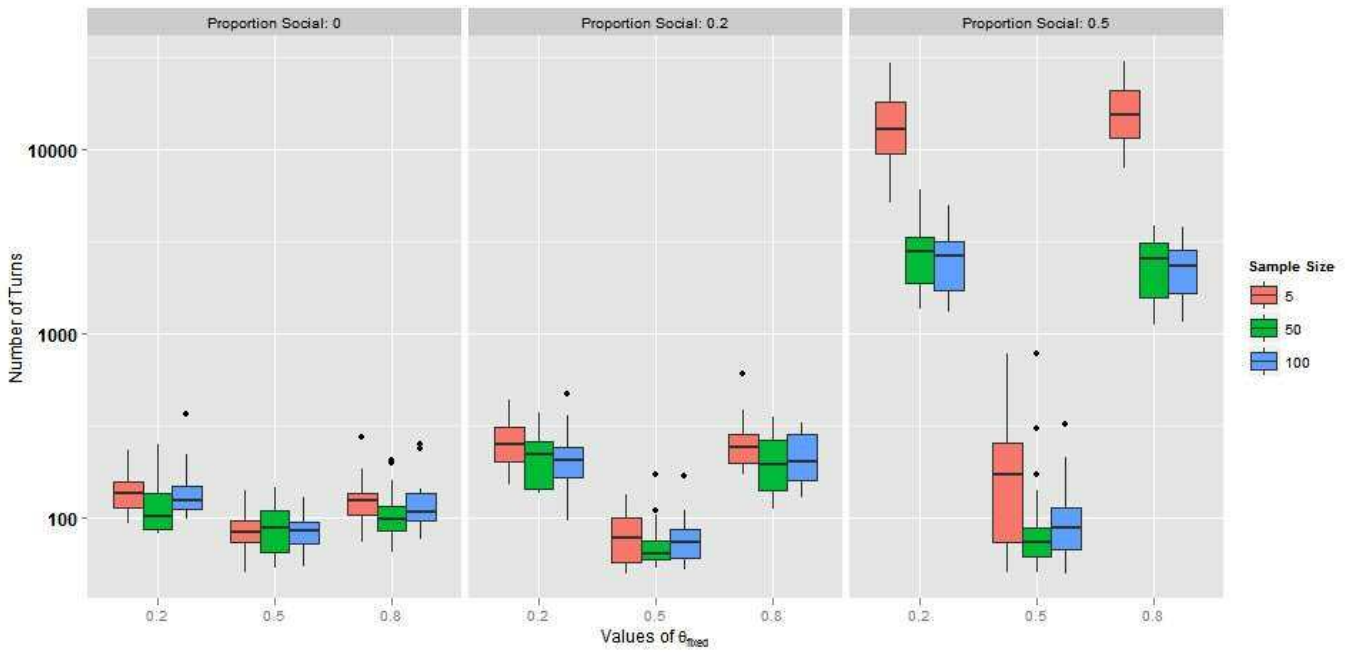


Figure 7: Time to convergence for mixed systems

Of vital note here is that in order to show the differences in time to convergence for these mixed systems compared to a purely non-social system, the axis indicating time in Figure 7 has necessarily be rendered in a logarithmic scale. In congruence with the findings for the high proportion social systems, there is the initial observation that convergence looks to be easier across the board for systems that have $\theta_{fixed} = .5$. Nonetheless, in the mid-social scenario of 50% social information, we see here an increased variability in how long systems take to find the underlying parameter, especially in situations where the sample size is small. Even more striking are the findings for systems with more extreme value of θ_{fixed} . In these instances, including only 20% social information in agents' learning processes results in a notable increase in the time required to converge upon the underlying parameter. For the mid-level scenario of 50% social,

the time to convergence increases much more profoundly, with the most notable effects being the two orders of magnitude increase in time to convergence for systems with small sample sizes.

Qualitatively speaking, in all mixed systems, even the high proportion social ones that did not converge before the runtime cutoff, the average of agent estimates of $E[\theta]$ did always seem to always monotonically approach the value for θ_{fixed} . They did so at an ever decreasing and slowing rate, however, a trend that became more pronounced the higher the proportion of social learning present. As such, it is not possible to confidently assert at this point that the high proportion systems would never converge upon the underlying value of θ_{fixed} , just that the time it would take to do so was more than three orders of magnitude greater than in the purely non-social case⁹. Another point related to these trends is also the fact that according to the convergence criteria used earlier for purely social systems, many of these slower systems would have been considered as having effectively “settled” on a value for θ that did not match that of θ_{fixed} . Given that these systems continued to approach this value after that point, it would not be accurate to say they had fully converged. Nonetheless, the fact that they ended up meeting the relatively strict criteria for social systems long before they reached the much “easier” criteria of arriving to within .01 of θ_{fixed} is telling.

To summarize, these findings concerning the behavior of systems with mixed sources of learning carry some strong cautions for our general understanding of valuation processes. Chiefly, they indicate that mixed scenarios cannot be justifiably assumed as being like either the purely social or non-social valuation cases, or even as some obvious combination of the two. Instead of facilitating the ability of the collective to find values of a fixed parameter, the

⁹ This is obviously a question that can and should be pursued in future work. Results of some exploratory runs that have already been done, however, have shown that high proportion social systems with extreme θ_{fixed} values do not converge even after 500,000 turns.

presence of social learning in these systems actually exerted the opposite influence, sometimes to quite profound degrees. This realization entails that social influences cannot be justifiably assumed away in situations where there is a mix of information being used in valuation processes, as their presence can fundamentally alter the dynamics of the collective system. Even if such systems may ultimately find their way to the “correct” estimation of an object’s value, the extraordinary interference that arises from the social aspects of even the most straightforward, honest, and simplest versions of this valuation process indicates that in practice, the standard assumption that the collective will find the “true” value of an object cannot hold.

2.5 *“Something Out of Nothing” and its Implications for Economic Understanding*

The results that emerge from this computational approach to modeling valuation processes resonate significantly with many of the insights that have developed in classic and contemporary work on the social construction of value. The ability of groups to arrive at very different valuations of the same object under similar circumstances, the unplanned emergence of a collectively agreed upon idea of value from processes of social interaction, and the innate contingency and susceptibility of valuation processes to early actors are all prominent ideas in the sociological study of value. Notably, however, this framework arrives at these conclusions in a bottom-up fashion, using a model of uncertain, learning individuals that is also compatible with contemporary models in economics. By creating this link between valuation and learning and taking seriously the different classes of information that can inform that learning process, it becomes possible to start exploring the economic implications of the social nature of value in a much more systematic and rigorous fashion than has previously been possible.

Of primary importance is the confirmation this perspective offers of the ability of “something” to arise out of “nothing” in valuation, an issue that is of central importance in

accounting for the rise of digital currency. While standard economic perspectives ordinarily assume that *real* value must be grounded in some objective world that exists apart from social processes, this perspective asserts that inter-subjective constitutions of value can be as stable and real in their consequences as non-socially based valuations. The default in much of economics has been to be to treat instances of socially constructed value as temporary, mistaken deviations from true estimates of value that should ultimately be “corrected” via the market or interactions with objective reality. The results considered here, however, paint a different picture, one in which systems of individuals can and do converge on common and stable valuations, even in the absence of some “true” initial basis for that value. It follows from this that we can reasonable assume that *the process of collective valuation is in and of itself, sufficient to constitute value*, and as such, appeals to objective or subjective-objective origins of value are not necessary to explain its existence.

Another implication of this perspective is that in strongly social cases, a focus on determining the “correct” valuation of an object is nonsensical except in as far as it seeks to understand what value the system has already converged upon for it. As such, the assessment of value in these strongly social situations will be far less like researching the innate qualities of an object and far more like the one faced by participants in Keynes’ (Keynes 1936) newspaper beauty contest example who are tasked with guessing which of the beauty contestants they think that the majority of others will say is most attractive. It is also clear from these results that time plays a critical role in such assessments. Early on, the question of what the “true” value of such objects does not make sense in the way it does after social valuation processes have led to a collective conclusion about it.

This point about time and accompanying understandings concerning the sensitivity of these processes to initial conditions and early movers also carries with it strong strategic implications. Specifically, it entails that individuals who want to increase or decrease the ultimate valuations of a thing are best served by acting early on in the social valuation process to make it *seem* as if that particular valuation has already taken root across many others or that there are people know with high certainty that such a valuation is correct¹⁰. By creating the perception of a certain level of value early in a systems' development, such actions may ultimately cause that valuation to become true. To tie this into the present case of digital currency, we can see how early actors deciding to act as if Bitcoin had value can serve to get the ball rolling in the direction of it becoming established as having value for the collective. The reasons why such initial actors chose to exchange existing valued currency for Bitcoin - be it because they wished to make a political statement or just because they thought it might be fun - are rather immaterial. The point is that they did and in so doing, contributed to its ability to become socially established as having value today.

While the perspective presented here has sought to re-enfranchise the critical role of the social in valuation, it does not attempt to do so at the expense of acknowledging non-social origins of value as well. The model considered here is not a "pure constructionist" one (Zuckerman 2012) as it does not propose that all value is socially derived, only that social processes are also a legitimate source of value. Most sociologists are likely to agree with this idea in principle. The advantage to pursuing the type of formalization developed here, however, is that we can now move beyond mere statements that both social and non-social forms matter

¹⁰ Arguably, these are realizations that propagandists and marketing have been using to great effect for centuries.

and into deeper explorations and analyses of how these types of valuations interact (or interfere) with one another.

In investigating the dynamics that occur when a mix of non-social and social information is involved in valuation processes, it became clear how problematic it is to make the naïve assumption that these processes will combine in a straightforward or even necessarily constructive manner. Consistent with prevailing ideas in economics, these modeling results indicated that sources of non-social value can serve as an attractor for social valuation processes, essentially “anchoring” the collective’s ultimate valuations to whatever that objective value is. Counter to these ideas, however, is the fact that the inclusion of social feedbacks in valuation processes produces very non-trivial effects on the efficiency of that learning process. Even in these highly idealized scenarios where complicating factors such as lying and biased access to information were not at play, systems relying on a mix of non-social and social information in their valuation processes took much longer, sometimes orders of magnitude longer, to find the underlying “non-social” value. Such effects are quite sobering and have strong implications for perspectives that blithely exclude the role of the social in valuation processes or make the, as it would seem, totally unfounded assumption that social influences are temporary and have negligible effects on the operation of real world economic systems.

This is not to say that there is no basis for these established perspectives, only that more awareness needs to be brought to how they are applied. For instance, in making the assumption that the stock market is capable of finding the “correct” valuation of a stock and pricing it accordingly, the profound influence of social valuation processes has been implicitly assumed away. If there is any reason to believe, however, that the potential value of a stock is not only determined by the quality of the assets underlying it but also by what actors in the system expect

other actors to value it at (say, for the purposes of being able to sell it later), then we have definitively moved from a “non-social” to a “mixed” valuation circumstance. Consequently, the time required for the system to find the “true” price of a stock becomes a critical issue and any assertions that such a thing will occur in any practically feasible timespan become untenable. As a popular saying goes, “The market can stay irrational a lot longer than you can stay solvent!”¹¹ A similar sentiment applies in this example, but instead of the purported “irrationality” of markets, the issue moves to the real implications that follow from the reasonable assessment that market actors’ valuations are being driven by both non-social and social factors.

In cases where it is assumed that the objective value of an object is the ultimate real adjudication of its value, social processes definitely appear to be a hindrance to the collective’s ability to find the “truth” according to this analysis. There are other scenarios involving a mix of social and non-social value, however, where such social influences might be considered differently. Specifically, we can think of cases in which the worth of goods not only involve their immediate utility to individuals, but also their perceived impacts on society.

For instance, we can think of the value associated with buying products made from recycled materials versus freshly extracted resources. In terms of personal utility, there may not be a notable difference between the two products. However, the social valuations associated with the recycled materials product has the potential to increase its value to consumers enough to actually cause them to pay more for it¹². This greater value is not in any way a “mistake” or incorrect assessment of the product’s value, just one that includes both social and non-social

¹¹ This quote is often attributed to Keynes, but there is debate on his origination of it.

¹² One might seek to preserve the standard economic view of utility by saying that the more environmentally friendly product has higher individual utility due to the additional “psychic benefits” it proffers. This argument belies the social origins of those benefits, however, and misses the point that such increased individual benefit arises in great part from the socially constructed value that has been placed on acting in eco-conscious ways.

factors in it. Similarly, we can also think of the increased premiums some individuals are willing to pay for “hyped” new technologies due to both the usefulness they will derive from the product *and* the status they will receive from owning it.

In these and any number of other possible examples, not the least of which being digital currency, we can see how the social elements of these objects’ valuation can sustain their value above (or potentially below) the level they would have if only non-social valuation processes mattered. Whether social processes is ultimately a “good” or “bad” influence on these valuations is not at issue, nor is the idea that they are making the product’s valuation more or less correct. It means only that there is a social component to its value and as long as that social estimation remains stable, the distinction between it and the non-social aspects of its value should not be very relevant. In the case of digital currency, the judge of whether a money works in the immediacy is governed in great part by others’ willingness to accept it as having value. It may well be that in terms of its innate characteristics that money is of low utility or even costly to use in some notable respects. So long as it is valued by others in that moment, however, there is no mistake or “irrationality” in an individual treating it as having value at that time.

2.6 *Conclusion*

This work has forwarded the idea that in order to understand digital currency, one must begin by reconsidering the common basis between economic and social valuation processes. It showed that by treating valuation as a process of learning under uncertainty, sociological and economic conceptions of value might be addressed in the same model. Using a series of ABM simulations, it explored how dependencies on different levels of social and non-social information can lead to different, emergent behavior from these learning/valuation models. Specifically, it demonstrated how social valuation processes quite readily create “something out

of nothing,” how initial states and the presence of highly confident actors can drive social valuation, and how scenarios in which both social and non-social information are being incorporated into the learning process can lead to unexpectedly complicated outcomes in valuation. It then spent some time considering how these modeling results might relate back to valuation in real world contexts.

It can be tempting to reify divisions in disciplinary thought as being based on actual, objective differences in the world. In the case of valuation, there have been long standing divisions between how sociologists and economists conceive of it. In many cases, the different models that characterize the two disciplines are ultimately the ones that are best suited to address the sorts of problems upon which each field tends to focus. Sometimes, however, new phenomena arise in the world that are difficult to understand from such delimited perspectives. Digital currency is one such phenomena, but there are arguably many other examples that could be found. It is only by taking such anomalies seriously and focusing on developing models that can handle the apparent contradictions and puzzles they entail that we can ultimately arrive at a more complete understanding of the processes of interest.

Chapter 3

A Bitcoin's Worth: Talks of Money and Value at the Advent of Digital Currency

In the wake of the Great Recession, a monetary object born of a novel combination of cryptography, computation, and anti-centralization politics was introduced to the world: Bitcoin. Since its inception, the valuation of Bitcoin and the other digital currencies that followed it has risen in a meteoric, and often extremely volatile, fashion. With this rise has also come a sustained disruption to some of the most deeply taken-for-granted concepts in modern life, money and value. Using text gathered from 100,000s of messages posted by individuals in the main communities surrounding Bitcoin, this work uses a combination of automated and traditional content analysis to explore the “talks” (Swidler 2001) of money and value that individuals have employed to deal with this upheaval. The resulting analysis traces the manner in which the initial metallist views that first inspired the creation of this form of “digital gold” (Popper 2015a) continues to heavily influence these discourses and the way in which members have had to go beyond those founding ideas in order to make sense of the novel monetary project they have undertaken. In exploring these variegated, sometimes contradictory, discussions of the economic, political, and social origins of money and value, this analysis will seek to shed light on the ways the individuals at the advent of digital currency are making sense of this new arena of economic activity and how they might be creatively reworking established notions of money and value to explain what Bitcoin is and where its worth comes from.

In early 2009, immediately in the wake of the Great Recession, an individual or group acting under the pseudonym of “Satoshi Nakamoto” introduced a truly novel monetary object to the world: Bitcoin. From the initial $\$.001 \text{ USD} = 1 \text{ BTC}$ exchange rate published in October 2009, Bitcoin reached a high to date of $\$1,147 \text{ USD} = 1 \text{ BTC}$ in December 2013, only to fall back down again to its present range of $\$200 - \$450 = 1 \text{ BTC}$ in the last quarter of 2015. Alongside the diffusion of its use and dramatic fluctuations in its valuation, the unexpected rise of digital currency has also brought with it renewed interest in questions concerning the fundamental nature of value and money. Via the on-going efforts of both experts and laymen to explain what Bitcoin is, how it has come to hold value, and what its eventual fate will be, a new set of contemporary discourses have emerged surrounding many of the most deeply taken-for-granted aspects of modern economic life.

The purpose of this present work is to begin unpacking some of these discourses by investigating the conversations on money and value that the communities surrounding Bitcoin

have generated in the course of making sense of the unprecedented monetary project they have undertaken. Through gathering and analyzing hundreds of thousands of posts from the online forums at the heart of Bitcoin, this work will show that though the development of digital currencies may have been motivated by timeworn metallist perspectives on value and money and the desire to create a new form of “digital gold” (Popper, 2015), the unprecedented nature of Bitcoin has required the individuals involved with it reach beyond these concepts that first inspired it. In particular, it will explore how this unusual circumstance has led to the generation of a new, variegated, and sometimes contradictory set of “talks” (Swidler 2001) on the nature of money and value that not only draw on formal economic models, but also include conceptions of the role of politics and social processes in value and money, as well as a modern form of investment agnosticism which asserts that such deeper issues are of little practical consequence. By examining these discourses, this work will aim to offer a contemporary addition to a body of established work on the social construction of value and money and demonstrate how sociological models of culture are necessary to understanding what is presently playing out in this burgeoning arena economic activity.

3.1 *The Sustained Disruption of Digital Currency*

The global economic turmoil that began in 2008 constituted a major crisis not just for financial systems, but also for the larger social, cultural, and political contexts in which those systems were embedded. The so-called “Great Recession” led to major shifts in the public discourse surrounding a number of issues such as systematic inequality and governments’ complicity with the careless and deeply damaging activities of large banks and other major players in the financial sector. Among the many major social, cultural, and political consequences that followed from this global crisis are the Occupy Wall Street movement, the

introduction of the concept of the “99%” into major political debates, and increased attention on strengthening government regulatory oversight over the financial sector. Bitcoin, and digital currency more generally, was also a product of this moment.

Though the idea of digital money has existed since essentially the beginning of the internet, it was not until 2008 when a white paper released written under the pseudonym ‘Satoshi Nakamoto’ was posted to a cryptography mailing-list that a viable design for an online system of value transfer that did not require a trusted central actor to verify and confirm transactions was proposed. The development of this so-called “trustless” electronic cash system did not require any single actor to maintain a ledger of transactions but instead, relied on the distributed processing power of a network of computers (i.e. a network of “nodes” or “miners”) to verify exchanges of Bitcoins between individuals’ “wallets” using a cryptographic, proof-of-work procedure. In order to incentivize the individual participation of nodes in this verification network, the system was set up to probabilistically reward newly “mined” Bitcoins to participating nodes. Once constituted, the proposed system would be able to run without a central authority and no changes to the underlying protocols, programs, or historical ledger would be able to be made without a majority consensus of all the nodes in the network.

Given the anonymity of Satoshi Nakamoto and the relative paucity of personal information he/she/they offered during their early participation in online communities, it is difficult to pin down their exact motivations for pursuing such a thoroughly decentralized design. However, the inclusion of the news headline “The Times 03/Jan/2009 Chancellor on brink of second bailout for banks” in the comments of the code used to mine the first Bitcoins¹³ as well as several statements Satoshi made on keeping the system outside of the influence of central

¹³ The so-called “Genesis Block”

actors¹⁴, offer strong indications that the economic crisis and the influence of the anti-centralization, Libertarian and “cypher punk” views of the online circles in which Satoshi participated were key drivers in the creation of Bitcoin. In any case, the subsequent first adoption of Bitcoin by a community of individuals who explicitly identified their interest in the project as stemming from their stances against strong central governments, state impingements on personal liberty and privacy, and the monetary policies of the Federal Reserve makes it clear that the origins of digital currency most definitely began with a community where many believed that money itself might be used to challenge existing political and economic structures.

Had Bitcoin stayed confined to this initial context, it very well may have ended up as little more than the interesting side-project of a small group of individuals whose relatively extreme, pre-existing views on the nature of money and value were only reinforced by the economic collapse of 2008-2009. Digital currency did not, however, stop with this group. In the years since the Great Recession, it has grown in both use and value, and as a result, has come to the awareness of increasingly larger and more mainstream audiences.

With this rise in prominence, it has also brought with it a sustained source of disruption to the “taken-for-grantedness” of the concepts of money and value for those who encounter it. Akin to the disruptions that surrounded movements onto and off the gold standard (Carruthers and Babb 1996), the politically motivated creation of local alternative currencies (North 2007), and the instantiation of new trans-national currency like the Euro (Dodd 2005), the unprecedented and unexpected success of digital currency has often engendered a “de-naturalizing” (Carruthers and Babb 1996; Douglas 1986) of money and value in those who have encountered it. Such disruptions or “breaches” of existing background orders has been

¹⁴ See “Satoshi Nakamoto” entry in “BitcoinWiki” (https://en.bitcoin.it/wiki/Satoshi_Nakamoto) for links to statements

established by cultural researchers as being useful in laying bare the usually unarticulated logics that undergird social life (Sewell 2005). This sort of “unsettledness” (Swidler 1986) is also known to prompt a variety of different, sometimes contradictory, “talks” as individuals draw on their respective cultural repertoires to make sense of what is going on and to organize their views and actions.

The present work will endeavor to take advantage of the sustained disruption Bitcoin has provided to the, ordinarily, deeply naturalized concepts of money and value in order to investigate the “talks” of money and value that the individuals at the center of Bitcoin’s advent and rise are using to define digital currency, explain its worth, and predict its future. Through this investigation, this work will seek to add a contemporary contribution to an existing body of research on the social construction of money and value (e.g. Carruthers and Babb 1996; Lamont 2012; Orléan 2014; Zelizer 1994; Zuckerman 2012) and provide a more in depth exploration of some of the ways ordinary individuals have creatively used and recombined “commonsense” notions of social processes, political ideologies, and economic theory to explain this new monetary phenomena and organize their own ideas and actions with respect to it. As this work will make clear, not even the core community surrounding Bitcoin has yet been able to find a single, coherent framework of understanding that can conclusively define what digital currency is and explain why it has worth. Nonetheless, through the wide diversity of ideas these individuals are using in their attempts to account for it, we will be able to gain insight not only into some of the cultural repertoires modern individuals draw upon to explain economic systems, but also, potentially identify some early, new evolutions of these concepts that may at some point feedback and impact established notions of the nature of money and value.

3.2 *The Discourses of the Bitcoin Community*

In terms of the history alternative currencies, digital currency and Bitcoin are unprecedented in many respects. Just a few of its unique features include the priority it places on ensuring anonymity in transactions, its global reach, and the often spectacular track record of fraud and other illegal activities that has been part of its development. Another unique aspect of its development, one that should be of particular interest to researchers who want to look at the intersection of economic activity and socio-cultural processes, are the critical role a key set of online, public forums have played in the development and spread of digital currency. The digital communities surrounding Bitcoin and other “alt coins” have served as major arenas for the practical coordination of the increasing large-scale project of digital currency as well as primary settings for discussing, educating, and debating the nature of digital currency, the causes and consequences of its valuation, and the connections it has to the larger social, political, and economic environments within which it is situated. These online forums, which have been present and operating since Bitcoin’s inception, also act as an archival record of the discourses and conversations that have been accompanied the evolution of this new monetary object.

Historically, those interested in analyzing cultural content have often been necessarily restricted to the records that have been able to survive through decades or centuries. Oftentimes, though not always, these records have been unavoidably slanted toward those produced by collective entities acting in formal capacities or prominent actors of noted social status. With the advent of the internet and the rise of online communities and social media, however, we are entering a new era of unprecedented access to the perspectives and statements that are organically produced by common individuals in the course of their interactions with each other. Such online communications and the record of thought and statement they produce makes it, as Venturini and Latour (2009) states, “as if the inner workings of private worlds have been pried

open because their inputs and outputs have become thoroughly traceable.” With this in mind, the present work will aim to make use of the fact that the communities surrounding Bitcoin have been heavily involved in public forums since its inception in order to pull out the raw “talks” of money and value that have accompanied the creation and spread of Bitcoin.

Bitcoin’s Online Communities

There are numerous online communities that have arisen around digital currency, with most digital currencies being associated with their own accompanying set of public forums. The two largest communities that have been central to the development of Bitcoin are ‘Bitcointalk.org’ and the Reddit hosted community, ‘r/bitcoin.’ Bitcointalk.org, the older and most central of the two communities, was created in November 2009 and presently records having over 650,000 users and over 13 million posts. The main heading of the Bitcointalk forum houses 207 separate message boards organized by discussion topics ranging from ‘Development and Technical Discussion,’ general discussion, ‘Altcoins’, and a variety of regional boards in a number of different languages. The Bitcoin Reddit community (‘r/bitcoin’) was created after Bitcointalk, in September 2010. It presently records having over 177,000 subscribers and is linked to a number of other smaller, less central Reddit-based Bitcoin communities including r/Jobs4Bitcoins, r/BitcoinMarkets, and a variety of regionally based Bitcoin communities and is also affiliated with several non-Bitcoin communities including r/Anarcho_Capitalism, r/Economics, and r/Crypto (a community devoted to cryptography and related topics). Though the website design used by Reddit does not provide a straightforward count of the number of posts and responses for a given community, the data collection done for this project makes it

possible to state that the main r/Bitcoin community has generated more than 3 million total messages since its inception.

Membership in these communities is on a free and anonymous basis, though participants are allowed to identify themselves to other members of the community. Though the anonymized nature of participation makes it difficult to infer demographic characteristics of these online communities, it is commonly assumed that they reflect the overall user base of Bitcoin which, according to anecdotal evidence and a few independent survey attempts, is usually thought to be composed primarily of white men under the age of 40 who are well-educated, tech-savvy, and more likely than the mainstream population to claim a Libertarian or Anarcho-Capitalist political orientation (CoinDesk 2015; Zero Hedge 2013)¹⁵. In spite of the likely homogeneity of these online communities' membership, the statements and conversations in these forums point to the presence of range of political orientations, experience levels, and motivations for being involved in Bitcoin. Beyond the standard tech-oriented, Libertarian viewpoints, these communities also involve the participation of self-described Socialists, technological neophytes, conspiracy theorists, merchants, and individuals primarily interested in managing their investment portfolios.

Data Collection and Analytical Approach

In order to explore the talks of money and value that have been employed by the individuals involved in the advent and rise of digital currency, I began by 'scraping' the

¹⁵ Present independent surveying efforts of the Bitcoin community face severe limitations in that they have been forced to rely on non-representative sampling methods. In particular, non-North American users are expected to be under-represented, in spite of efforts to provide surveys in several different languages (CoinDesk 2015). Due to the strong prioritization those involved in Bitcoin so far have placed on privacy and anonymity, it seems likely that these surveying difficulties are likely to persist.

complete set of messages that have been publically posted to the “Politics” and “Economics” message boards in the Bitcointalk forum¹⁶. Given that r/Bitcoin, unlike Bitcointalk, does not organize its posts into boards that relate to general topic areas, it was necessary to collect the entire set of messages that have been posted to r/Bitcoin. For every post, I collected the message text, its timestamp, author, and the ‘topic’ or ‘original post’ to which it was related. This resulted in an initial set of over 3.1 million posts from Bitcointalk boards with dates range from December 2009 through July 2015 and over 450,000 from r/Bitcoin that ranged from November 2010 through July 2015. Given the wide diversity of topics discussed in these forums and my desire to hone in more specifically on conversations related to notions of value and money, I created subsets of these larger collections by extracting just those messages that contained some form of the words “money”, “currency”, “value,” or “worth.” While some relevant discussions were almost certainly missed using this criteria, I felt it was important to use a conservative set of terms that would not preferentially pull out messages containing a particular set of viewpoints but that also would still effectively get at the major themes of interest here¹⁷. After applying this criteria, I was left with a subset of 35,000 messages from the Bitcointalk boards and 200,000 messages from r/bitcoin.

Even after this narrowing down of the full corpus, extracting themes from and making sense of the underlying conversations in such a large body of text necessarily requires computational assistance. As such, in order to be able to generate insights that were both richly informative but also faithfully generalized the discourses present, I undertook an analytical

¹⁶ Complete set of messages refers to original posts on new topics and all subsequent responses and comments posted under that topic.

¹⁷ For instance, inclusion of the terms “gold” or “fiat” run the risk of preferentially biasing the resulting set toward “metallist” discussions, while inclusion of the term “exchange” has the capacity to lead to a much noisier mix of discussions on not just money/value, but also current news on major currency exchanges as well as conversations that contained other unrelated, practical usages of the word.

approach that combined aspects of both traditional and automated content analysis. In terms of automated content analysis, I utilized natural language processing methods such as generating word and bigram frequencies in order to get a sense of important trends and tendencies in these discourses. In conjunction with this computational approach, I also undertook a more thorough hand coding and reading of a randomly generated samples of 150 messages from the Bitcointalk forum boards and 500 messages from r/bitcoin.¹⁸ By combining the in-depth analysis that is possible through this traditional approach with the overarching trends found via computational methods, it will be easier to demonstrate how individual discourses connect to the wider patterns in talk that characterize these communities.

3.3 *Talks of Money and Value at the Advent of Digital Currency*

What do the discussions of money and value look like at the advent of digital currency?

The grounding of its design in a set of political and economic views that have a long history of being expressed in monetary debates grants an initial similarity between these discourses and ones of centuries past (e.g. Carruthers and Babb 1996; Maurer 2006) Nonetheless, the unprecedented nature of digital currency has entailed that such preexisting repertoires of explanation and understanding are not complete enough to fully define what Bitcoin is, explain why it is valued, or predict its future course. This situation has necessarily led individuals involved in digital currency to go beyond the initial conceptual frameworks responsible for its inception in order to seek out and creatively rework other ideas of money, value, and the relationship of digital currency thereto. As such, what will ultimately become evident by looking at these talks is that the prevailing understandings of digital currencies remain variegated and

¹⁸ Future iterations of this project will not only include larger samples from these corpora, but will also attempt to use this resultant coding of texts as the basis for building a set of automated text classifiers that will be able to grapple with coding the larger corpus of texts.

quickly evolving at this time. Though it not yet possible to identify the final definitions and explanations for digital currency that will eventually win out, it will be possible to start identifying how far its ultimate construction is likely to be from the initial ideas that first gave rise to it.

Gold for the Digital Age

In 1998, a decade before the first Bitcoin was mined, Nick Szabo, a prominent figure in the digital currency world, began working on an idea that is widely cited as the conceptual precursor of Bitcoin¹⁹: “bit gold” (Szabo 2008). The basic premise of bit gold was to use cryptographic protocols to allow individuals to send and receive strings of bits which would represent value transfers without having to rely on a trusted third party to verify and back up the worth of those bits. The primary motive cited for developing such a “trustless” system was to free money from the manipulation of central actors (e.g. banks and governments) and thereby address what he Szabo saw as one of the “most pernicious” insecurities associated with money, inflation (Szabo 2008). As he stated later, he was attempting to “mimic as closely as possible in cyberspace the security and trust characteristics of gold, and chief among those is that it doesn’t depend on a trusted central authority” (Peck 2012).

This brand of “digital metallism” (Maurer et al. 2013) ultimately both informed the design of Bitcoin and was a key motivator in its initial adoption. Alongside a prioritization on privacy and anonymity in online economic transactions, an issue the “cypher punk” community considers to be key to protecting individual freedoms from state control, the original Bitcoin white paper (Nakamoto n.d.) placed great emphasis on designing a system of value exchange that was inherently decentralized and trustless in the sense that it did not require a trusted third party

¹⁹ Due to the striking degree of similarity between Szabo’s proposal and the Bitcoin’s design, it is has been widely speculated that Satoshi Nakamoto is actually Szabo operating under a pseudonym.

to operate. This seminal paper also introduced an explicit analogy between individuals who invested in computer “rigs” to “mine” Bitcoins and gold miners and set an ultimate cap on the number of Bitcoins that would ever be produced by the protocol, a feature that would ensure the ultimate scarcity and finiteness of supply that has been a central feature in many contemporary metallist arguments.

This grounding in metallism was not only critical to the design of Bitcoin, but also played a major role in its initial adoption. Specifically, it was Bitcoin’s emulation of gold that gave it much of its initial appeal in the Libertarian and Anarcho-Capitalist circles that to this day still make up a core part of the wider digital currency community. The founding of Bitcoin in metallist perspectives has also had a sustained influence on the community’s discourses surrounding money and value.

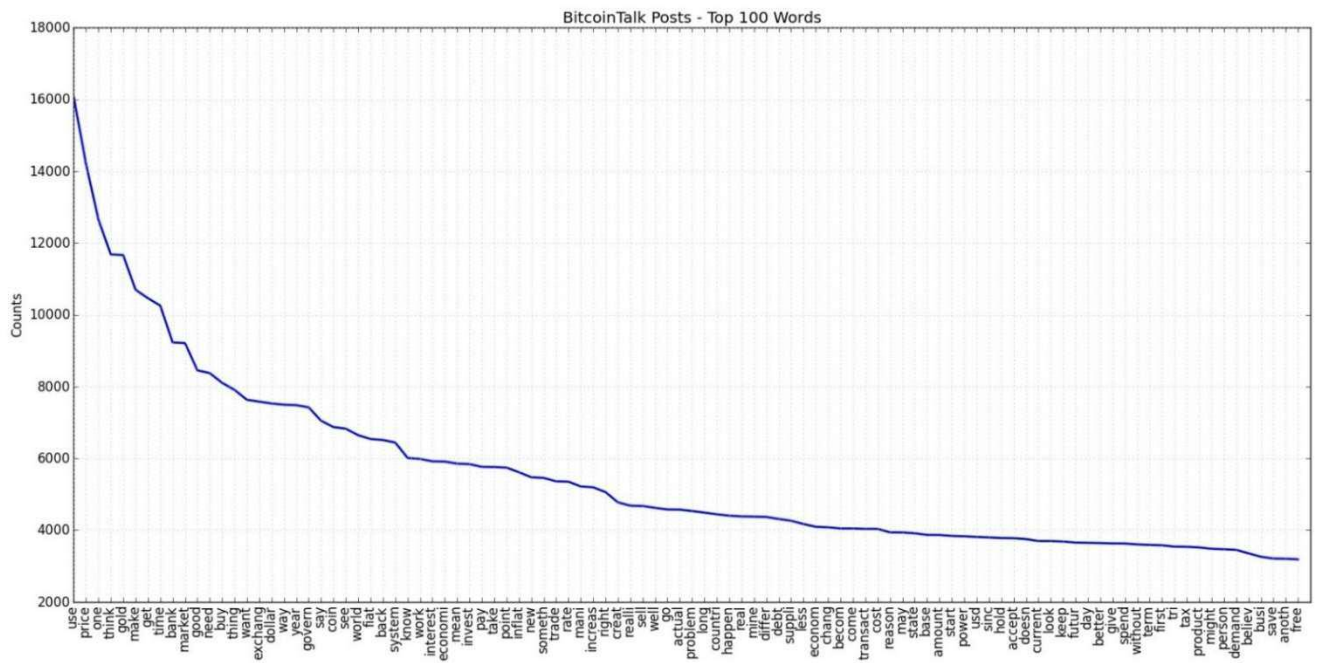


Figure 8: Top 100 words in selected subset of BitcoinTalk posts

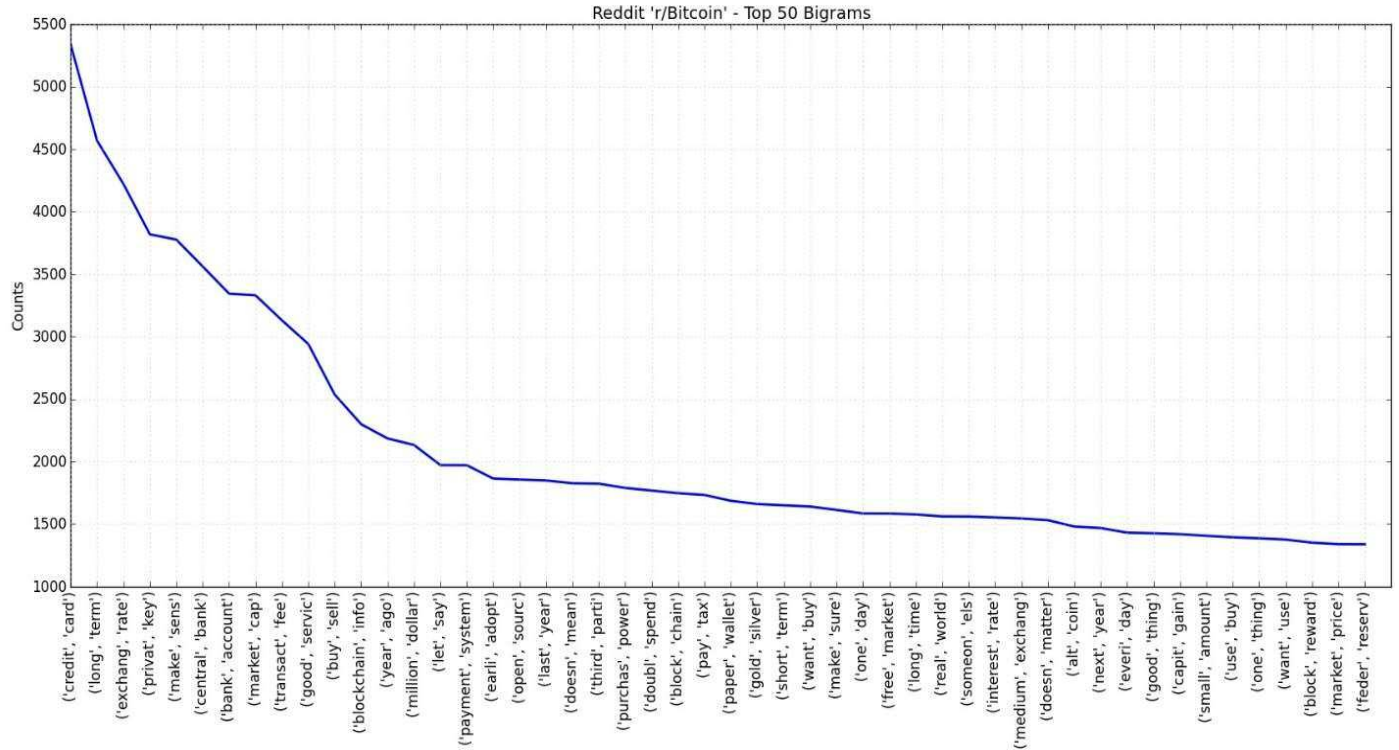


Figure 11: Top 50 bigrams in selected subset of r/Bitcoin posts

As can be seen in the word frequency counts for both forums, the word ‘gold’ is one of the most frequent terms that occurs in both subsets of posts, with it being the 20th most frequent word for r/Bitcoin and the 4th most frequent in BitcoinTalk. The prevalence of this perspective can also be seen in the bigram frequencies²⁰ of both, not just in terms of the frequent occurrence of “gold, silver,” but also in the bigrams “feder, reserv,” “fraction, reserv” and “central, bank” that reflect contemporary metallist antipathy toward centralized financial institutions like the Federal Reserve and central banks. In the case of the BitcoinTalk forum posts, additional bigrams pertaining to “preciou, metal” and “gold, standard” also reflect the ubiquity of such thinking in this community’s discourses.

²⁰ Bigrams refer to collocations of two words with one another in a corpus. In this case, the prevalence of the “gold, silver” bigram, for instance, would reflect frequent occurrences of the phrase “gold and silver” in the underlying corpus.

The persistence of more traditional metallist perspectives is periodically evidenced through statements concerning the usefulness of precious-metal backed money:

“People need to get back to precious metals.... What’s needed (IMO) is a Credit system THAT IS TIED TO LIMITED PRECIOUS VALUBLES. If there is no limit on how much is out there then eventually majority of currencies will suffer Inflation.” (BitcoinTalk, 7/13/2013)

“Until the end of time humans are going to value what is rare (and added to that what is easily fungible and transmittable), nothing is going to change that for our civilization. Yes we don't use the gold standard for currency today. Does that mean that gold is worthless, became worthless when we adopted fiat currency? Absolutely not.” (r/Bitcoin, 12/23/2013)

The influence of these views can also be discerned in the abundance of conversations focusing on the perils of inflation, the potential benefits (and drawbacks) of a deflationary currency whose value increases through time due to the innate limits on its supply, and the great antipathy toward the Federal Reserve and central banks that is often expressed in these forums such as is expressed in the following:

“Firstly, deflationary currencies would improve the standard of living of the poorest amongst us by lowering prices for essential goods and services. By saving their money the poor would no longer be subject to the inflation tax as they are now. Secondly, deflationary currencies don't stifle investment. People can still choose to invest in whatever they wish however the potential returns on those investments should be greater than the economy's productivity gains. This would lead to more market-driven, prudent levels of investment. As it stands now, the so called risk-free return investment is government bonds. People earn interest for lending their money to a centralized group of people who use those funds to support projects that are greatly influenced by all sorts of back room deals, graft, and corruption. Bitcoin would move investment decisions away from centralized actors with hidden agendas to rational individuals.” (r/Bitcoin, 3/18/2015)

“Inflation and Deflation in the economy should be nothing more than market feedback to supply and demand, being able to spot the trend is the job of economists. Manipulating the Money supply to manage the trend is criminal. Holding the belief the money supply should grow and contract is akin to believing that reducing the supply or increasing supply of electricity to manage productivity is of benefit to all.” (BitcoinTalk, 7/30/2013)

In addition to conversations focused on Bitcoin’s capacity to reproduce many of the most desirable properties of gold and silver, there are also recurrent discussions that consider how digital currencies possess features that make them significantly better mediums of exchange than precious metals in the modern digital age. Digital currencies are often described as surpassing

gold and other metals along several dimensions including in the speed with which they can be transferred between actors across the world and their relative invulnerability to counterfeiting. Further along these lines, the design of Bitcoin and related digital currencies is seen as ensuring a greater degree of privacy in economic transactions than the use of precious metals could feasibly due to Bitcoin's ability to firmly disassociate individuals economic transactions from their real world identities. This is seen by many as a revolutionary inversion of the current prevailing model of non-cash payment transactions that depend on third parties (e.g. banks) that are not only legally required to know and monitor the connections between individuals' identities and their transactions, but also, release that information to "counter-parties" (i.e. governments) under certain conditions²¹. For those who place a premium on preserving privacy in economic transactions and associate it with individual freedom from state control, digital currencies are often seen as a necessary solution to economic exchange in the digital era that cannot be matched by precious metals:

"Gold advocates will point out that physical gold bullion has no counter-party risk, but that is only true for storage in your own home. Store it in a vault or bank and you have counter-party risk. And sending gold? You have to trust all sorts of people if you wish to transfer your gold somewhere else or spend it across distance. Bitcoin means complete ownership of money both in storage and transfer. Nobody can prevent you from having it. Nobody can prevent you from spending it." (BitcoinTalk, 12/11/2013)

Worth Without Metals

Classic and contemporary metallist explanations of money and value have obviously played a very formative role in the advent and early adoption of digital currencies. These explanations, however, face an unavoidable and significant problem in their application to digital

²¹ This unique ability to disassociate identities from transactions is unquestionably a primary reason for Bitcoin and other digital currencies becoming primary mediums of exchange in arenas like online black markets, donations to organizations that have been deemed as potentially dangerous by the State, and for paying ransoms in acts of online extortion.

currency: for all its emulation, Bitcoin is not backed by any precious metal or for that matter, any material whatsoever. Given the newness of digital currencies' existence, they also have no millennia long history of being valued within and across societies to justify their potential usefulness as money, a feature that has been critical in many accounts of why gold and other precious metals have been able to make the transition from commodity to money (e.g. Menger 1892). In many respects, Bitcoin can rightly be seen as no more than an ingeniously designed accounting ledger that tracks the movement of made-up, virtual objects which were automatically generated by a computer protocol. Complicating matters further is also the fact that Bitcoin's core design involves the intentional obviation of the role of national governments or central agents. Consequently, any direct appeal to the precedence of other non-metal based money in the forms of banknotes, fiat currency, or government designations of legal tender also cannot be directly applied to explain or justify Bitcoin and its value.

The insufficiency of the historical economic perspectives that inspired Bitcoin's creation to fully account for what it is or how it has worth has resulted in a notable conceptual impasse. As a result of it, Bitcoin community members have had to delve unusually deeply and critically into the subjects of value and money in order to figure out whether digital currency constitutes money or even to just explain why it currently holds sufficient enough worth to be exchangeable for quite large amounts of national currency. The "talks" of money and value that this situation has evoked are not as coherently organized as those that adhere more strongly to the original metallist perspectives that initially structured the project of Bitcoin. Absent a preexisting economic framework or model to explain Bitcoin and its worth, individuals have drawn upon a wide set of formal and informal concepts, theories, and commonsense notions in their considerations and explanations of digital currency. The sources of these sense-making materials

are not drawn only from the domain of Economics as a defined discipline, but also extend further out into territories such as investment practices, social dynamics, and politics (see Figure 12).

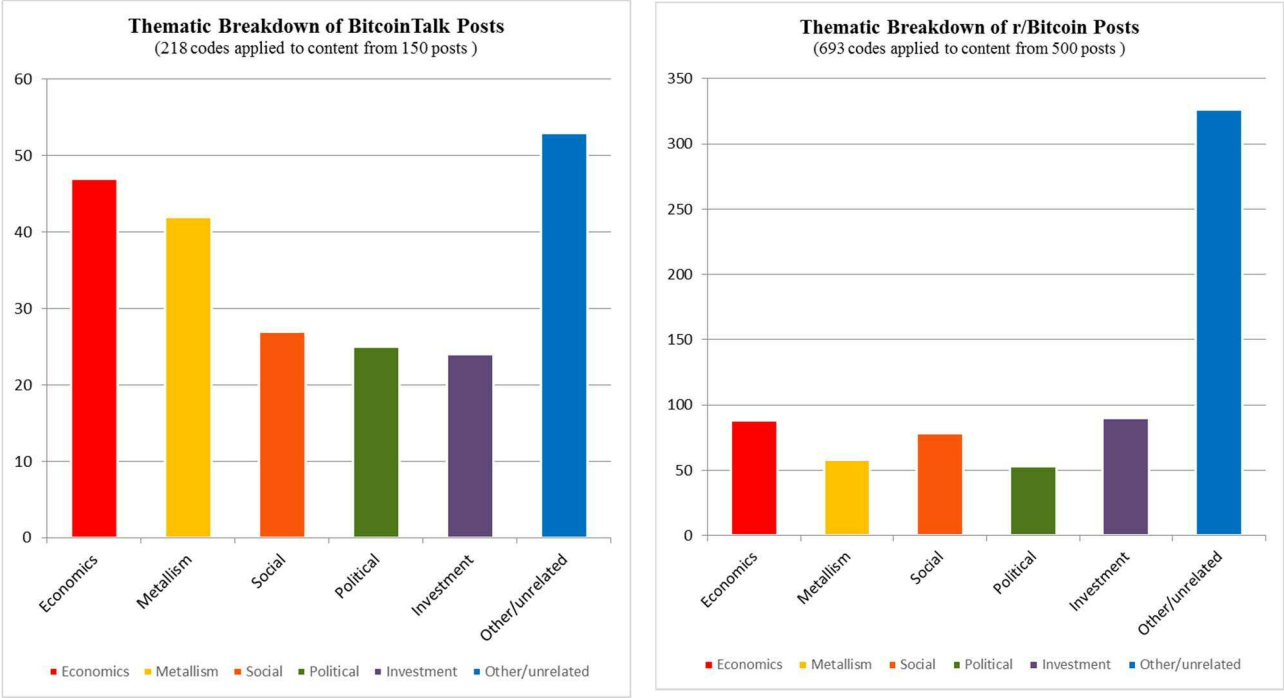


Figure 12: Thematic breakdown of sampled posts from BitcoinTalk and r/Bitcoin forums

By exploring some aspects of the repertoires individuals have employed to reconcile digital currency with pre-existing notions of money and value, it becomes possible to not just

better understand the “toolkits” (Swidler 1986) being used to navigate this new field of economic activity, but also, potentially detect signs of new, evolving reworking of these elements that may ultimately lay a foundation for a more coherent, future reimagining of money and value vis-à-vis digital currencies.

Economic Themes

Perhaps a natural first place to start looking for alternative explanations of Bitcoin and its worth is in the arena of Economic theory. Concordant with idea is the reoccurring presence of classic, economic textbook definitions of money as a “store of value,” “medium of exchange,” and “unit of account” across the discussion. Specifically, referring to the bigram frequencies in Figure 9 and 11, there is evidence that the subjects of “store of value” and “medium of exchange” frequently occur. How are these being used, however? For the most part, the notion that Bitcoin serves as medium of exchange has remained relatively unproblematic as it has gained acceptance as a payment for goods and services. Describing it as a store of value, however, meets with more contention. The majority of this debate centers on the fact that to date, the sometimes incredibly dramatic fluctuations in the exchange rate of Bitcoin has made it an unreliable store of value. For some individuals, the instability in the price of Bitcoin precludes it from achieving the status of “money” and relegates it to something more akin to a stock or commodity. Others, however, see fit to point out that national currencies, like the Venezuelan bolívar, also exhibit dramatic swings in exchange rate but are still considered to be money. Along a different tract are arguments that though Bitcoin may not yet be a full-fledged money due to this current variability, but that with increased adoption and use its value will at some

point stabilize sufficiently well that it will be able to meet this criteria of money. This is a logic that we will see reoccur in discussions of the role of speculation on Bitcoin's future.

Beyond the relatively semantic question of whether Bitcoin now or at some point will meet textbook definitions of money, individuals also pull upon existing Economic theory to tackle the deeper and more complex question of where Bitcoin's value stems from. A notion expressed in some early writings on Bitcoin and implicit in the justification offered for the initial exchange published for Bitcoin in 2009²², is arguably reflective of a significantly altered form of a labor theory of value that cites the computational work used to generate a Bitcoin and/or the resources that were expended in performing that work constitute an initial source of value for Bitcoin. Given the degree to which Bitcoin's current valuation has gone far beyond this initial level, however, and the fact that the underlying cryptographic problems being used to verify transactions do not have solutions that are of any usefulness outside securing the Bitcoin system itself²³, this particular view of Bitcoin's value has not dominated.

A much more prevalent theme in accounting for Bitcoin's value involves appeals to the laws of supply and demand. Essentially, this logic states that the value of an object, virtual or otherwise, arises from the degree to which the demand for it exceeds the available supply as expressed in the following:

“Generally, the value of a money type is dependent on the demand, which is the demand to hold, and the supply, the demand to hold less.” – BitcoinTalk, 5/1/2015

“Bitcoins are a long term investment as they will remain in a fixed supply and the uses will slowly come to market increasing demand and thus value.” – BitcoinTalk, 7/5/2011

²² This rate, published by a Bitcoin group operating under the name of “New Liberty Standard,” was based on the estimated cost of the electricity it took to produce one Bitcoin at that time (Anon 2010).

²³ Noting the possibility that solving the difficult computational problems that form the basis of a digital currency's system of transactions might actually be designed in such a way as to be useful in a wider context has led to the development of an alternative digital currency (i.e. an “AltCoin”) named “Primecoin” that uses its underlying computational processing to help find large prime numbers.

Though this is a relatively simple argument that is reminiscent of basic level Economics, the Bitcoin's community strong grounding in Libertarian and Anarcho-Capitalist thought makes such "market" explanation of Bitcoin's value appealing.

Another angle that is often applied proposes that the value of money, or in this case Bitcoin, arises at least in part from its ability to be exchanged for goods and services. This is reflected in Bitcoin advocates annual marking of "Pizza Day," the anniversary of the first use of Bitcoin to purchase a real world good – two Papa John's Pizzas that a BitcoinTalk forum member purchased from another forum member for 10,000 BTC, an amount that at the time was equivalent to \$25 USD but at today's exchange rate would be worth over \$4 million USD. This sentiment is also recurrently expressed throughout conversations on these forums:

"If bitcoin acceptance reaches a critical mass where necessities of food, shelter, and clothing can be bought with it, it will likely have reached a tipping point where it displaces national currencies" (BitcoinTalk, 4/10/2011)

"If Bitcoin is not actively used as a currency and is just held as a hoarding tool, it will quickly lose its value over time, similar to fiat, because the value in a currency is strongly correlated with how well you can exchange it for goods and services." (r/Bitcoin, 10/14/2013)

The logic being drawn upon here is essentially that the more easily one can use Bitcoin to acquire goods and services that possess either inherent or subjective value, the greater the value Bitcoin will have by extension. A major conclusion that follows from this model then, is that merchant adoption will be critically important to the ultimate success of Bitcoin. This view has created a strong motivation for the Bitcoin enthusiasts who subscribe to it to proactively encourage online and "brick-and-mortar" businesses they frequent to begin accepting Bitcoin and support the development of technologies and applications that make it easier for businesses to use digital currency. It also supports pushing Bitcoin and its lower transaction fees as an alternative to credit cards in electronic payment transactions and celebrating the adoption of

Bitcoin by major retailers such as Overstock.com and Dell. On a more complicated note, this emphasis on exchangeability also makes it harder to deny the initial, and potentially continued, importance of Bitcoin's use in facilitating illegal transactions including gambling and purchases made in online black markets such as the now defunct Silk Road and its most recent successor, Open Bazaar.

Social Perspectives on Digital Currency

Overall, the Bitcoin communities considered here express a strong orientation toward applying economic models and theories to explain not just Bitcoin, but larger world events as well. Given this orientation, evocations of “supply and demand” and “exchangeability for goods and services” as being primary sources of value are not surprising. The application of such Economics derived explanations to the subjects of Bitcoin and its worth, however, face some considerable problems, ones which resemble many of the formal critiques that have been made of many of the models economists have applied in their attempts to explain money (e.g. Dodd 2014; Ingham 2004; Orléan 2014; Zelizer 2005). Most notably, they fail to account for how the demand for digital currencies originates in the first place or explain why individuals and merchants would want to use anything other than the national currencies they already are using in the exchange of goods and services with each other. Such explanatory holes not only pose problems for explaining the history of digital currency thus far, but also, in anticipating whether or not it will succeed in the future and in justifications of its innately disruptive capacity. It is here at the boundaries of what Economics can explain that talks of money and value start turning toward discussions of social dynamics and political processes.

A key concept that is frequently used to bridge between economics and the more social aspects of Bitcoin's valuation is that of “network effects.” Network effects is a business and

economics term that refers to situations wherein the value of an object is dependent on its rate of adoption – the more people who use fax machines, for instance, the more desirable it becomes to any given individual to get one. From this perspective, a second-order dependency drives the value of Bitcoin such that as the number of existing users increases, as well as the number of investors and amount of Bitcoin infrastructure, the individual utility of Bitcoin also increases:

“A currency's value is derived almost entirely from the size of its network. In order for the dollar to be vulnerable, its network needs to start shrinking. Thus, there needs to be a movement towards accepting only cryptocurrency. Someone has to be first. Might as well be me.” (r/Bitcoin, 10/18/2014)

In its common usages, the concept of network effects has been used mostly to describe technology adoption, not the constitution of a new currency. In principle, it certainly reflects an essential social feedback dynamic that undergirds how money or currency actually operates - the worth of a dollar, after all, is obviously related to the number of others who also value it and thus will be willing to accept it in return for something else²⁴. In practice, however, this and related framings of Bitcoin promote a shift toward viewing Bitcoin more as a new payment technology rather than as an alternative to national currency and leads to more emphasis on the industries and infrastructures that have arisen around Bitcoin as signs of its growing success. This perspective centered on technology adoption also helps to engender the very popular comparison of Bitcoin's current stage of development to being “like the internet in 1994/1995” and discussions on the benefits and risks of being “early adopters” of such technology:

“ Watching the internet grow from nothing (at least in the public space) to the behemoth it is today, and the effect of instant information transfer on newspapers, music, movies, and other traditional medias. Now that same inevitable tide of change will affect the transmission of value.” (r/Bitcoin, 5/15/2014)

“The reason you need innovators and early adopters is that they are the ones who enter before there is a stable and market and thereby creates it. I just don't see the average Joe being the first in his society picking up a new virtual currency. If he did he would in fact be classified as an innovator.

²⁴ For an excellent and much deeper exploration of this key feedback process in social valuation and currency, see (Orléan 2014).

I think we are on the start of the curve until the total value of BTC and use of BTC converge... IF the BTC market will successfully [sic] mature (Big if) ” (r/Bitcoin, 3/19/2013)

While considering adoption and network effects begins to open up a more “social” view of Bitcoin’s valuation, on its own it cannot entirely account for a big, still outstanding question: why would the ordinary people who would constitute such networks want to use Bitcoin in the first place? In between the early adopters that constitute the majority of the membership of these Bitcoin community forums and the hypothetical future wherein there is critical mass of adoption and “everyone” switches to Bitcoin/digital currency because it has become so predominate, a lot of individuals who are not yet invested in or even aware of Bitcoin will have to make a decision to use it. Though many Bitcoin advocates believe that there are inherent advantages to using Bitcoin for most people, the hurdles of path dependency and institutional inertia are real. It is here that conversations shift solidly away from established economic models and into more informal and sociological considerations of why people do or do not adopt something new.

Two of the key concerns expressed in Bitcoin community conversations on why people would or would not move to Bitcoin are those of “accessibility” and “awareness.” Routine invocations of an ideal “Average Joe” or “Common Joe” are often used to speculate on how what aspects of Bitcoin adoption might be prohibitively difficult for “ordinary” people and what might be done to encourage interest in it amongst them. This can be seen, for instance, in debates concerning whether the number of decimal places used to represent Bitcoin value should be changed to a more “user-friendly” format:

“The way it is now is contrary to how people usually deal with both numbers and currencies, and only serve to overcomplicate things. Now before you argue that the numbers all add up, and decimals are just fine, then remember that you are someone who is used to technology, numbers and computer and what not. We want this to be for more than the elite of computer users, right? If we want this to be a currency for John Does too, then we need to make it more appealing and less robotic.” (BitcoinTalk, 2/8/2014)

In terms of other ideas about increasing accessibility, other popular subjects include making Bitcoin wallets easier to acquire and use for individuals who lack tech savviness and encouraging the development of Bitcoin payment processors such as “Bitpay” that allow merchants to be able to more seamlessly and effortlessly receive Bitcoin payments and exchange them to fiat.

On the awareness side, attention often goes toward individuals in the community making efforts to ask businesses they frequent to accept Bitcoin and even talking to their own employers about getting part of their salary paid in Bitcoin. These conversations also focus on coming up with ideas about creative and effective ways to “spread the word” about Bitcoin. One innovative and arguably quite effective project to come from r/Bitcoin in this regard has been the creation of a “changetip” bot for Reddit – an automated script that all Reddit users can activate in the course of their conversations throughout the massive and diverse discussion website in order to “tip” other users small amounts of Bitcoin as a reward for making a good comment or contribution to the discussion. In order to accept such tips, however, users who receive them must have or create a Bitcoin “wallet” to store the tipped Bitcoin. As a result of this process, individuals who want to use or receive from the “changetipbot” get introduced to Bitcoin in a fun and interesting way and have their initial adoption of it facilitated for them.

Beyond the practicalities of adoption, digital currency’s resistance to being explained by purely economic models has also led to deeper conversations that center on, effectively, the conventional or socially constructed nature of money’s value. An interesting contrast that is recurrently brought up in this regard are the recent phenomena of online video game currencies and in-game items becoming worth significant amounts of real world money, with two primary examples of this being the ‘Linden dollars’ used in the game “Second Life” and the ‘gold’ used

in the game ‘World of Warcraft.’ In these cases and others, people’s interest in acquiring the virtual money or objects used as part of the play in these massive, multi-user game worlds has led to independent markets and exchanges springing up that allow users to spend their real world national currencies to acquire them.

The conclusion often drawn from these and related examples is that ultimately, the value of an object comes from people’s perception of it being valuable. Applying this notion to money, it then follows that the real reason any money holds value is because people have come to perceive and treat it as having value and thus, if Bitcoin seems valuable and is treated as such by people, regardless of the reasons for it, it can also serve as money²⁵:

"All value is whatever people say it is, there's some myth of intrinsic value but it's just a symptom of people having weird ideas about money ." (r/Bitcoin, 7/27/2015)

Interestingly, this argument is not only used to explain and justify Bitcoin’s value and potential status as money, but is also frequently turned back in order to challenge not just the status of fiat currency, but of gold and silver as well:

“I do find this point of view [*that Bitcoin’s value comes from computation behind it*] confused and misguided: the Bitcoin protocol is backed by mathematics. The economic value isn't. I don't understand why people can't accept Bitcoin isn't backed by anything other than faith in it. It doesn't matter, all value is the same in the end, even the value of gold.” (BitcoinTalk, 2/28/2014)

Political Perspectives on Digital Currency

As digital currency and Bitcoin continue to encounter the real world challenges of becoming accepted as either money or just as an object that legitimately holds value, it seems likely that the individuals involved will have to continue reaching outside Economic models and into more social perspectives to effectively make sense of what is happening. This emphasis and interest on economic and social dynamics does not come at the preclusion of more politically

²⁵ Again, this set of perspectives along with those focused on adoption share a strong resemblance to the account of money and value offered in (Orléan 2014).

oriented perspectives, however. In point of fact, the deeply politicized origins of Bitcoin continue to be evident throughout the discourses of the Bitcoin community and also inform individuals' accounts of what digital currency represents and how its future is likely to play out. For some sections of the Bitcoin community, the political contexts within which Bitcoin exists is a key part of how they think Bitcoin will ultimately succeed as money.

In terms of its original design priorities, Bitcoin's ability to facilitate private economic transactions outside the reach of government controls makes it an innately political tool to many users. In its most noble light, the ability to use digital currency to anonymously support organizations such as *The Electronic Frontier Foundation*, a group devoted to fight NSA's mass surveillance program, and *Wikileaks*, an organization made famous by Edward Snowden that is devoted to the online publication of documents that reveal corporate and government misconduct, is seen as making Bitcoin an increasingly important and necessary tool in the fight against the malicious encroachment of the State on individual rights:

“...in the present system, with so many people struggling under dictatorships, any lovers of justice should support an anonymous currency that helps them fight back” – (r/Bitcoin, 12/14/2013)

On the less savory side, however, is also the unavoidable acknowledgement that it is this same aspect of digital currency that gives it a significant potential to be used not just for the purchase of drugs and arms, goods that many in the community would argue should not be criminalized, but also to facilitate less redeemable endeavors such as the activities terrorist organizations, online extortion, and the acquisition of child pornography. For the most devoted Anarcho-Capitalists in the community, this dual nature may be deemed as an unavoidable and necessary aspect of any money that is truly free of centralized control, and a critical feature that must be preserved if Bitcoin is to succeed as a currency:

“If you cannot make anonymous purchases of whatever kind with Bitcoin, it is not a currency worth using. It doesn't matter what the privacy use cases are. It matters that there be a robust privacy ability available. There is no better test bed currently than [sic] illicit drug sales. If it can survive there, it can survive anything. Adoption will come when it is a proven, solid, untraceable currency - or at least has that ability should you wish to use it.” (r/Bitcoin, 11/7/2014)

For others, however, these more nefarious uses remain problematic and many members acknowledge that due to either governments' reactions to them or the negative impacts on public perception they have, the association of Bitcoin with such unseemly activities may jeopardize its ultimate ability to succeed

Beyond the possibilities for political action that are inherent in its design, other lines of explanation for Bitcoin's future valuation focus on the wider political context within which digital currencies are situated. Of specific interest here is the potential for Bitcoin to serve as a safe haven for wealth in the event of national currencies becoming destabilized. According to this logic, if/when there is a significant shock or disruption to collective confidence in a given national currency, citizens of that nation who either are holding Bitcoin or able to quickly transfer their savings into it will be able to avoid losing their wealth due to the rapid depreciation of the unstable national currency. Similarly, transferring value into digital currency is also seen as a way of circumventing governments' attempts to prevent financial destabilizations by restricting citizens' access and ability to use or exchange the national currency.

In great part as a result of this model, a large amount of discussion tends to arise in these communities surrounding countries that are currently experiencing moments of economic crises and any concurrent rise in the Bitcoin exchange rate or volume of transactions that may happen meets with speculations that it may in some part have been caused by the destabilization of national currency. This view has also engendered much conversation on the potential ability of Bitcoin to act as alternative for individuals living in countries such as Venezuela that are

characterized by extreme levels of inflation and great instability in the worth of their national currency.

“The same way people in Turkey prefer the Euro or USD to their nations Lira. They trade out of Lira almost immediately. In some countries like Venezuela it is against the law to exchange out of local currency and by the way experienced 51% inflation last year... This means either hold the nations currency, trade it on the black market or find another way out of it. While Bitcoin is volatile, it's still in an upward trajectory which makes it historically a way better bet than holding fiat.” (r/Bitcoin, 1/17/2014)

“ Argentina and Venezuela with some others countries of South America have very unstable economy plagued by huge inflation, volatile national currency, low GDP and restricted laws for citizens who want to invest money abroad. I think people are starting to notice that Bitcoin could be a help to overcome all these problems.” (BitcoinTalk, 7/3/2015)

On the whole, given the extreme pessimism and distrust of central governments and the existing economic system that has characterizes much of the Bitcoin community since its beginnings, the destabilization of national currencies is often seen as less of an “if” and more of a “when.” From these particularly politicized points of view, Bitcoin is not only seen as a potential beneficiary of the inevitable collapse of the existing system, but also a possibly essential element of how the world will manage to survive it.

Investment Agnosticism

In addition to the many economic, social, and political explanations of digital currency and its worth that are found in these forum conversations, there is another, much more committedly agnostic model of Bitcoin that is also prominent throughout these communities' discourses. In this class of views, the questions of what Bitcoin is and where its value stems from are not particularly important. Of much more vital interest are questions concerning what will happen, either in the immediacy or in the long term, to Bitcoin's price and what the best investment strategies might be for maximizing one's return on it. By default, conversations along this theme tend to treat Bitcoin as a high-risk stock or commodity but rarely pursue a strong definition of Bitcoin as such and only delve as deeply into the origins of its value as is needed to

anticipate what might happen next with it. Much as might be the case for many of the individuals who attempt to play the stock market, thorough knowledge of the underlying stock is far less important than the knowledge of how to make a profit off of it.

On one extreme of this investment pragmatism are those who advocate for buying Bitcoin and then holding onto it for the foreseeable future. A frequent source of support for this sort of hoarding comes from the history of Bitcoin's valuation to date and the outcomes of individuals involved in it at various points. In addition to the many notable success stories of individuals who made tens of thousands of USD (and more) from holding onto their earlier acquired Bitcoin, forum conversations are also replete with both personal and second-hand horror stories of selling off one's Bitcoins years too soon or losing hard drives or access keys to wallets that at this point, would contain the Bitcoin equivalent of many thousands to hundreds of thousands in USD. Such stories provide ample fodder for the argument that extreme month-to-month fluctuations in exchange rate have been part of Bitcoin's development since the beginning and that those who end up really "winning" off of it are those who take a long view and hold onto it through such periods of volatility.

This sort of practical investment approach to Bitcoin is not necessarily in-line with the other, grander views of what it is and what it might represent, but it is not always treated as being incompatible with them either. While such hoarding behavior does somewhat go against ideas emphasizing the importance of exchanging Bitcoin for goods and services in order to increase its value, it works well enough with the ideal of digital currency ultimately serving as a deflationary currency and a reliable store of value. Much less congruent with such higher ideals are investment practices at the other end of the spectrum – those centered on pure speculation based on short term price movements.

Given the purely instrumental and short-term orientation that drives this type of speculation, those participating in Bitcoin for such reasons are likely to have little reason to participate in the communities, online or otherwise, that surround Bitcoin and digital currency. As a result of this fact, conversations that reflect models of Bitcoin that accompany such speculative practices are likely to be underrepresented in community discourses. Such speculation-based views of what Bitcoin is and what its value means may very well predominate amongst Bitcoin owners even if it is not particularly prevalent among Bitcoin community members. Given both their lack of explicit involvement in these communities or other means of identifying them, however, it is not possible to know at this time²⁶.

However, the lack of involvement of this sort of speculator in the Bitcoin community has not precluded a large number of conversations about them:

“Yeah, as a newb [new Bitcoin adopter] all you care is making some money off BTC, but if you go a bit deeper you'll see Bitcon is interesting because it has an endpoint production so assuming the human race continues to be productive the currency should increase in value if it is pegged to the sum total of goods and services. Too bad most newbs will sell way too soon as soon as they get some BTC in exchange of some beermoney.” (BitcoinTalk, 6/12/2015)

While overly crass expressions of such a speculative mindset can be met with censure from other community members and there is no shortage of antipathy articulated by those who, per a standard economics perspectives, view such activities as preventing the market from settling on the “true” value of Bitcoin, there are many members who have also forwarded lines of reasoning that argue that such speculation practices and the bubbles they produce may not be entirely bad for Bitcoin in the long run.

²⁶ One popular theory for why Bitcoin reached its all time high to date of an exchange rate of \$1,124.76 = 1 BTC, for instances, involves the sudden influx of a massive number of such speculators from China. Far from being financial insiders or investment professionals, this particular group is expected to be composed primarily of ordinary individuals who wanted to make a quick buck, knew little about Bitcoin and its history, and were simply hopping on the bandwagon of a passing investment fad. The sheer number of them is proposed to have been large enough to drive up the exchange rate by hundreds of dollars in just a few weeks (Popper 2015a).

In terms of price history, some note that often after steep, unsustainable increases and accompanying crashes in the Bitcoin price, the overall level of the Bitcoin price ends up holding at a higher level than it was at before the bubble. Getting at a deeper level, some have also forwarded the notion that such speculative runs and the dramatic highs and falls they produces are a key part of generating awareness of the existence of Bitcoin in more mainstream audiences and thus potentially plays an important role in increasing more widespread adoption of it:

“I don't understand why people keep trying to draw a line in the sand between currency and speculation, do you just love conflict? Speculators are only helping to increase the adoption rate of bitcoin. This is a necessary phase of bitcoin adoption as a currency, once the volatility stabilizes in the years to come, because most everyone knows about it and has made their decision on buying in or staying out, it will be in a perfect position to act as a currency.” (r/Bitcoin, 11/9/2013)

Seen from this point of view, speculators become unintentional and unwitting participants in the rise and future success of Bitcoin. While in the short term they may be sources of risk and volatility in digital currency, some see in them the possibility of providing a necessary stepping stone for getting to a point where adoption is sufficiently widespread that the price of Bitcoin can stabilize and it will be able to fulfill its ultimate goal of acting as a stable, currency alternative for the world.

3.4 *Conclusion*

Digital currency generally, and Bitcoin in particular, is still at a very nascent stage. Its novelty and lack of precedence entails a huge amount of true uncertainty surrounding its eventual outcome. At present, billions of USD are currently wrapped up in it, not just in terms of its present market capitalization, but also in the hundreds of millions of venture capital that has been funneled into the companies and emergent subindustries that make up the so-called “Bitcoin ecosystem.” Whether Bitcoin will ultimately achieve the status of a real currency, fail as money but survive on as an innovative, new technology, or come to be regarded as one of the biggest

and most expensive follies of the early Information Age cannot really be discerned at this point in time. What can be known, however, is that the extent to which it already has established itself as some sort of monetary object has ushered in many new, contemporary reconsiderations of our existing understandings of the nature of value and money.

While the focus of this work has been on extracting and singling out some of the overarching themes that characterize the discourses of communities surrounding digital currency, it is important to remember that in practice, individuals are free to apply, reject, and interweave these concepts as they wish, as can be seen in the following long explanation of the nature of value and its implications for Bitcoin:

“I feel there is a lot of confusion over the concept of value. People argue Bitcoin cannot have value because it does not have intrinsic value. The reason this is not true is because value comes from people, the only thing in the economy of value is people’s time and energy, from the goods and services are produced but before that can be its the time and energy of people thats required. Therefore it is this that backs Bitcoin and every other currency.

Anyone that accepts bitcoin as payment is adding to its value as you can now exchange bitcoins for that person/persons goods and services which are the thing of value, it really is that simple. ', This is the same reason USD or GBP works, it also is mere digits created from nothing, but people are forced to accept it as payment (the fiat, the decree (legal tender law) therefore it has value, the moment they lose faith in it and stop accepting it as payment it will begin to lose its value.

People are not forced to use Bitcoin as payment because it is not a fiat currency (there is no law demanding you use it). However people are accepting it regardless out of choice, democratically and thus it gains value each time someone accepts it as payment.

The major reason the dollar, euro or pound is losing value is due to the printing of huge amounts diluting its value making people lose faith, the confiscation of funds from peoples banks accounts that have happened and are about to happen in the coming bail ins will also hugely erode faith. Therefore faith in a currency and thus its value will be based on what attributes that currency has to act well as a currency such as (highly divisible, rare, secure, easily transacted, free from counterfeit and manipulation. <--- these are the real things a medium of exchange needs to be of value, for it has intrinsic value in that peoples goods and services are intrinsically valuable.

So the currency itself is not the thing of value it is the tool which is allowing the exchange of the thing of value. Even for gold this is true, in and of itself it has little value to the majority of people, it is only in being able to exchange your gold for the goods and services (the things you actually need) within the economy that it derives its symbolic value. So it is true that Bitcoin like the Dollar has no direct intrinsic value, but it becomes the symbol for that intrinsic value which is held within the people where the value always belongs” (r/Bitcoin, 12/6/2013)

The presence of a wide diversity of models of money and value expressed in this statement - from the origins of value in goods and services, to the political aspects of money, to assertions of the inherent qualities of money, and the issue of people's faith and treatment of it as a valid symbol – is reflective of how individuals pull on existing repertoires and apply any number of “talks” to creatively organize their thoughts and actions with regard to novel situations. As has been shown here, this sort of strategic conceptual work should not be seen as being limited to more classically “social” arenas of life but also economic arenas as well.

Perhaps even more important than the simultaneous presence of so many concepts in individuals' discourses are the ways in which they are also drawing new types of connections between them. In the drive to form a personal model can successfully account for an object that does not readily fit any existing definitions, we see not just individual attempts to make sense of the world but also, possible new ways of synthesizing existing understandings into more complete models of the world. The quality of these sorts of “conceptual blends” (Turner and Fauconnier 2002) are not all equal. At the end, the vast majority are likely to fail for any number of reasons. The ones that do succeed and can offer more satisfactory and reliable ways of making sense of new things as they arise, however, have the definite potential to at some impact our most established notions of the world. Whether the conversations surrounding digital currency and Bitcoin will ultimately have this type of impact on our understanding of money and value cannot be foretold any better than the ultimate fate of digital currency can be. What can be said with more confidence, however, is that its evolution so far has already given the world sufficient reason to start reevaluating some of the most thoroughly taken-for-granted concepts in contemporary life.

Chapter 4

What is Bitcoin? Adoption, Co-option, and the Robust Object of Digital Currency

In less than a decade, Bitcoin has gone from being the obscure monetary experiment of a small group of “techno-Libertarians” to becoming the basis of a new multi-billion dollar financial technology industry – an industry dominated by the very same institutions and actors the digital currency was initially intended to subvert. Alongside this rise, the persistent question of what Bitcoin actually is has accompanied it. The goal of this work will be to demonstrate how this definitional ambiguity has enabled Bitcoin’s success while also simultaneously laying the groundwork for its co-option by the powerful actors it was originally meant to challenge. Using an array of evidence and analytical approaches, including the documented history of Bitcoin’s evolution, the application of automated content analysis and topic modeling methods to thousands of news reporting articles that have appeared on it, and consideration of trends in quantitative metrics reflecting Bitcoin related searches, venture capital funding, and price and market activity, this work will show how Bitcoin’s multivalent identity initially facilitated its adoption by a multiplicity of groups, but also, ultimately left it vulnerable to being preferentially defined in ways that best benefitted powerful actors in the existing structure. By charting the rise of Bitcoin and linking it to the collective definitional processes that have surrounded it, this work will seek to not only contribute to existing literatures on social constructions of money and value, but also, point the way to developing a broader understanding of the social dynamics that surround such “robust objects” and the role they play in enabling the reproduction of existing power structures in new fields and arenas of social life.

Embedded in the comments of the code that generated the very first Bitcoin, the unknown creator of cryptocurrency²⁷ inserted a headline from the previous day’s news: “The Times 03/Jan/2009 Chancellor on brink of second bailout for banks.” Though much remains unknown about Satoshi Nakamoto, the pseudonymously named creator of Bitcoin, it is clear from their writings and participation in politically radical online communities that the inclusion of this headline was meant to reflect the founding vision of Bitcoin as a new type of money that could be used to challenge existing economic and political structures. It is thus no small irony that a

²⁷ Cryptocurrency refers to the form of cryptographically based, digital currency of which Bitcoin is the original example.

little over seven years after this first coin was generated, former U.S. Secretary of the Treasury, Larry Summers, would give the most prominent talk of the 2016 “Consensus” meeting, the Bitcoin community’s largest and most important annual conference. Speaking to a sold-out crowd that contained representatives connected to such major finance and banking firms as J.P. Morgan, Citigroup, and Goldman Sachs, Summers would not talk about Bitcoin’s ability to incite a political and economic revolution, but instead, about how the “blockchain technology” that Bitcoin was based upon could be used to advance how the finance and banking industry does its current business (Rizzo 2016). How did this happen?

The purpose of this present work is to address this question in a manner that sheds light more generally on how the processes that initially facilitate widespread adoption of disruptive ideas, practices, or objects can also leave them open to cooption by the powerful actors they were initially intended to subvert. Toward this end, this paper will engage with sociological work in the social construction of value (Boltanski and Thevenot 2006; Lamont 2012; Zuckerman 2012), categorization in economic and market settings (Zuckerman 1999; Zuckerman et al. 2003), and robust action (Padgett and Ansell 1993) to show how different groups’ responses to the question of “What is Bitcoin?” has both driven its initial success and ultimately, left it vulnerable to being taken over by the same actors it was initially intended to subvert. The first part of this analysis will use a combination of historical data and quantitative metrics to focus on how the “robust object” of Bitcoin facilitated an interplay of attention, definition, and adoption among different groups that led to the establishment of the “Bitcoin ecosystem” which exists today. The second part will then use data on venture capital funding and automated content analysis of Bitcoin reporting to explore how this same robust identity has resulted in a situation where powerful actors have been able to coopt for their own purposes this object that was originally meant to

undermine them. It then concludes by considering how the example of Bitcoin speaks more generally to the processes via which early successes of disruptive collective endeavors get redirected toward the reproduction and reinforcement of existing power structures.

4.1 *The Robust Object of Bitcoin*

At each point Bitcoin has come to the awareness of a new sector of society, the question of “What is Bitcoin?” has come accompanied it. On a technical level, the definition of Bitcoin, as well as the other cryptocurrencies that have followed from it²⁸, is unambiguous if not necessarily straightforward for most laymen. A simplified version of this technical definition can begin by first describing the so-called “blockchain” that underlies all of Bitcoin exchanges. The blockchain can be thought of as a massive ledger of all the transactions that have ever occurred using Bitcoin. For every single time a Bitcoin has been sent or received in the history of the currency, there exists a corresponding entry for it on the blockchain. In order to protect the privacy of individuals using Bitcoin, the ledger does not contain any names, only the public addresses of individuals’ “wallets.” In order to send Bitcoin from a wallet or receive it, individuals use a “private key” that only they possess²⁹ to generate a signature for the transaction using a cryptographic process that to date, cannot be circumvented or faked.

Cryptographic wallets and electronic ledgers are critical elements of Bitcoin’s design, but the truly innovative and potentially revolutionary aspect of Bitcoin comes with how the ledger is maintained. Of primary importance to Nakamoto was the development of a so-called “trustless”

²⁸ Since the inception of Bitcoin, hundreds of other cryptocurrencies have arisen based on the initial open-source code used for Bitcoin. At the current time, the total market capitalization of all cryptocurrencies is in the range of \$8 billion (USD), with about \$7 billion of that being in Bitcoin and the rest being in other “alt-coins.”

²⁹ This key is not maintained anywhere on the network and can never be recovered if totally lost by the wallet owner. This in combination with the current inability to break into wallets has led to a number of stories of early Bitcoin adopters who lost their keys when Bitcoin was worth very little and who today, would have tens of thousands of dollars (USD) in Bitcoin if only they could still access it.

system, that is, a system of economic transactions that did not rely upon a trusted third party to maintain it (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 this peer-to-peer network, there is a copy of the confirmed ledger to date. In order 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” protocol to officially record and order the transactions that 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 and then added by everyone to their current copies of the blockchain. In such a way, the decentralized network is able to achieve a consensus on the official record of Bitcoin transactions without having to rely on any centralized, third parties such as a bank or government.

The above speaks to the technical definition of Bitcoin, but it does little to define what this novel object means in social and economic life: Is it money? A payment system or a commodity? The future of payments, a speculative investment, or a fly by night scam? Is it legal or illegal? Is it a disruptive new technology or a much overhyped fad? A serious challenge to central governments and existing financial institutions or the pet project of a group of fringe actors that has received an unwarranted amount of attention and investment? Depending on where people have been socially situated, the answers to these questions has varied widely. With those various answers, there have followed very different and sometimes quite contradictory understandings of other issues such as where Bitcoin’s value comes from, what its valuation and

usage is likely to be in the near future, what the most important priorities of the project should be at a given time, and what the overall, long-term viability of the endeavor itself is. Even after seven years, conclusions on the fate of Bitcoin continue to run the gamut from “doomed” (Strauss 2016), to achieving an exchange rate of \$2000 USD = 1 BTC within the year (Lingham 2016), to revolutionizing traditional financial and economic systems (Vigna and Casey 2016), to failing as a currency or payment system but succeeding as technology that will completely change how the financial world handles transactions, contracts, and stocks (Satell 2016).

If we were to think in terms of established markets or fields, we might expect that the high ambiguity surrounding what Bitcoin is and the consequent high degree of uncertainty surrounding its nature and future would greatly impede adoption and investment in this new object. We know from a vibrant and diverse body of work that has been done on the social construction of value and evaluation (Boltanski and Thevenot 2006; Lamont 2012; Zuckerman 2012), that the ability of individuals to evaluate and assign value to objects depends significantly upon their ability to make sense of that object in terms of the existing categories. Without that categorization, it is difficult to establish evaluation criteria and thus, valuation has trouble proceeding. More specifically, we might anticipate that the marked difficulty involved in categorizing Bitcoin would cause it to inevitably run into the so-called “illegitimacy discount” (Zuckerman 1999) in the marketplace, the effect wherein objects that are hard to place within pre-existing categories tend to be undervalued, potentially to the point where they might become entirely unviable. While it is undoubtable that so far, the failure to meet this “categorical imperative” (Zuckerman 1999) has most certainly dampened the willingness of many mainstream consumers to exchange their government backed currency for what has been derisively referred to as “magical internet money,” there is an argument to be made that this

multivalent identity has been of pivotal importance to the initial phases of Bitcoin's spread and its ability to constitute a truly new field of economic activity and investment.

If Bitcoin had been strictly limited to being the sort of ideologically charged, crypto-anarchic³⁰ object that it was initially conceived of being, the potential audience for its adoption would, for all of its fervor, likely have remained quite small. In order to achieve its original goal of becoming an alternative to state issued currencies, Bitcoin necessarily would have to find ways to appeal to a user base that went far beyond the political and tech fringe groups from which it originated. As will be explored more deeply in subsequent sections, it is in this arena that the multivalent and ambiguous nature of digital currency became a fundamental asset. In a way that resonates notably with prior work that has been done on the concept of "robust action" (Padgett and Ansell 1993), the proponents of digital currency have been able to use the ambiguity surrounding this new monetary technology to turn Bitcoin, and digital currencies more generally, into a "robust object" that could elicit buy-in from far sectors of society than its original definition ever could.

Much as the Medici family was thought to have pursued actions that allowed different audiences and networks to generate different interpretations of those actions (Padgett and Ansell 1993), robust objects can be identified by the manner in which those promoting them allow and even encourage different groups of potential adopters to read-in their own definitions of it. New technologies and products, for instance, may benefit early on from an ability to be of use to different types of consumers for different reasons. We can also think of the advantages that "big tent" social or political movements might have early on in building a base of participants via a

³⁰ Crypto-anarchy or "cypherpunk" refers to a set of political views and practices aimed at preserving individual privacy and freedom from government surveillance and interference via the use of encryption methods to protect communications and transactions between individuals.

multi-issue platform that appeals to the interests of different groups for different reasons. Even artists might find that by developing their work, and even their self-presentation, in ways that make it interesting to a number of different parts of society, they can move beyond the original context in which they developed and into a much greater level of fame.

The major payoff a multivalent identity is the manner in which it allows a large diversity of actors to find their own reasons for buying in. Especially in the case of novel objects whose initial success depends on establishing large adoption bases, the breadth of potential appeal that comes from them being *difficult to categorize* can be a critical part of how they ultimately become established. Furthermore, as will be seen in the case of digital currency, such diversity in definition and understanding can also provide a fertile ground for the constitution of new, rich organizational fields (DiMaggio and Powell 1983) as individuals with different understandings of such robust objects become seriously engaged in trying to build upon and further their own visions of what the object could be.

Acknowledging that there might be potential benefits to definitional ambiguity in early periods of adoption, however, does not eliminate the well-known problems that come with ambiguity. In particular, it is important to think about this process dynamically and inquire into what happens after the initial process of adoption and buy-in succeeds and the market or fields surrounding the object start to mature. In the beginning, a diversity of visions might be a great way to “explore”(March 1991) the space of potential ways an object might be developed into more powerful or successful versions of itself. As time goes on, however, finite resources and energy, the realities of needing to coordinate action across an increasingly large and diverse group of adopters, and the demands that arise from having to interface with existing structures, all combine into a set of mounting pressures to commit to a direction and definition for the object

and abandon the rest of its other potentials (i.e. to move from an exploration of what the object might be into an “exploitation” (March 1991) of one particular version of it).

It is at this phase that such objects become especially vulnerable to cooption. The very same multiplicity of definitions that may have initially facilitated early success in adoption can ultimately set the stage for making this decision point on what particular versions of it will be supported, and which will be abandoned, an arena of high contestation. Though the progenitors and earliest adopters of such an object might have begun with a strong idea of how it should evolve, the robustness that was required to get it off the ground leaves it vulnerable to a proliferation of many alternative ideas about it. In the most neutral situations, such developments might be useful in helping the original vision evolve into something that a more powerful or realistic version of itself through a sort of selection process within which the best conceptions of the object win out on the basis of their greater merit. If there are notable power differentials present at this juncture, however, then this choice of which version will continue becomes a lot more complex.

Most specifically, we can think about what happens in cases when the originators of such novel objects come from outsider or disadvantaged positions within the larger society³¹. In these cases, achieving buy-in or adoption from well-positioned, powerful actors in existing structures might initially represent a major success. Specifically, achieving this level can be profoundly legitimating for a new object in the eyes of mainstream audiences and also bring with it an unprecedented level of resources getting directed into its continued development. Significant issues are likely to arise, however, if this adoption by powerful actors is predicated on a

³¹ Given what we know about the greater potential risks and costs for innovation that face well-established firms and organizations, it may very well be that we should expect a disproportionate number of these sorts of novel, robust objects to arise from those operating in such outsider or disadvantaged positions in society.

definition of the object that does not align with the ones it was founded upon. Though they might be “late to the game” in terms of adoption, the combination of their alternative vision of the object and the much greater degree of clout they possess entails that they will have a significant advantage in pushing their ideas about it when the time comes to make decisions about its future. Using any number of potential tools - from preferentially channeling resources toward the lines of development they prefer, to using social capital to influence existing structures, to incentivizing opponents to switch to supporting their version of what an object should become - such powerful actors come well equipped to coopt objects arising from even the most radical of origins.

This notion of a “robust object” and the dynamics of adoption and co-option it relates to will be key to understanding the unusual and surprising trajectory of digital currency in the seven years since its inception. The first of the proceeding sections will consider the relationship between attention, definition, and adoption in the rise of Bitcoin and will unpack the primary facets of its multivalent identity the have developed to date. Of specific note will be how its definitional robustness has facilitated the investment of money, time, and skill from different groups through the course of its development and how these various forms and periods of buy-in have led to the constitution of the so-called “Bitcoin ecosystem.” The second section will then move on to consider how this adoption dynamic has laid the groundwork for a major cooption of the Bitcoin project by the very actors it was initially meant to oppose. Specifically, it will focus on how the increased interest and investment from major players in the finance and tech industries has led to a collective shift toward redefining Bitcoin in a way that cleaves the politically contentious and challenging, currency aspect of it away from the “blockchain technology” upon which it was built. By considering how venture capital funding and the

language surrounding Bitcoin has shifted in the past year, as well as how recent crises in determining the future of Bitcoin's development have played out, it will become clear how this seemingly ironic turn in Bitcoin's trajectory occurred.

4.2 *Attention, Adoption, and the Many Faces of Bitcoin*

Throughout the course of its development, there has been a persistent coupling of the collective attention being paid to Bitcoin at a given time, its usage, and its valuation. It is difficult to disentangle which factor precedes which in this dynamic, but many have speculated that attention, adoption, and valuation constitute a complex feedback loop that has been an important driver in Bitcoin market dynamics. As illustrated in Figure 13, since its inception, the valuation of Bitcoin (as indicated by market price), network usage (as indicated by Bitcoin Days Destroyed³²) and collective attention (as indicated by the relative volume Google searches related to the topic of "Bitcoin")³³ have displayed tendencies toward moving with one another.

³² BTC Days Destroyed (BDD) is a measure of market volume that weights transactions by how long it has been since the bitcoin involved has moved. For instance, sending 2 Bitcoin that have not been moved for the past 100 days would result in 2 BTC x 100 days = 200 BDD, whereas sending 2 Bitcoin that have not been moved in 10 days would result in 2 BTC x 10 days = 20 BDD. This measure was developed in an attempt to capture market activity while controlling for "noise" that arises in raw transaction counts from Bitcoins being moved between individuals' multiple wallets and individuals' receiving "change" in transactions.

³³ Historical price and volume data made available Blockchain Info (<https://blockchain.info/>). Google search data made available via Google Trends (<https://www.google.com/trends/>).

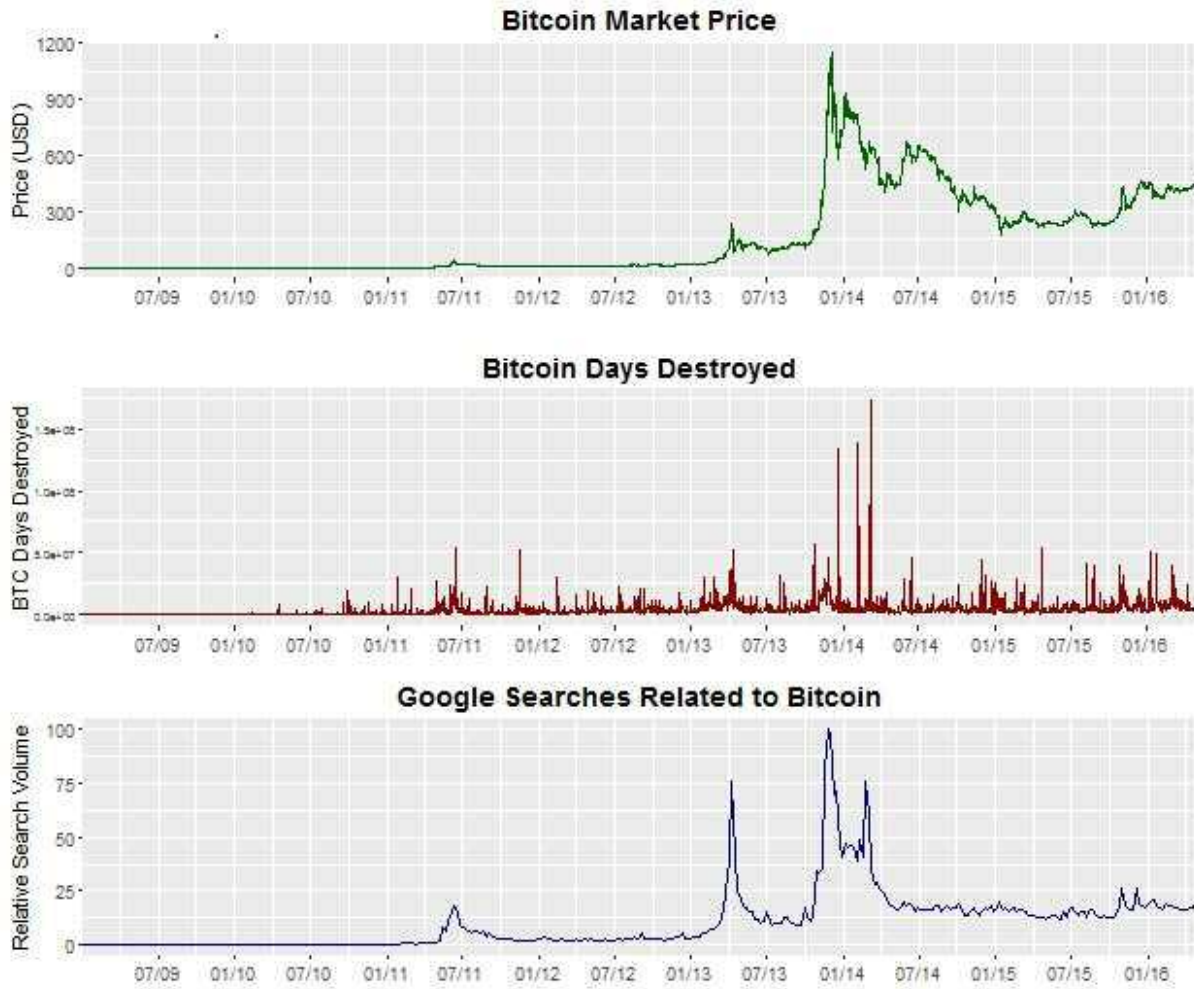


Figure 13: Trend comparison for Bitcoin exchange rate, market volume, and searches

This is relationship between Google search interest and both volume of activity and valuation of Bitcoin is also further corroborated through the results of a set of dynamic linear regression models shown in Table 3:

	Market Activity (BDD)			Δ Price (Price _t - Price _{t-1}) ^a		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Google Search Volume	239666***	294423***	325811***	0.50**	2.05***	1.77***
Google Search Volume [-1 week lag]	--	-59149	-470546***	--	-1.53***	-3.78
Google Search Volume [-2 week lag]	--	--	411217***	--	--	-1.202**
Volume (BDD)	--	--	--	-1.20E-06***	-1.24E-06***	-1.01E-06***

a: The first differences of price have been used in order to address non-stationarity in the market price variable
b: End of week prices and volume are used in this model in order to align these variables with weekly Google Trend data
c: * $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$

Table 3: Regression results for Bitcoin market activity and price

These results indicate that over the past seven years, Google Search volume has been significantly related to both the volume of activity in Bitcoin markets as well as movements in the market price of Bitcoin, even after controlling for its effects on market activity. As shown in Model 1 and 4, increases in Google searches are associated with increases in end of week market activity levels and an increase in the end of week's price from the preceding week. Interesting in both cases is also the nature with which the direction of this relationship changes through time. As indicated by the coefficients of the one- and two- week lagged variables for Google Searches in Model 5 and 6, increases in the prior week's search interest has a positive impact in market price, but for Google Searches two weeks prior, this relationship switches and becomes associated with downward changes in price. This is a relationship that seems indicative of Bitcoin's valuation being strongly coupled to a dynamic wherein it receives sudden waves of collective attention that lead to short, unsustainable bursts of demand. As this demand falls off over the course of the next few weeks, however, the price then falls with it. Such a dynamic

would also potentially explain Google Searches' complicated relationship to market activity shown in Model 3. Specifically, these results could conceivably be reflecting a collective pattern in which many individuals simultaneously move to buy Bitcoin, hold on to it for a short period of time in the hopes of it appreciating, and then when it falls to do so, then move to sell it off.

Whatever the case, it is clear from these results that collective attention has mattered a great deal for the evolution of Bitcoin. Beneath these quantitative measures, there is also a deeper realization that each new wave of attention and search that Bitcoin has received has entailed the arrival of a new set of individuals and groups asking the question of "what is Bitcoin?" Via these moments, there has arisen continuous opportunities to define and redefine the meaning of Bitcoin to different sets of audiences. Much of this definitional process has been carried out through organizations and groups explicitly allying themselves with the Bitcoin movement, such as any number of Bitcoin centered online news sources (i.e. Coin Desk³⁴, Bitcoin Magazine³⁵), the many Bitcoin educational sites that have been created since its advent (i.e. Bitcoin.org³⁶, Bitcoin Wiki³⁷, History of Bitcoin³⁸), and a handful organizations that have become de facto focal points of this massive, inherently decentralized enterprise (The Bitcoin Foundation³⁹, and Blockchain⁴⁰). A good deal of definition has occurred from the outside as well, however, in reporting and commentary by tech, finance, and mainstream news sources and from legal entities seeking to define and regulate digital currency from the city all the way to the country level.

³⁴ www.coindesk.com

³⁵ <https://bitcoinmagazine.com/>

³⁶ <https://bitcoin.org/>

³⁷ <https://en.bitcoin.it/>

³⁸ <http://historyofbitcoin.org/>

³⁹ <https://bitcoinfoundation.org/>

⁴⁰ <https://www.blockchain.com/>

This definitional activity has also occurred in a bottom-up fashion via individuals' participation in the online communities that have been at the heart of the Bitcoin endeavor since its inception (e.g. Reddit's r/bitcoin community⁴¹, the forums on Bitcoin Talk⁴²). Especially during the early periods of Bitcoin's development, these arenas of definitional activity were arguably of key importance as they often were the first settings in which new interpretations of Bitcoin were brought into explicit articulation and reworked. In many instances it was also those individuals who took part in these communities who were initially responsible for bringing Bitcoin over into new arenas of adoption. These "brokers" (Stovel and Shaw 2012) between different groups have periodically played a significant role in digital currency's ascent not only because they have served as channels for diffusing this new innovation but also, because they often were responsible for generating new definitions and perceptions of Bitcoin that facilitated the adoption of it by members of that outside group.

Through this process of attention, definition, and adoption, Bitcoin has become many things to many different people. While a complete catalogue of these interpretations is not beyond the scope of this work, it is possible to highlight some of the most important and notable ways that Bitcoin has been understood to date. The following subsections consider some of the most prominent answers that have emerged to the question of "What is Bitcoin?" and explore some of the history behind those interpretations and the role that they have played in the spreading adoption of cryptocurrency.

⁴¹ <https://www.reddit.com/r/bitcoin>

⁴² <https://bitcointalk.org/>

Bitcoin as a Political Movement

Bitcoin originally emerged out of what has been called a contemporary, “monetary utopian” (Dodd 2014) project led by a group of so-called “Cypherpunks” that sought to create a new type of money that would check the power of central banks and governments and work to promote individual freedom in the digital age (Prisco n.d.). Cypherpunk as a movement began in the early 1990s and was primarily focused on preserving individual freedom through finding ways to protect personal privacy and the ability to engage in anonymous transactions (Hughes 1993). Composed in great part by so-called “techno-libertarians,” the early cypherpunks prioritized the use of coding and cryptography to push back against government and corporate intrusions into privacy and made the development of a form of electronic cash, money that could be spent anonymously like cash but be sent and received electronically, a priority. The often cited conceptual predecessors of Bitcoin such as the crypto-anarchist “b-money” proposed by Dai (Dai 1998), the proposal for trustless “bit-gold” from Szabo (Szabo 2008), or the anonymous “Hashcash” of Back (Back 2002) were generated by known members of this movement and often first distributed to the mailing lists and personal blogs that served as community touchstones for these groups. Given this context, it is unsurprising that the first public dissemination of the original Bitcoin white paper (Nakamoto n.d.) occurred on one of these mailing lists.

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 (Maurer et al. 2013) refer to as a “digital metallism” that resonates significantly with the beliefs and views of fiscal conservatives who have advocated a

return to the gold standard and are strong proponents of the Austrian school of economics. This resonance along with the anger many in this group felt in the wake of the Great Recession toward the Federal Reserve and the governments' bailing out of big banks, created an early entrée for Bitcoin into circles that extend beyond the original, highly specialized cypherpunk community in which it began. In addition to expanding its potential base of early adoption, this politically charged quality of Bitcoin was also responsible for motivating many key 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 2015a) for an in-depth account of this period).

Without the ability of Bitcoin to speak to certain groups on this ideological level, it seems unlikely that it could have achieved the early buy-in of a core of devoted individuals that was required to get it off the ground. Though this political face of Bitcoin was more critical to its beginnings than it is currently, its influence has persisted throughout its evolution and into the present. Though the mainstream conversations on cryptocurrencies may not center on its more politically charged aspects, much of the conversation in the online communities surrounding Bitcoin continue to be characterized by discourses on money and value that are associated with digital metallism and continue to express a persistent mistrust of central institutions and regulations (Shaw n.d.). Some of the first major uses of Bitcoin also reflect this political orientation, such as its being used to circumvent federal restrictions on donations to WikiLeaks (Matonis 2012) and the early promotion and acceptance 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 cryptocurrencies also continues to be touted by some as an avenue of recourse for individuals during national currency

crises such as those that have occurred in recent years in Cyprus (Farrell 2013), Greece (Darwish 2015), and India (Wells 2013). Even more emblematically, there has even been a Bitcoin inspired digital currency called “Merits” that has been declared the national currency of the self-proclaimed, Libertarian micronation of Liberland (Lewis-Kraus 2015).

Bitcoin as an Open Source Community Project

The political aspects of Bitcoin were essential to its creation and without them, it is arguable that there would not have been a sufficient level of initial interest in it have moved it far beyond being a novel idea. It is also clear, however, that if the only way of viewing Bitcoin was through this politicized lens, its base of potential adopters would have likely remained quite small. It is perhaps very important then that early in its history, another, less politically divisive facet of Bitcoin’s identity developed - that of a technically interesting and innovative, open source software project. Open source constitutes a movement in its own right, one that is grounded in a philosophy that centers on making software source code freely available for individuals to see, modify, and redistribute. At its heart, at least in theory, is a communitarian ethos that 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, often for little or no compensation beyond the innate benefits they receive from working on it.

Due to the overlap of cryptographic and techno-libertarian communities with open source groups, it is unsurprising that Bitcoin was able to spread into this general arena. A little more than a week after the original white paper was released to the cryptography mailing list, Nakamoto registered the Bitcoin project to the open source software development and

collaboration website, SourceForge⁴³. Within the year, the first Bitcoin Internet Relay Chat (IRC) channel, #bitcoin-dev⁴⁴, was created for bitcoin development discussion on Freenode, a site devoted to supporting open source peer-directed project communities. Through this online community, Bitcoin came to the awareness of larger community of individuals, many of whom did not necessarily share the vehement political beliefs of its originators but who were nonetheless, compelled to participate and contribute to Bitcoin in the context of it being a technologically and conceptually innovative community project. 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 BTC⁴⁵, but also for being the first to develop a much more computationally powerful way of mining Bitcoins using the Graphics Processing Unit (GPU), a practice that has become standard for Bitcoin miners today (Popper 2015a).

The most notable early wave of adoption by the open source software community came about as a result of some important pieces of coverage of Bitcoin received from tech insider news websites. In May 2010, an InfoWorld article (McAllister 2010) began bringing new attention to the emergent cryptocurrency, including to that of one of the main figures in Bitcoin's subsequent rise and eventual head of The Bitcoin Foundation, Gavin Anderson. Though Anderson claims to be of a political orientation that aligned well enough with the foundational principles behind Bitcoin's development, he describes himself as primarily having gotten involved in it due to his strong interest in the "nuts and bolts" of Nakamoto's "elegant" design (Popper 2015a). The most massive influx of attention from the larger programmer community,

⁴³ <https://sourceforge.net/projects/bitcoin/>

⁴⁴ <http://irc.lc/freenode/bitcoin-dev/>

⁴⁵ This an amount that at recent exchange rates would be worth over \$4 million USD.

however, came immediately after a small mention of Bitcoin's most recent version release reached the front page of the popular tech website, Slashdot⁴⁶. The subsequent wave of new programmers downloading the mining software and inundating the online Bitcoin communities was sufficient to briefly overload the Bitcoin network. The valuation of Bitcoin also increased by a factor of 10 shortly thereafter.

Not all of the individuals who joined Bitcoin at this phase necessarily stuck with it to the present. In point of fact, the story of the programmer who toyed around with mining Bitcoins during this era but who lost interest and moved on to other projects only to realize that now, they would be able to exchange those Bitcoins for many thousands of USD if they had not lost the keys required to access their wallets, has become a bit of a cliché. Nonetheless, this period of expansion was sufficient to not only keep Bitcoin going, but also to expand it in nontrivial ways. In particular, this phase allowed it to gain sufficient size and familiarity to come to the attention of other individuals and players in different software communities such as those involved in the development and advancement of Peer to Peer (P2P) platforms⁴⁷, electronic payment systems, and ultimately, to the heavy hitting tech crowds of Silicon Valley.

One of the key tenants of open source projects and organizations is the notion of open membership. It entails that anyone may contribute to these collaborative endeavors without the need to adhere to or claim a particular set of beliefs, political or otherwise. Consequently, this open source community facet of Bitcoin was an essential element in moving the project beyond the politically oriented groups in which it began, and it is a feature of Bitcoin that persists to this day. Currently, the core Bitcoin project is now housed on the programming collaboration

⁴⁶ <https://news.slashdot.org/story/10/07/11/1747245/bitcoin-releases-version-03>

⁴⁷ Some well-known examples of P2P platforms include Pirate Bay and Napster.

website, GitHub⁴⁸, and boasts a history of having over 10,000 “commits” of code modifications and refinements by individuals participating in the project. Beyond the main project, the original open source code for Bitcoin has also been used to develop hundreds of other cryptocurrencies (so-called “Alt-coins”) that taken on their own, are estimated to have a market capitalization over \$1 billion USD⁴⁹. In spite of these persistent characteristics, however, some have argued that the ability of the Bitcoin to continue meeting the ideals of open source collaboration faces many threats. Notable among the concerns has been huge amount of recent controversy over the appropriate role of a handful of key developers in determining the future of the cryptocurrency (Feder 2016) and the “arms race” that has occurred in Bitcoin mining computing power as the value of the currency has continued to increase and thus the mining of it has become more profitable (Vance and Stone 2014). These and other factors have combined to raise the barrier of entry for individuals wanting to play central roles in the Bitcoin project today to a level far above what the computer hobbyists who joined in just a few years ago faced.

Bitcoin as Criminal Currency

Both in terms of its Cypherpunk origins and its growth via open source collaboration, initial adoption and investment in Bitcoin might be considered to have been driven in great part by what could be characterized as a sort of value rational action (Weber 1978). This class of motivations for buying into the project is very beneficial to the early stages of such a collective endeavor when large amounts of time and resources are often required to get it off the ground and the immediate pay-offs to participants are quite low. The draw back to such a motivating force, however, is that it only exists for those who have already aligned themselves with the relevant value systems. While this might be sufficient for certain concentrated endeavors,

⁴⁸ <https://github.com/bitcoin/bitcoin>

⁴⁹ <https://coinmarketcap.com/>

projects that depend on widespread adoption need to have a basis of appeal that does not depend on the values of a relatively small part of the population. It is in this regard that the translation of Bitcoin into a sort of “criminal currency” marks a significant moment in its evolution.

The appeal of using Bitcoin, or cryptocurrencies more generally, in illicit activities is entirely utilitarian in nature: it has a high degree of transactional anonymity and the regulations around its use and exchange remain for more ambiguous than for established currencies. The first major player to begin to leverage this facet of Bitcoin is widely cited as being Ross Ulbricht, the creator of the infamous Dark Web⁵⁰ black market, Silk Road. Ulbricht was an early member of the Bitcoin community and has 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 2015a). His choice to make Bitcoin the default currency of the Silk Road was no doubt based in great part on the much higher level of anonymity it provided in transactions for illegal goods and is arguably a decision that to this day has created a baseline of demand for it. It is difficult to deny that the use of Bitcoin in these arenas has greatly increased its use as well as expanded awareness of it. Most immediately, it has brought Bitcoin to the awareness of participants in these illicit online markets (see (Hout and Bingham 2013; Martin 2013) for more in-depth accounts of these users experiences). 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 are attributed with bringing Bitcoin to the awareness of mainstream populations for the first time.

⁵⁰ The Dark Web refers to a set of interconnected, online networks that cannot be accessed via standard web browsers, are not indexed by standard search engines, and often require special permissions and procedures to access.

Use of Bitcoin in online black markets has contributed heavily to the view of Bitcoin as a criminal currency, but it is not the only aspect of its use and history that has contributed to this identity. In the “Wild West” of the early Bitcoin ecosystem, there have been a striking number of examples of mismanagement and fraud that have led to millions of dollars (USD) lost for participants. Some of the highest profile events in this arena have included the loss via hackers and mismanagement of nearly \$500 million (USD) by Mt. Gox, the formerly preeminent Bitcoin exchange in the world (McMillan 2014), and the arrests and investigations high profile figures in the Bitcoin world for activities such as money laundering (Poladian 2014). Given the still ambiguous nature of Bitcoin to formal institutions and the lack of regulations governing the services and exchanges related to it, involvement in this frontier of economic activity has continued to carry with it high risks of encountering fraud and scams and fewer avenues of recourse when one becomes victim to them (Chester 2016). Additionally, usage of Bitcoin as the payment of choice for digital extortionists and blackmailers (Popper 2015b), along with official concerns over its ability to be used to fund terrorist activities (Fung 2014), continue to solidify the view of Bitcoin and cryptocurrencies as the currencies of criminals.

For those in the Bitcoin who are working in more formal and above board capacities, this aspect of its identity is often treated as a barrier to its ultimate ability to succeed. While its use in some of this arenas might help to ensure a base of demand for it and encourage a robust level of market activity, the potential of this bad reputation to both forestall mainstream willingness to adopt and create a hostile regulatory environment are not seen as being worth it. Toward that end, many players in the Bitcoin community have come forward to proactively work with legal and regulatory bodies to help bring order to this new arena of economic activity. Examples of this include the Bitcoin Foundation’s establishment of a Regulatory Affairs Committee, the

development of advocacy groups such as the Chamber of Digital Commerce⁵¹ and the Blockchain Alliance⁵² who are devoted to working with law enforcement on digital currency and blockchain related issues. It has also lead to the promotion of a cooperative, even conciliatory, tone when dealing with governments' evolving regulation of the space, such as with the New York City's creation of a BitLicense to regulate cryptocurrency exchanges. Interestingly, given the continued presence of anti-state and regulation perspectives that were predominant at the beginning of Bitcoin, these efforts remain controversial within many parts of the Bitcoin community.

Bitcoin as a Speculative Investment

This speculative face of Bitcoin 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 dizzying 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 (see above). 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, a point that is corroborated by the relationship between Google searches and price in Figure 13. This, along with the general instability in price that has periodically plagued it, has led many critics of

⁵¹ <http://www.digitalchamber.org/>

⁵² <http://blockchainalliance.org/>

Bitcoin to advance a view of it as being little more than the “tulips” of 17th century Holland’s infamous speculative bubble.

This volatility in valuation might be considered a threat to the long-term ability of Bitcoin to attain its originally intended goal of becoming a real, alternative currency. From another point of view, however, the ability to turn a quick profit on Bitcoin has arguably served as a bridge to adoption and awareness among individuals who had no innate interest in it as a collective undertaking nor any need to acquire it for the sake of making illicit, online transactions. A major example of this is the degree to which Bitcoin has become established in China. The run up to its highest exchange rate to date, \$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 2015a; Wood 2013). To date, BTCC⁵³ (formerly BTCChina), a Shanghai based Bitcoin exchange, remains one of the largest exchanges in the world, even in spite of strong rulings by the People’s Bank of China that Bitcoin cannot be considered currency, cannot be used for purchases, and should be treated as nothing more than an online trading commodity (Mullany 2013). The healthy volume of activity in Chinese exchanges in spite of these strictures, along with the fact that the largest Bitcoin mining pools are now in China (Vincent 2016), all lend credence to the assertion that no small part of its present use and adoption centers solely on it being a profit-making activity.

On another front, this view of Bitcoin as speculative investment has also created some surprising avenues to legitimation and adoption among the financial elite. As Bitcoin has continued to persist through its volatile price swings, it has managed to transition in the eyes of many from being a one-time, faddish bubble to a potential new arena of legitimate investment

⁵³ <https://www.btcc.com/>

activity. Some of the earliest and primary actors in this regard have actually been the Winklevoss twins of Facebook notoriety. In addition to being early and eager investors in Bitcoin⁵⁴ as early as April 2013, they have also been responsible for creating one of the first fully regulated Bitcoin exchanges, Gemini⁵⁵, and putting forward the first Bitcoin Exchange Trust Fund (ETF), a product designed to resemble investment vehicles used for precious metal commodities, for Securities Exchange Commission (SEC) approval. Notably, though they were the first to file for approval of a Bitcoin ETF, they were ultimately beat to the punch in July 2015 when the prestigious private stock market, SecondMarket, launched its own private version of the same vehicle, the Bitcoin Investment Trust (Primack 2013). From these initial beginnings, Wall St. and major financial players such as J.P. Morgan and Citigroup have continued to expand their investment and involvement in digital currency, both as a commodity and more recently, as a new financial technology. The facts that the Winklevoss Bitcoin ETF now appears as “COIN” on the Nasdaq stock ticker and that Bloomberg now lists the Bitcoin exchange rate on its own ticker could in many respects be viewed as encouraging signs of the degree of legitimacy that Bitcoin has achieved in the past seven years. As will be seen, however, there are other reasons to suspect that its successes in this arena may have laid the way for a massive undermining of its originally intended purposes.

Bitcoin as a Payment System

Irrespective of the politics surrounding it or the expedient uses to which different groups have put it, the fundamental design of Bitcoin is as a system of transferring payments between individuals. In terms of this core functionality, it has done remarkably well for such an

⁵⁴ The Winklevoss brothers currently claim to own about 1% of all total Bitcoins presently (Lee 2013)

⁵⁵ <https://gemini.com/>

innovative technology and its actual processing of payments has remained impressively secure and reliable 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 as a payment system represents a potential threat to online payment processors such as PayPal and major credit card companies like Visa. Notable among these features are its ability to move large amounts of value across the globe many times faster than current systems allow, low per transaction fees, the ability to assure irreversible and extremely secure transactions, and the fact that it does not require companies to be responsible for managing and storing sensitive customer information such as names and physical addresses. While politics may have gotten Bitcoin started, many investors and developers have hoped that it would 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 that 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 their local national currencies. Some of the most prominent services that have arisen in response to these needs are Bitnet⁵⁶, BitPay⁵⁷ and Coinify⁵⁸, all cryptocurrency based start-up companies who have received tens of millions USD in venture capital funding in the past years (Dougherty 2014; Rizzo 2014). Other efforts that also facilitated merchant adoption have been experimental inclusions of Bitcoin payment processing capacities

⁵⁶ <https://bitnet.io/>

⁵⁷ <https://bitpay.com/>

⁵⁸ <https://www.coinify.com/>

by existing payment companies such as Stripe (Alby 2015) the online payments company used by the car-sharing company Lyft, and Square (McMillan 2014), a San Francisco payment company who is currently one of the biggest players online payments and point of sale software. Other Bitcoin based companies, most namely the Bitcoin currency exchange Coinbase⁵⁹, have also extended their existing capabilities in order to facilitate merchant adoption.

For a period of time, 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 this high profile events has also been a proliferation of smaller businesses who have chosen to accept it, including any number of “brick and mortar” businesses that have opted to accept the cryptocurrency. Nonetheless, in the past year it has become increasingly evident that retailers and consumers have not embraced Bitcoin and cryptocurrencies to nearly the degree that was suggested by the initial hype around its capacity to disrupt the payments’ arena (Chernova 2016; Williams-Grut 2015). There are many potential reasons for this underwhelming response, including lingering associations of Bitcoin with fraud and illegal activities, price volatility, regulatory uncertainty, and the fact that Bitcoin as a payment system exists in direct competition with major, established interests who have little cause to support its success in this arena.

In spite of this disappointing level of adoption by merchants so far, hope 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 through becoming more dominate in the arena of international payment transfers and remittances (Ombok 2013). One specific emerging arena

⁵⁹ <https://www.coinbase.com>

of payments that cryptocurrency may be able to gain a notable foothold is that “nanopayments” for online content (Prisco 2016). In these still mostly hypothetical systems, small amounts of online content or digital goods will be able to be monetized via having users pay extremely small quantities of money to access limited or specific parts of it (e.g. a single article instead of a subscription to an online magazine, streaming of just a part of a video clip). Given that the proposed amounts these payments are too small to be handled effectively by established payment processors, Bitcoin and other cryptocurrencies might have the necessary level of advantage over existing structures to gain a real foothold in this particular arena. Time will ultimately tell, however, if these alternative pathways will be sufficient to establish it as a widely used and recognized payment system in its own right.

Bitcoin as a Finance and Business Technology

There are many respects in which Bitcoin’s attempted development into a mainstream payment system have not aligned well with its original vision. Most notably, its evolution in this direction has involved a reintroduction of trusted third parties to handle payment transactions and has been heavily predicated upon merchants being able to immediately convert whatever digital currency they receive back into national currencies. While this attempt to establish Bitcoin as a widely used payment system has required deviations from its founding ideals, many have still considered success in this arena to be a fundamental step toward Bitcoin becoming accepted as a legitimate medium of exchange and token of value and thus, that much closer to becoming a real, alternative money. Within the past years, however, powerful interests have started to shift their attention away from Bitcoin as a payment system or investment commodity, and toward

considerations of how Bitcoin's innovative design might be reworked in order to remake how the existing finance sector does business.

Until recently, discussions of Bitcoin did not necessarily distinguish between the currency, the payment system, and the computer protocol underlying it. As interest in the protocol has grown, more efforts are being made to distinguish Bitcoin from the "blockchain technology" that underlies it (Tillier 2015). This new focus on blockchains has come about due to a number of potential ways the distributed ledger system might be used to change how finance is done. Examples of this potential financial and business applications include using blockchains to create automatically executable "smart contracts", as platforms for keeping track of exchanges in securities markets, and for currency clearing and settlements. Chief selling points for using blockchains in these and many other applications is the elimination of needing to hire third party intermediaries and the rapidity and security with which such transactions can occur. This recent tidal wave of interest in blockchains by major finance sector companies such as Goldman Sachs, Bain Capital, the New York Stock Exchange, MasterCard, and American Express has recently driven the estimated total of venture capital that has been invested in Bitcoin and blockchain startups past the billion dollar (USD) mark (Pagliery 2015).

This field of research on blockchains and their potential financial applications is still very much in its early phases, and different groups are exploring different ways of bringing them into practice. Of most 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 being developed abandon Bitcoin entirely either through the creation of

“private chains” and “distributed ledgers” that are completely internal to a given company or alternatively, through the use of blockchains based on other cryptocurrencies such as Ether 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 are a host of new but very well-funded and well-known startups such as Blockstream⁶⁰ with the development of sidechains, R3 CEV⁶¹ with distributed ledgers, Chain, Inc.⁶² with private blockchains, and Ethereum⁶³ with the use of alternative cryptocurrencies. In total, these startup companies are receiving millions in funds from an impressive number of establishment banks and finance companies (Hope 2015; Metz 2015) and in many ways, backing of these startups has become equivalent to staking territory in what looks to be an imminent battle over which versions of blockchain technology will revolutionize the financial sector. Notably absent from any of these companies’ missions, however, is any goal of using Bitcoin or blockchains to challenge the existing political or economic system within which these companies are operating

4.3 *From “Bitcoin” to “Blockchain” and the Cooption of a Would Be Economic Movement*

As shown, the multivalent nature of digital currency has played a key role in its adoption across a wide array of groups. Due to its robust identity, different sectors of society have been able to find very different reasons to buy into Bitcoin. Some versions of what Bitcoin has been defined as have had notable ideological underpinnings while other conceptions of it have been unabashedly utilitarian in nature. Likewise, some visions of it have motivated individuals to

⁶⁰ <https://blockstream.com/>

⁶¹ <http://r3cev.com/>

⁶² <https://chain.com/>

⁶³ <https://www.ethereum.org/>

expend a notable amount of effort into seeing it succeed in the long-term while other conceptions of it have led many of it to treat it as a speculative gamble. These varied definitions of Bitcoin have occasionally come into real conflict with each other, with the most notable example of this being the persistent tension that has existed between its becoming established as a reputable payment system and its continued association with criminal activity. Nonetheless, during this formative period for digital currencies, these multiple identities have assisted Bitcoin in overcoming some of the most formidable barriers that face new movements, technologies, or monies – widespread adoption and awareness.

For most of its development to date, these many faces of Bitcoin has facilitated its ability to become established far beyond the political fringe groups within which it originated. In just seven years, it has allowed cryptocurrency to go from being the pet project of an anonymous participant on a little known cryptography list-serve to an innovation that has spawned an entire new tech and finance subindustry. In many respects, this success might be seen as a testament to what a differentiated identity can accomplish. It would be extremely shortsighted to assume, however, that this robustness has come without risks. The very same multivalence and openness to interpretation that has given Bitcoin the flexibility to become what new audiences wanted it to be has also left it open to being redefined and reworked into forms that deviate very far from what it was originally intended to become.

Hypothetically, it might have been possible that these various versions of Bitcoin to continue coexisting for quite some time. However, mounting pressures from existing structures (e.g. legal and regulatory requirements) and the interests of well-positioned actors and groups (e.g. Wall St.) are making this scenario increasingly unlikely. These forces, have set the stage for a critical juncture in the definition for cryptocurrencies. Ultimately, only time will tell how this

moment of high contingency will play out for Bitcoin. There are already strong indicators, however, that the version of cryptocurrency that will win out will not be one that resembles the original vision that inspired it. In point of fact, there is mounting evidence that the most immediate fate of the Bitcoin endeavor will be one wherein its underlying innovations will be redirected toward a path of development that greatly benefits the very same powerful actors it was originally meant to challenge.

There are many arenas within which one can find evidence for this imminent cooption. The three that will be considered here are shifts in venture capital funding, collective changes in the language being used to report on Bitcoin, and a series of highly contentious events that have accompanied a recent, critical decision point for the open source code that powers Bitcoin. By investigating how the definitional struggle for Bitcoin and digital currency has played out in these different arenas and the interplay between them, it will be possible to demonstrate how a process of adoption has now given way to cooption and in so doing, clarify some of the pathways through which existing power structures are able to use their resources to ensure that their reproduced and protected in newly emerging fields.

Shifts in Venture Capital Funding

When the collective undertaking of cryptocurrency began, the resources being poured into it were largely in the form of individuals' volunteered time, energy, and expertise. With the entrée of both Silicon Valley and major finance and business groups into the field, however, this has changed. For the past few years, increasingly substantial amounts of venture capital have begun to pour into this arena. Along with it has come the host of Bitcoin and digital currency related start-ups that constitute the Bitcoin ecosystem explored in the preceding section. The

businesses that have received funding have run the gamut from digital currency exchanges, Bitcoin ATMs, mining pools and computer hardware, wallet services, and the development of distributed ledgers for businesses. Though there is no final authority in charge of determining the direction of digital currencies' development, it is inarguable that the preferential flow of resources into certain types of companies over others has a major impact on which versions of Bitcoin are likely to ultimately win out.

Implicitly present in these different categories of digital currency businesses are different ideas about what Bitcoin and digital currency are and where their future lays. For instance, businesses that focus on facilitating merchant adoption of Bitcoin inherently support an understanding of Bitcoin as a payment system. Similarly, currency exchanges align with the views of digital currency as a type of investment, whereas startups that focus solely on using blockchains or distributed ledgers for business applications effectively advance the idea of it as an innovative finance and business technology. Were all these different types of businesses receiving equal support, we would be in a situation in which we could see how these different versions of digital currency compete or coevolve with each other based solely on their own merits. This scenario of an even playing field, however, is not what we have.

Figure 14 offers a breakout of publically reported rounds of venture capital funding for Bitcoin related startups, organized by type of business⁶⁴. The three classes of businesses that have received the majority of venture capital funding are “exchanges,” “payments,” and “financial/business applications,” which are roughly reflective of the “investment,” “payment

⁶⁴ This data has been collected and made available by the Bitcoin reporting site, CoinDesk (<http://www.coindesk.com/bitcoin-venture-capital/>). Due to ambiguity in the original coding of businesses reported by this source, the 145 individual companies have been independently recoded to reflect their primary focus and whether they are based on the original Bitcoin currency/Blockchain or on an alternative. Both categorization schemes produce similar findings.

system,” and “finance/business technology” approaches to Bitcoin discussed previously. Of primary note are the levels and changes in funding through time. In the quarter of Bitcoin’s highest exchange rate to date in November 2013, the venture capital funding for digital currency companies increased dramatically, with most of the funding invested in exchanges. Over the course of the following year, funding then shifted primarily toward companies involved in payments, with more resources also beginning to move into financial and business applications.

In the first quarter of 2015, a dramatic shift occurred with a sudden, 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%. In the proceeding second quarter of 2015, funding for payment ventures rebounded to its highest levels to date of nearly \$68 million. However, the rest of the funding for this category in 2015 dropped off notably and 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. This last wave of funding put the total reported venture capital investment in financial and business applications since the Spring of 2012 to the beginning of 2016 at almost \$480 million. In spite of the early lead funding for payment startups had, the total for this class of companies stood at near \$321 million over the same time period, 33% less than what has been received by financial and business applications.

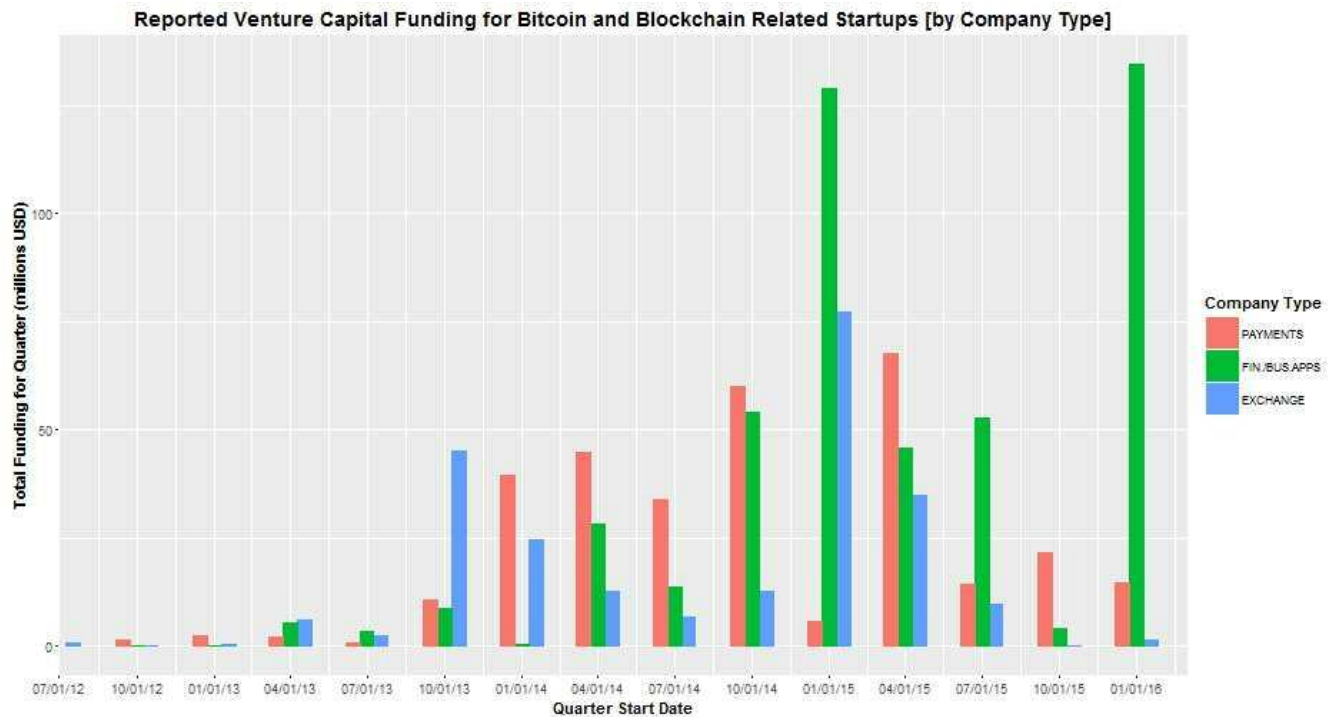


Figure 14: Venture capital funding by company type

Another way of getting at shifts in the venture capital funding priorities is to look at the emerging differences between the funding being received by companies that are based upon Bitcoin proper (e.g. exchanges centered around Bitcoin, financial and business applications that utilize the original Bitcoin blockchain, and payment software that focuses specifically on Bitcoin transactions) and those that focus instead on the development of alternative digital currency tokens and other utilizations of blockchain technology that do not involve the original implementation of Bitcoin (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 15 uses the same venture capital funding data as the prior figure, but

instead breaks down funding in terms of whether the companies receiving it are Bitcoin or Non-Bitcoin based.

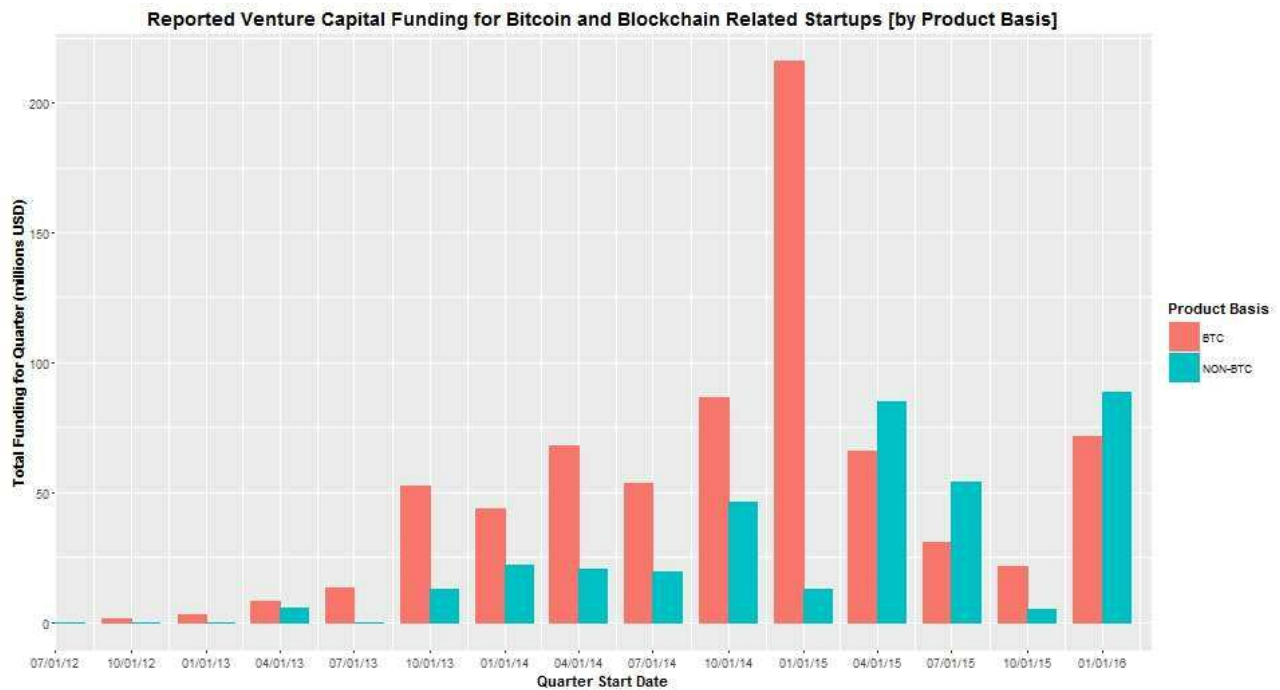


Figure 15: Venture capital funding by product basis

Up through the first quarter of 2015, Bitcoin based companies clearly dominated in venture capital funding. Given the first-mover advantage the original cryptocurrency had along with its much greater degree of development and familiarity, the fact that it attracted more funding than alternatives in these early phases is not particularly surprising. Notably, Bitcoin was the basis of many of the financial and business applications companies that received the massive influx of funding in the beginning of 2015. Over the course of the next year, however, another notable shift occurs and we see for the first time the quarterly totals for non-Bitcoin based businesses start to outmatch funding for Bitcoin based companies. This remains true for two of the four quarters in 2015 and most significantly, holds true for the second massive wave of

funding into business and financial application startups in the first quarter of 2016. Unlike at the beginning of 2015, the large influx of capital in the first quarter of 2016 was near evenly split between Bitcoin and non-Bitcoin businesses, with the non-Bitcoin based actually receiving about \$17 million more than Bitcoin based.

Contemporaneous with these shifts in reported venture capital funding has also been increasing involvement by firms such as J.P. Morgan, Citi Ventures, Visa, Goldman Sachs, and IBM as well as the founding of new investment firms such as the “Digital Currency Group” and blockchain startups like “Digital Asset Holdings” by Wall St. and finance industry insiders (Leising 2016; Vigna 2016). Along with the substantially larger amounts of capital these actors have brought into the Bitcoin and blockchain arena, they have also brought their own set of priorities. It is obvious that these players are not likely to have any interest in either the radical views that first spurred the creation of Bitcoin or the revolutionary potential of non-state backed currency. What has come to be more evident through these trends in funding, however, is that they also do not seem as interested in Bitcoin as a payment system in and of itself either. Given the new involvement of funders such as credit card companies who would be in direct competition with a successful and well-used Bitcoin payment system, this is perhaps not surprising. The increasing interest of powerful actors in this arena is still very clearly present, however, and shows signs of becoming concentrated in how either the established blockchain Bitcoin is based upon or just the blockchain design itself might be harnessed toward the end of improving their own existing business and finance systems. While this diversion of massive amounts of resources into one particular vision of Bitcoin does not necessarily entail that the other versions of it will necessarily fall away, it does undoubtedly shift the odds on which one is

likely to succeed, and it does so in a way that distinctly disadvantages those potential versions of it that might potentially challenge existing structures.

The Changing Language of Bitcoin Reporting

The channeling of resources into particular lines of development matters in that it affects which visions of cryptocurrency technology become developed fastest and spread most widely during this critical phase of establishment. Importantly, this concentration of powerful actors, along with the large amounts of money and influence that accompany them, has also affected the collective attention being paid to this emerging arena and has started to reshape the discourses through which Bitcoin and the technology surrounding it are discussed. Nowhere is this effect more evident than in recent shifts in reporting on Bitcoin away from its history and potentials as a currency or payment system and toward a new coalescence around the more general, less loaded concepts of “blockchain” and “blockchain technology.”

In the last half of 2015 and continuing through the spring of 2016, Bitcoin has seen 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*. Arguably one of the most prominent examples of this wave of reporting was Bitcoin making it to the cover story of the October 31, 2015 issue of *The Economist* (The trust machine 2015). At first blush, this trend in coverage might initially be taken as sign of an increasing legitimization of the Bitcoin endeavor and a signal of its successful integration into the mainstream. Looking more closely into the nature of this coverage, however, yields a more complicated picture. Specifically, it starts to become clear that there is a new line of distinction

beginning to be drawn between “Bitcoin” and “blockchain.” 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, that traces of it are detectable at the aggregate level. Figure 16 depicts the relative frequencies with which the term “blockchain” and “payment” appear as compared to other words⁶⁵ that occurred over the preceding six months of coverage for a set of six different news sources. These frequencies are based on text scraped from all online pages returned for a search on the term “Bitcoin” from two finance and business publications, *Bloomberg News* and *The Wall Street Journal*’s “Moneybeat” Blog, and two tech oriented publications, *Wired* and *Gizmodo*. In addition to this, text was also scraped from all online articles available from two prominent Bitcoin reporting sites, *CoinDesk* and *Bitcoin Magazine*, for a resulting total corpus of over 6,500 individual documents. In both graphs, the red-dashed vertical line indicates the initial large influx of venture capital funding into financial and business application startups at the beginning 2015.

⁶⁵ Consistent with standard practice, the total words considered in these relative frequencies excludes common “stop” words (e.g. “the”, “will”, “been”) and words less than 3 letters long. Also excluded is the term “bitcoin” as it was used as the basis for selection of the corpus.

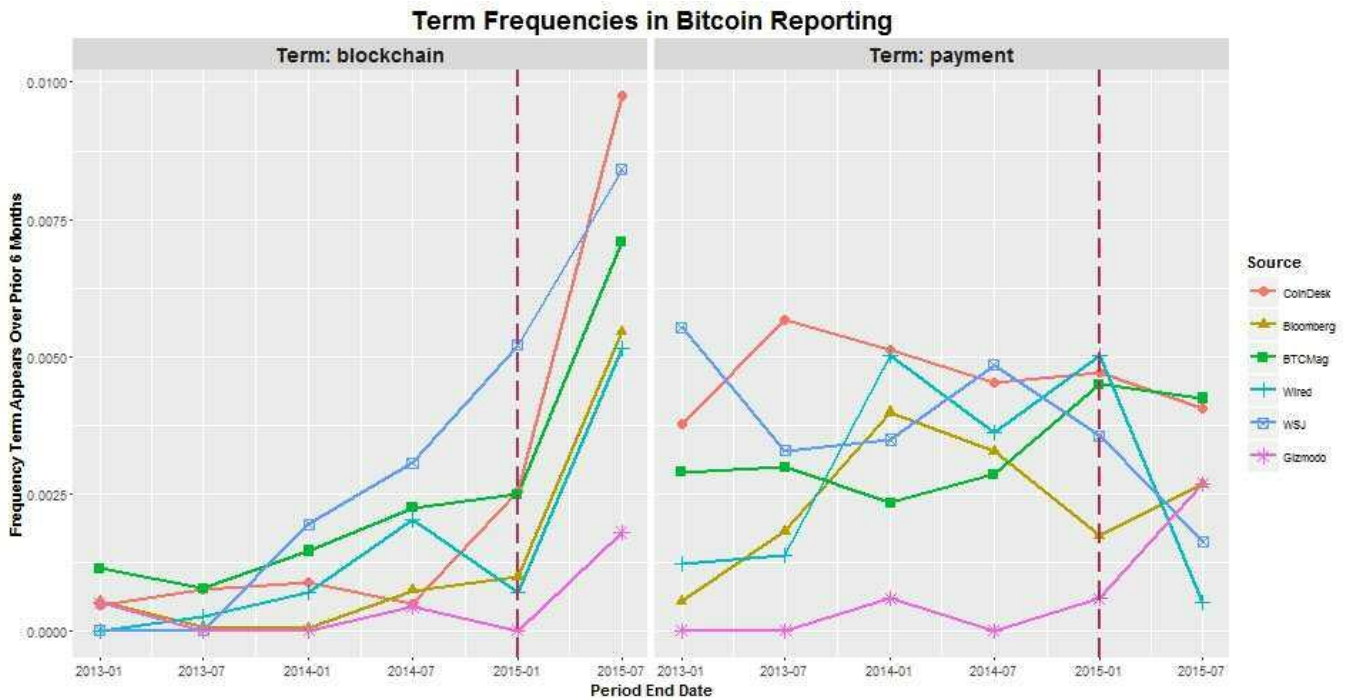


Figure 16: Term frequency trends in Bitcoin reporting

The most striking feature of these results is the several fold increase in the first half of 2015 that occurs in the frequency with which the term “blockchain” appears across all news sources. Prior to this point, mentions of “payment” tended to be more frequent than “blockchain” across the board. After the start of 2015, concurrent with the major shift in venture capital funding toward business and financial applications, the frequency with which “blockchain” appears dramatically overtakes those levels across almost all publications. Changes in the frequencies of the term “payment” are less consistent at this same point, with slight decreases for the Bitcoin focused publications, marked decreases in the *The Wall Street Journal* blog and *Wired* usage of the term, and some increases for *Bloomberg* and *Gizmodo* (though *Bloomberg*’s usage remains lower than its highest point for the term in the last half of 2013). Also of interest is the marked degree to which *The Wall Street Journal* blog was ahead of the curve on this shift

in language, and the fact that even Bitcoin centered publications have also been part of this change.

It also possible to detect this shift in discourse via a more comprehensive view of the themes that have characterized this reporting across this three year period. To extract these emergent themes, I use a form of topic modeling based on Latent Dirichlet Allocation (LDA)(Blei and Lafferty 2007). Topic modeling, and LDA in particular, has become an increasingly well-known and important tool in sociological analyses of cultural processes (DiMaggio, Nag, and Blei 2013; Mohr and Bogdanov 2013) and here it is used to help identify themes in reporting coverage that are present in the same corpus that was used to construct Figure 16. Toward this end, I combined all documents from all news sources mentioned and divided the resulting corpus by year of coverage. I then generated a 5 topic model (i.e. $k = 5$) for each year, and extracted the top ten words associated with each identified topic. The results of these models are presented in Table 4.

Topics in 2013				
<i>Topic 1</i>	<i>Topic 2</i>	<i>Topic 3</i>	<i>Topic 4</i>	<i>Topic 5</i>
downloads india currencies money quarter people third market federal silk	price wednesday afternoon road federal exchange silk volumes money internet	virtual market silk trading road week price companies thursday money	virtual currencies money road downloads silk federal trading price india	price wednesday federal money silk internet road afternoon exchange volumes
Topics in 2014				
<i>Topic 1</i>	<i>Topic 2</i>	<i>Topic 3</i>	<i>Topic 4</i>	<i>Topic 5</i>
financial price blockchain company exchange byrne current could york back	payments apple million price service company exchange mobile financial services	company financial exchange money current bitlicense service services year rise	financial exchange company back price blockchain services software money proposal	price company financial could services service back exchange blockchain market
Topics in 2015				
<i>Topic 1</i>	<i>Topic 2</i>	<i>Topic 3</i>	<i>Topic 4</i>	<i>Topic 5</i>
based blockchain services technology products ripple ethereum platform partnership service	taxes based services blockchain ethereum products platform ruling businesses step	services based financial trust gemini regulatory technology charter blockchain winklevoss	services products technology firms based group blockchain ripple system called	system ripple technology group liquid products firms services platform build

Table 4: Top 5 topics found for news reporting on Bitcoin, 2013-2015

Several general trends in the development of Bitcoin are reflected in these results. For 2013, the topics are reflective of how reporting during the period focused on events surrounding the shutdown of the Silk Road and accompanying fluctuations in its price, as well as a sudden surge of Bitcoin interest and downloads of Bitcoin software in India, arguably as a result of actions by the U.S. Federal Reserve that weakened confidence in the rupee, and subsequent hostile stances toward Bitcoin from the Indian Central Bank along with the Indian government's shutdown of Bitcoin exchanges. In 2014, reporting moved toward developments going on within the Bitcoin ecosystem. Blockchain financial services begin coming into view, but there are also discussion of Bitcoin with reference to payments and notably, as being in competition with Apple Pay. There is also discussion of major shifts in the environment around Bitcoin businesses surrounding the institution of New York's BitLicense and continued focus on Bitcoin's price and exchanges.

With 2015, however, there is a definitive shift toward financial and business applications. This is evidenced not just through mentions of the blockchain, but also in coverage focusing on non-Bitcoin based, blockchain financial tech companies like Ethereum and Ripple. Blockstream's first Bitcoin-based sidechain for financial and business tech companies, Liquid, is also identified. Coverage of non-financial tech services is present as well in the form of reporting on the Winklevoss brothers' Gemini digital currency exchange and the regulatory struggles their Bitcoin exchange-traded fund (ETF) went through before being approved. These results further corroborate the notion that Bitcoin as it was initially conceived is being overtaken by the finance and business technology vision of it not just in terms of funding, but in the way it is being discussed as well.

A question follows from these findings concerning what if any effect this shift in language is having on the attention being paid to digital currencies and the technologies related thereto. While public attention and awareness is a difficult thing to capture and an even more difficult one to quantify, some measure of insight is available through a consideration of search patterns. The following figure (Figure 17) shows weekly Google Trend information for searches on two general topics related to Bitcoin, “Cryptocurrency” and “Blockchain” from the beginning of 2013 through the first quarter of 2016. Similar to Figure 16, the vertical dashed line indicates the first quarter of 2015 when the initial major influx of venture capital into financial and business applications occurred, and relatedly, the inflection point for the increasing frequency of the term “blockchain” across the news sources considered in this analysis.

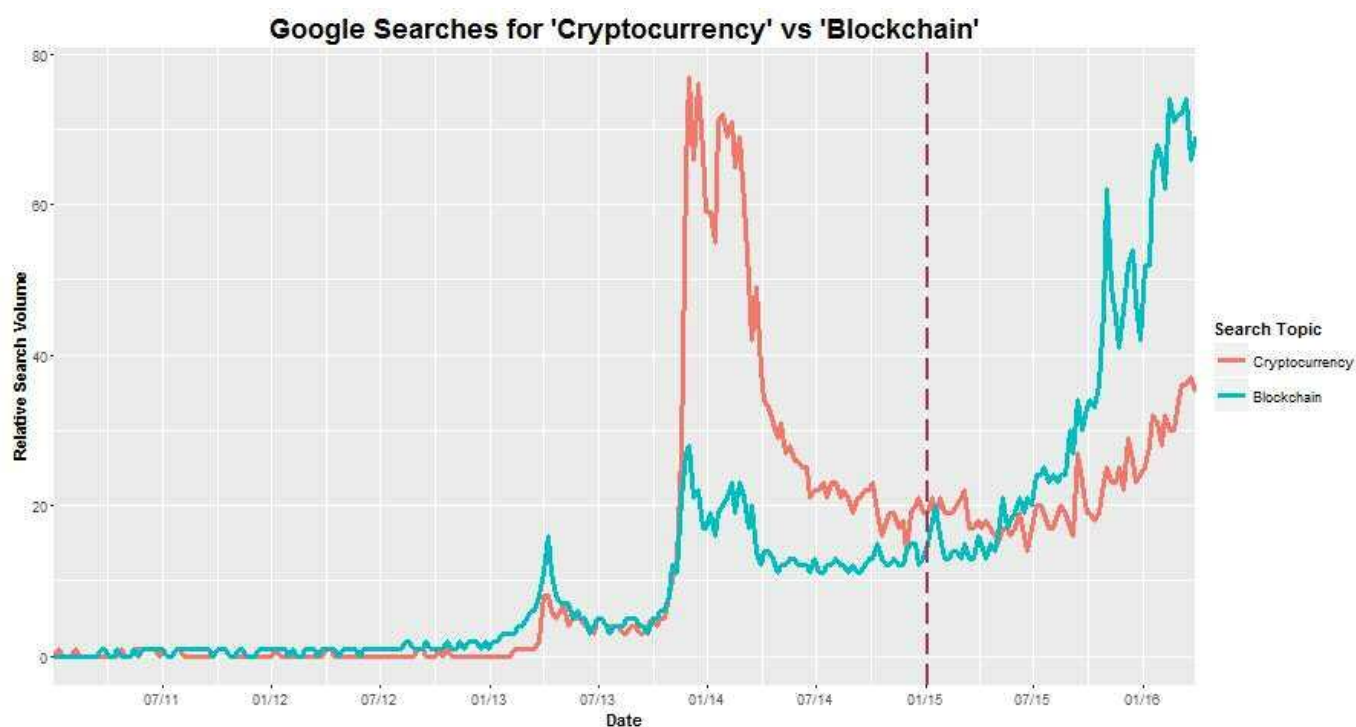


Figure 17: Google search volume for ‘cryptocurrency’ vs ‘blockchain’

From the outset, searches for “Blockchain” and “Cryptocurrency” topic areas remained at more or less comparable levels through the last quarter of 2013. Likely due in great part to Bitcoin reaching its peak exchange rate in mid-November 2013, searches for “Cryptocurrency” topics dramatically surged ahead of “Blockchain.” Through 2014, search volume fell back down to a similar level as that of “Blockchain” topics, though both search volumes remained at a higher level than they were previously. “Cryptocurrency” remained slightly above “Blockchain” up until the second quarter of 2015. During the same time that term frequencies of “blockchain” rise in reporting, search patterns switch toward favoring “Blockchain” topics. Though overall volumes for both subjects continued to rise through the second half of 2015 and into the first quarter of 2016, “Blockchain” topic searches have and continue to notably outpace search interest in “Cryptocurrency,” and in so doing, point toward a shift in the way larger audiences are thinking about Bitcoin away from being a potentially new type of currency, more toward a definition that foregrounds the technology upon which it was based.

It remains unclear whether this “blockchain” version of Bitcoin as a financial and business technology will continue to dominate how digital currencies are seen and discussed, or if another future version of it that has yet to be developed will ultimately succeed. It is also entirely possible, though increasingly unlikely, that even with the over \$1 billion of investment into the Bitcoin ecosystem, that this experimental, monetary “curiosity” will have no long-term impact in the financial world. What is clear given the current trends in both resource allocation and definitional processes, however, is that earlier conceptions of making digital currency into a real alternative to existing payment systems seem to be becoming increasingly unpopular. With this diversion away from exploring the ability of digital currency to act as a medium of exchange and into it being a helpful new tool for making existing financial systems faster and more

efficient, any remaining hopes of transforming its mainstream success into an increased ability to challenge the structures it was original meant to subvert are also dimmed.

Breakdowns of Consensus in the Block Size Debate and the Future of Bitcoin

These shifts in resources and processes of collective definition might not matter so much for Bitcoin if it were possible for its many different faces to continue coexisting harmoniously with each other. As it stands currently, however, Bitcoin is now facing a series of necessary choices, the outcomes of which will affect its ultimate shape. As is the case with many collective endeavors that reach a certain level of maturity, those involved in the project are now in a position where they must pick a direction for its continued evolution and find some way to get their fellow participants to commit to that particular course. It is these sorts of moments that unavoidably require those involved to decide on which visions of their project will be prioritized and supported and which ones will be abandoned. Here at these critical junctures, we can most clearly see how the influence of powerful interests plays out.

One of the most striking examples of such a moment for Bitcoin involves the highly contentious “block size debate” which has recently created deep rifts in the Bitcoin community and profoundly soured relations among its leadership. At issue is the number of transactions that the blockchain can process in a single “block” and the implications it has for the scalability of Bitcoin. Early on, Nakamoto set a 1MB limit on the size of blocks, with the supposed purpose of protecting the blockchain from being overwhelmed by spam transactions and keeping blocks small enough that they could be processed by personal computers. At the time, this limit was far more than was required to efficiently handle the number of transactions occurring on the network, and the expectation was always that the block size would be increased at some later

date. Though this limit was not a problem for many years, increasing growth and usage of Bitcoin now means that a point has been reached where this size limit issue must be addressed or the whole network will be put at risk of becoming increasingly unreliable in the near future.

All the parties who are seriously invested and involved in Bitcoin agree that something must be done. The controversy over *what* should be done, however, has raged for most of the past year. On one side are those who support increasing the block size immediately, a position that aligns solidly with those interested in seeing Bitcoin become a viable, global payment system. Mining groups who also will have the computational power and network bandwidth required to support the larger block sizes are also on board with the increase. Others, however, have advocated for the need to find alternative solutions that will keep the block size near what it is but find other ways to process transactions. Some of the groups invested in this side include miners who would be disadvantaged by the change, including influential Chinese miners behind the “Great Firewall of China” who would likely encounter bandwidth issues if the size was increased, and Blockstream, a massively well-funded, Bitcoin financial technology company that has proposed their own “sidechain” solution to the problem.

The controversy surrounding what direction Bitcoin should take has been both heated and ugly. So far, it has engendered a host of conferences, an uncountable amount of online vitriol, censorship of discussions of particular proposed solutions on main Bitcoin community forums (Madore 2015), and the extremely public and dramatic exit of a community figurehead (Popper 2016). All the while, the continued lack of resolution to this issue for Bitcoin has left it increasingly vulnerable to being usurped to any number of less controversial and fractious, non-Bitcoin blockchain businesses who have been building up their capacity and base during the same time that the original cryptocurrency has been mired in debate.

It is still unclear how the block size debate will ultimately be adjudicated, though it is possible to anticipate that the longer it takes, the less hopeful Bitcoin will be able to gain the momentum it needs to definitively succeed as a large-scale payment system. What is already abundantly clear, however, is that this debate in and of itself has already proved to be a critical juncture in the evolution of Bitcoin due its forcing of those involved to make firm decisions on what Bitcoin is and what it will become. As stated in an August 2015 article from CoinDesk (Caffyn 2015):

“...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.”

While nominally all these groups are involved in this current decision point, their voices and interests no longer carry comparable weight. It is true that throughout this controversy, there have been rhetorical appeals on both sides to a few of the most popular ideals upon which Bitcoin was founded (e.g. decentralization, free market dynamics, democracy). Nonetheless, among the main voices involved there has been a notable absence of anyone advocating for Bitcoin staying true to, or even compatible with, the radical vision that founded it. Meanwhile, the ability actors who are already well-established in the existing structures are evincing a disproportionate ability to shape the course of these collective processes of definition. Whatever Bitcoin is to become after this point, it seems clear that it will not end up resembling what it originally was meant to be. Even more cynically, it also seems increasingly likely that it will end up assuming form that blatantly advantages and reinforces the very same system it was originally intended to subvert.

4.4 *Conclusion*

This work began by considering how, contrary to what might be the case in established markets and fields, an ambiguous identity may prove beneficial during early stages of adoption. Through the introduction and development of the concept of the “robust object,” it was able to explore how the many faces of Bitcoin have allowed it to spread and develop to a degree that would not have been possible without such a multivalent and malleable identity. By charting the evolving answers that have arisen to the question of “What is Bitcoin?” and showing how these redefinitions were fundamental to Bitcoin’s ability to spread from one group to another, this work has improved our understanding of how the availability of a multiplicity of interpretations might be a key factor in explaining how adoption-dependent objects are able to become established in the early phases of their development.

This work also showed, however, how this same capacity to be many things to many people can leave objects vulnerable to cooption by actors and groups who are already well-positioned in existing systems and structures. Via such powerful actors’ access to resources and their much greater influence on discourse and attention, we see how they are able to preferentially select which definitions of such objects best suit their own interests and by default, select against those definitions that might potentially challenge them. In the case considered here, this work was specifically able to identify how this process has played out for Bitcoin through analyzing how the entrance of finance and banking industry insiders into the Bitcoin ecosystem has resulted in massive shifts in venture capital funding and a contemporaneous alteration of the collective discourses and attention surrounding Bitcoin. This work then briefly explored one of the most important and impactful decisions currently facing Bitcoin, the block size debate, and offered some considerations of how this growing influence of establishment actors has unavoidably influenced, and potentially even determined, how this debate will resolve.

In particular, it noted that at the present time, there is a conspicuous absence of any of the primary voices advocating for the protection, or even acknowledgement, of the founding vision and principles upon which Bitcoin began.

Though this work focused on the emergent arena of digital currencies, the arc it has traced is arguably one that resembles the history of many features in current social life. Movements, politicians, artistic trends, and even narratives are all examples of objects that potentially share this story of successful adoption facilitated by a multivalent identity that unintentionally lays the way for a cooption by powerful actors who have an enhanced ability to decide which version of it will survive. In the maturation of any field or social object, it is likely inevitable that a time must come for it to pare down its potential lines of development in order to commit to just a few visions of what it will be. To assume that this is a neutral selection based on the inherent merits of those different visions, however, is a major mistake. Without taking seriously the advantaged role of powerful actors to not only navigate existing social systems and structures but also decide which new ones will be allowed to fully develop, one misses seeing a major avenue via which power and inequality manage to reproduce themselves across time and context. In assuming that all voices are allowed to be equal in answering the question of what something is or will be, one overlooks a primary reason for why so few truly revolutionary ideas are ever able to come to full fruition.

Chapter 5: Conclusion

Of all the social facts that characterize contemporary life, there are few that are so powerfully determinative or as deeply embedded as those of money and value. Though these features of our world are usually so completely taken-for-granted as to go “unseen” by researchers and laymen alike, the advent and success of new digital currencies has unavoidably drawn collective focus back toward fundamental questions concerning their nature. Bitcoin and its predecessors carry with them implications for disciplinary knowledge in fields as wide ranging as mathematics, economics, and political science. Given the degree to which their rise has made obvious the innately social processes surrounding valuation in economic arenas, it is absolutely necessary that applications of a sociological perspective be part of the wider endeavor to understand what these new moneys are. In a complementary fashion, we should also expect that what we learn from this new and rapidly evolving field to have a notable and lasting impact on our dominant models of value and money.

This dissertation has set out to offer one of the first of what are likely to be many contributions in this vein. At the most general level, all of the studies undertaken herein have sought to demonstrate both the necessity of a sociological lens for understanding the rise of new digital currencies and to explore some of the early implications this new monetary object has for prevailing ideas on how social and economic forces intersect. Though there are multitude of questions that can and should be asked in this arena, the current studies have been driven by a sociological interest in unpacking the various roles social construction processes have played in the constitution and reception of digital currencies. Most specifically, this work has focused on the three following distinct but interconnected research questions:

- 1) How is it that seemingly valueless objects, like the “strings of bits” that constitute digital currency, come to achieve and hold value in social life?
- 2) How has the emergence of digital currencies like Bitcoin disrupted the “taken-for-grantedness” of money and value? What are the discourses that have been employed to address this disruption in order and make sense of how Bitcoin has attained its value and whether it qualifies as money?
- 3) What are the different categories groups in the “Bitcoin ecosystem” have employed to make sense of this emergent monetary object and what role has this diversity of categorizations played in Bitcoin’s adoption, valuation, and development?

The following sections briefly review the findings of this work with respect to each of these questions, discuss the contributions of these studies to our current understanding of money and value, and consider limitations of the present approach as well as future lines of potential work.

5.1 Summary of Findings

Chapter 2 of this dissertation focused on the fundamental issue of how seemingly useless objects, such as the “string of bits” that constitute digital currencies, might come to be accepted as holding value. By identifying the historical shortcomings of classical economic models in explaining this aspect of money, this chapter began by forwarding the assertion that a different view of value, one that took more seriously the legitimate role of social processes in its constitution, was necessary in order to satisfactorily explain how economic value can be constructed out of seemingly “nothing.” It then went on to show that by reconceptualizing valuation as a process of learning under conditions of uncertainty, it is possible to reconcile

economic and sociological models of value by viewing them as capturing different parts of what happens when the same sort of actor is placed in different informational feedback situations.

This chapter then used agent-based modeling (ABM) with Bayesian updating agents to computationally model the different collective valuation dynamics that can be expected to arise under different conditions of social, non-social, and mixed valuation situations. Of central importance in these results was the finding that in a purely social system, that is one in which agents depend solely on the feedbacks received from other learning agents, stable valuation can and does coalesce through the collective learning process alone. Expanding on this foundational result, this chapter then showed how this computational approach to valuation could then be expanded to unpack the sensitivity of social valuation processes to initial conditions, strongly confirmed early actors, and time, as well as demonstrate how valuation processes that combine social and non-social feedbacks in the learning process take orders of magnitude longer to converge on the “true” value of a parameter. The final part of this chapter then considered some of the ways in which these theoretical results could be brought to bear on substantive issues, including legitimating the idea that a hypothetically worthless object, such as a metal disk or string of bits, can attain real, stable economic value via social processes alone and challenging standard assumptions that markets that rely on a mix of social and non-social feedbacks can be expected to “find” the true value of object on a reasonable time scale.

Having offered a social theoretical model of valuation, one motivated by the question of how digital currencies have come to acquire and maintain value, Chapter 3 then moved on to a different but related question of how the individuals at the heart of the Bitcoin community have themselves made sense of the monetary project they have undertaken. Of specific interest to this study was an exploration the various “talks” (Swidler 2001) that have been evinced in the online

forums that have been central to Bitcoin's development in the wake of the profound "denaturalization" (Douglas 1986) of money and value that the rise of digital currencies has brought. Using a subset of text scraped from two of the most central online communities to the Bitcoin movement, this chapter undertook a combination of both traditional qualitative coding methods and automated content analysis techniques in order to get a broad sense of the various discursive trends that have emerged in these communities as the individuals involved have sought to make sense of Bitcoin and the processes through which it has come to hold value.

The outcome of these analyses was the uncovering of a rich, variegated, and at times, contradictory set of talks concerning the nature of money and value. It provided strong evidence for the persistence of the original ideologies that motivated the development of Bitcoin as a sort of "digital gold" that might be free of central banks and government control. Though the continued relevancy of this form of "digital metallism" (Maurer et al. 2013) was clearly supported, these results also showed that it by no means represented the extent of the repertoire that individuals have relied upon. Especially in the face of the obvious problem facing the application of metallist explanations of value to digital currencies (i.e. the fact that they are not backed by either precious metals or tangible commodities of any sort), this analysis found that participants also drew upon a wide array of ideas and concepts, including standard economic models of supply and demand, ideas about social conventions and adoption dynamics, considerations of the political drivers of monetary value, and the invocation of a sort of investment agnosticism that committedly disavowed any need to understand why Bitcoin has come to hold value, only that it does and that its valuation might continue to grow. This study also showed that, congruent with prior work on such talks, that individuals liberally drew from multiple explanatory bases to make sense of money and value, and in an expansion of this

perspective, showed how their creative reworking and recombination of these ideas might feasibly lay the groundwork for the new formal and informal models of money and value that might come to be commonly evoked at some point in the future.

The final study of this dissertation, presented in Chapter 4, expanded upon the question of how Bitcoin is being made sense of in order to investigate how the definitional processes surrounding it have been part of its rise, and also, provided an arena within which contentious power dynamics have been able to play out. It began by discussing established work in the sociology of value on the relationship between valuation and categorization (Zuckerman 1999; Zuckerman et al. 2003), and then developed the concept of a “robust object” as an object whose multivalent identity allows a diversity of groups to find reasons to buy into it. It also considered how this same characteristic may both facilitate initial success in adoption but ultimately, also leave it vulnerable to co-option by powerful actors who can use their superior influence and access to resources to preferentially select which definitions of it will be allowed to persist.

The study then showed how these concepts can be applied to the rise of Bitcoin using a combination of historical accounts of Bitcoin’s development, text scraped from thousands of articles covering its development, and quantitative metrics that captured trends through time in Google search patterns, Bitcoin exchange rates and trading volumes, and venture capital funding for digital currency companies. Via tracing the adoption of Bitcoin through reporting and investigative journalism on its rise, this study was able to demonstrate how Bitcoin’s ability to be understood differently by different groups was critical to its ability to spread far beyond the fringe political circles that originated it and secure the levels of adoption it needed to achieve its current level of success. It then showed, through a combination of trends in venture capital funding, a consideration of word frequencies and topic models of reporting on Bitcoin through

time, and changes in search patterns, how the entrance of powerful players into the digital currency arena has led to dramatic shifts Bitcoin's definition away from the revolutionary money it was originally intended to be and toward it being a technology that could be harnessed by the existing financial industry. In demonstrating how the superior resources and influence of powerful actors have allowed them to preferentially select which versions of Bitcoin will continue to be developed, this work has sought to clarify what might be a more general process through which existing power structures are able to reproduce themselves in new arenas and fields of social life.

5.2 *Contributions*

Taken both as individual studies and as a whole, this dissertation has set out to make a varied set of contributions to economic and cultural sociology. In terms of individual studies, Chapter 2 sought to develop a theoretical model of valuation that could faithfully unite sociological and economic conceptions of value through a single type of actor and then show how such a model could be systematically and rigorously explored via a formal, computational operationalization of it. In so doing, it also opened the door to bringing a much larger literature on the dynamics of social learning to bear on questions of value. It also provided another potential way for sociologists to more thoroughly engage with and challenge prevailing economic models that have historically failed to account for the importance of the social in the constitution of economic value.

The study of Chapter 3 sought to expand existing understanding in the sociology of money and the sociological study of moments of cultural disruption. In addition to providing a contemporary update to the literature on the sociology of money, it also had the advantage of being able to go beyond the articulation of monetary ideas as they are expressed via more formal

writings in order to explore the organically arising economic discourses that individuals have employed in the course of their conversations with each other. It also showed that there is a great deal of analytical traction to be had by extending the established cultural sociology models of “talks” to the arena of money and value, thereby demonstrating the existence of another area in which our understanding of cultural processes might be used to help us better understand subjects that are often treated as being purely economic phenomena.

The contributions of the final study, undertaken in Chapter 4, were both theoretical and empirical in nature. Conceptually, it undertook the development of the idea of the “robust object” in order to be able to clarify how a multivalent identity might not necessarily be a hindrance to valuation, but especially in new fields and at early stages of development, but a critical feature that allows it to be adopted widely. At the same time, it also identified the inherent vulnerability of such objects to co-option if and when they do succeed at a sufficient level as to come to the interest of powerful actors in existing structures. Using a mixture of qualitative and quantitative data, it then provided the most complete account of digital currencies’ rise available in sociology to date, and provided support for the hypothesized pattern of adoption facilitated by a multifaceted appeal to different groups, followed by co-option by powerful actors via their superior ability to direct resources and attention to the definitions of the object they preferred. In so doing, this work has opened up new lines of inquiry into how this general pattern has potentially played out in other arenas of social life such as in the spheres of social movements, art, technologies, and organizations/firms.

Taken as a synthetic whole, this dissertation has made another set of contributions to the field. On a methodological level, it has, through the use of both agent-based modeling and automated content analysis, striven to show how much traction can be gained by applying a

computational social science approach to economic sociology and, more generally, to studies of contemporary social construction processes. Throughout its chapters, this dissertation has also sought to aver and demonstrate from a multiplicity of angles the necessity of taking into account the role of cultural processes in the constitutions of real world economic value, both in theoretical treatments of the issue and in empirical investigations of it.

In its empirical studies, it also aimed to reaffirm the manner in which disruptions of embedded taken-for-granted expose the usually unseen and sometime massive gaps in commonplace understanding, even in economic arenas. It also then went further to show how the creative reworking of ideas and definitions that occur in response to these gaps can potentially lay the groundwork for new understanding and even become the basis for new fields of social and economic action to arise surrounding those disruptive objects and events. It has also shown that in these arenas of creative recombination, we cannot automatically assume that all groups and individuals exist on a level playing field. To the contrary, it has demonstrated that the same factors that empower actors in existing structures can also enable them to steer those definitional processes in directions that bolster and further their own interests and away from options that might challenge them. In the case of Bitcoin, this entails that as radical as the vision that spawned digital currency was and as invested as many its community have been in seeing it become a tool for economic and political change, the ultimate deciders of its fate are still likely to be the very powers it was meant to subvert. Consequentially, we again arrive at yet one more example of how an existing power structure manages to reproduce itself in another new arena of social, and in this case also economic, life.

5.3 *Limitations and Future Directions*

One of the biggest limitations of the studies undertaken herein is their reliance on a relatively small set of publically available and accessible data. It is clear that while the rise of Bitcoin has spawned a multitude of conversations and commentary on the nature of money, value, and digital currency itself, only some of these have been recorded in open online forums and news reporting and still less of it has been collected and considered for the purposes of this dissertation. As an unavoidable result of this fact, these analyses must be understood as working with an inherently biased set of information which potentially underrepresents many groups involved in the development of digital currency, such as non-English speakers, individuals outside of the main Bitcoin communities studied, and those who are unable or unwilling to communicate in online forum conversations. As such, these studies cannot be seen as covering the universe of social construction activities that have occurred surrounding digital currency and must be very conservative in their claims as to what they have described.

In a related vein, the generalizability of these studies must be approached with extreme caution. In terms of the automated content analysis approaches that have been used, it is important to clarify that while such methods are very powerful tools for characterizing large corpora, they are not inferential in the sense of being able to speak to what the larger universe of texts outside of that corpora look like. This fact, alongside the aforementioned biases that are undoubtedly present in the data and the lack of comparison cases considered, entail that the results of these studies must be classified as being much more toward the description and theory-generation side of social science research rather than being in the arena of hypothesis testing and explanatory adjudication.

It is also important to note that digital currency is a complex phenomenon that is still evolving rapidly and in unforeseeable ways. At the current time, it remains unclear where

Bitcoin will stand a year from now, let alone a decade, and what impacts it will have on social, cultural, and economic systems along the way. While there are benefits to being able to study and comment upon events and objects as they arise, there are also costs in as far as the results and conclusions of such research must always be understood as being provisional in nature. Consequentially, the ultimate test of the findings of this dissertation will necessarily have to be the degree to which they continue to be borne out and determined to be of continued relevance in the years ahead.

While these studies have many important limitations that must be acknowledged, they also open the door to a number of directions for potential future research. One such direction, one that will help address in part some of its present limitations, involves expanding the corpora of text considered to include a wider variety of sources. Beyond increasing the number of communities and reporting outlets, other classes of texts, such as those generated by formal and legal institutions in the course of their reactions to Bitcoin, educational and promotional materials that have been produced on Bitcoin, and the conversations that have occurred in the public comment sections of reporting websites, are all candidates for new corpora which might be usefully added to the present analysis. This expanded corpora, along with the application of more advanced automated content analysis techniques such as clustering and supervised learning, could greatly round out and deepen the understanding of the social construction processes surrounding digital currencies that has been developed here.

Another line of further development would be to undertake a more systematic, longitudinal investigation into how the discourses surrounding Bitcoin and its valuation have changed through time, and how these changes relate to other metrics, such as Bitcoin's exchange rate and market volumes and significant events that have occurred over the course of its

development. Alongside this temporal focus on rhetoric, future work may also consider a more comprehensive set of factors influencing Bitcoin's valuation. Examples of such factors include rulings on Bitcoin's legal status and statements on it by different national and state government, high-profile exposures of fraud and illegality in the Bitcoin ecosystem, such as the closing of Mt. Gox or the FBI shut down of the original Silk Road, and the impact of external events that have lowered individuals' confidence in their own national currencies, such as Greece's debt crisis and U.K.'s vote to leave the European Union, and potentially driven some to transfer their wealth into stateless digital currencies. By compiling data on this more comprehensive set of factors and analyzing the relationship of them to valuation and adoption metrics such as exchange rate and market transaction volume, this future work will offer not just tests of commonly evoked explanations for Bitcoin's value, but also, provide a more complete and holistic picture of the complex social, political, and economic forces that are driving this new monetary object.

5.4 *Final Remarks*

The advent of digital currency has not only brought about a set of profound technological and financial disruptions, it has also brought about conceptual ones as well. Cultural sociologists have long noted that there is a connection between the stability of our structures and institutions and the lack of conscious attention we pay to them. It is often not until we are faced with novel, ambiguous objects and events that we start to realize how incomplete an understanding we have of the social facts and forces that determine our individual lives and collective fates. Few would argue that in contemporary life, money and economic value are primary determinants in these respects. It is perhaps not surprising then, that in the face of this conceptual upheaval, we find evidence that both our commonplace and academic notions of them have proven to be quite piecemeal and in some cases, contradictory.

Of all the many effects the strange and surprising ascent of digital currency has had so far, one of the biggest has been its redirection of our shared attention back toward the deeply social aspects of value and money. In the everyday course of living, we are prone to forget that such things are being created and reproduced via our own actions and understandings. Faced with the ambiguity of this new monetary object, however, we are inevitably drawn again toward the realization that for all their assumed objectivity, economic arenas are also places that we inter-subjectively constitute and shape via the ways we define and evaluate the objects within them. Bitcoin and its accompanying bevy of alternative digital currencies have, in both intentional and unintentional ways, momentarily lifted back the “veil of money” for participants and academics alike. What we have begun to find underneath it are not the operations of an abstract, “true” economy, but instead, real people attempting to make sense of what things are and what value they hold.

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