

# On the Pursuit of Happiness & the Big History of Money

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## Abstract

The link between happiness and income has long been a focus across several academic disciplines. Two factors are, however, conspicuous in being undervalued for their potential for relevance. The first is, very simply, the kind of money people use – its characteristics and its quality, and the second is whether the type of money in use has an effect on how humans experience happiness. We consider both here. A Big History of Money is outlined based on key epochs in the evolutionary history of money systems. Some general associations of these epochs with structures in the brain are highlighted, especially with respect to their capacity to influence wellbeing. The effects of money on subjective wellbeing are significantly modulated through the mechanisms of the brain's reward system; the most recent epoch of fiat money systems has also seen a worsening of several factors accretive to happiness. This calls for far more attention on the quality of money in circulation and a closer look at past epochs in the Big History of Money for useful insights.

## Keywords

money; happiness; big history; brain

## 1. Smuggling income in

In considering the happiness of humans, two factors are conspicuous in being undervalued for their potential for relevance. The first, quite straightforwardly, is the kind of money people use – its characteristics and its quality. The second is the manner in which humans experience happiness – its mechanisms.

A usual focus in economics is on the assessment of the effect income has on subjective wellbeing or happiness rather than the nature of the currency in which the income is denominated. A key lynchpin in this regard has been the so-called 'Easterlin paradox' which suggests that, while reported happiness reliably increases with gains in income, there are diminishing returns. There have been several revisions and refinements of this observation since it was made by Easterlin in 1974. For example, Kahneman and Deaton (2010) reported that beyond an income of \$75,000 in the United States, gains in happiness were negligible, though gains in life satisfaction were possible. In a cross-country study across 54 developing nations, Howell and Howell (2008) suggested that the relationship between happiness and income was strongest among the poorest and least educated, but that, even in those cohorts, the effect moderates when economic status was defined by wealth rather than income and wellbeing was defined not as happiness but by satisfaction with life.

There is, however, little commentary on the intervening role of the characteristics of money, let alone a serious consideration of how wellbeing itself is perceived by humans physiologically as the characteristics of money alter across time and place. This is especially peculiar since the observation was initially made at a time when the nature of most monies had undergone a fundamental alteration, going from a gold exchange standard to a purely fiat model. That this alteration may have had some independent effect on happiness than income does is, perhaps, a difficult claim to assess. Nevertheless, if there indeed are connections between the features of the money that is being used and the quality of wellbeing an individual experiences, the ramifications are fundamental. For example, there would then need to be a far more critical appraisal of any proposal to alter some aspect of a money in circulation on grounds of social wellbeing rather than on economic imperatives alone. Further, individuals would then be served well by being informed on the choices that they can feasibly make in adopting a form of money that is more conducive to their wellbeing.

Since the Easterlin paradox was outlined, it has been observed that reported happiness has not kept pace with gains in per capita income in developed countries, and that individuals appear to be maximizing happiness by making relative comparisons between their own condition and what is experienced by some reference group (Oswald, 1997).<sup>1</sup>

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1 On this topic, see also Clark et. al (2008), which also contains a useful review of the literature on the paradox.

Indeed, the concept of individual ‘welfare functions’ directly contends with subjective evaluations that individuals might make about the utility they derive from their incomes. They may compare their incomes with past incomes or with their evaluation of their relative position in their perception of the society’s income distribution. In both cases, individuals display a remarkable propensity for preference shifts that make happiness gains from income gains to be smaller than imagined. In other words, individuals make income gains progressively banal, failing to derive as much happiness from them.<sup>2</sup>

Even if income has special relevance to happiness through its distribution, it would seem particularly relevant to also observe that such distributions of income are affected fundamentally by the type of money that a society adopts. Take the simple observation that the shares of aggregate income enjoyed by the top 5% in the United States relative to the bottom 20% have been relentlessly diverging in the era of fiat currency. If this variance could have been attenuated with an alternate type of money, it would at least make monetary reform a factor worth considering alongside other social, political and economic policies that purportedly address income inequality, leave alone happiness. At present, money is seen to have no direct role at all.

Two areas of inquiry suggest themselves as pertinent and are, therefore, the focus of what follows. First, explanations and extensions of the relationship between income and happiness can gainfully be made by appealing to biology and psychology. This seems essential if the objective is to understand the physiological foundations for the very idea of subjective wellbeing and to assess what role money plays in such biological mechanisms. For example, it seems counterproductive to undertake investigations of any relationship of money and happiness without an understanding of what drives value in the human brain in the first place and how those neural mechanisms can get disrupted. Second, a Big History of money is adumbrated in Section 2 below for the context of this analysis. While this is an immense topic, the point of doing so is to be able to identify how developments in money over long stretches of time have occurred and to then assess what impacts those changes may variously have had on human wellbeing.

### *1.1 Happiness resets*

Let us begin by motivating a key goal of this paper to which we shall return later – exploring the relevance of biology to wellbeing, especially in the context of income as a reward. Rayo and Becker (2007) address this connection rather simply. They argue that the empirical regularities of the Easterlin paradox are ‘innate’ and can be understood using a principal-agent framework – where Nature is the principal who devises an effective happiness function – rooted in evolutionary biology. Organisms are provided (by Nature) with happiness merely as an evolutionary heuristic that helps maximize the chances of their genes surviving relative to the status quo. In Easterlin (2001), another compelling paradox is offered that underscores the role of psychology. It observes that, while income and happiness do vary positively in the aggregate, over the life-cycle of an individual there appears to be no relationship. Strikingly, individuals across all age groups report that they were less happy in the past than the present and expect to be happier in the future. This ‘expectation’ of happiness in the future is, of course, how we would expect a biological heuristic for happiness in an organism to function. It would serve to inspire action by the individual in the present to acquire some indefinite amount of resources that could lead to happiness in the future. This, of course, is because the acquisition of resources raises the probability of the organism’s genes to survive and be passed on.

Note that, for such a heuristic to have enduring efficacy, a reset of what constitutes ‘happiness’ appears to be necessary. Once the resources are received, the individual’s perceived level of happiness must then reset to a lower level of happiness than was previously imagined. Thus, regardless of the accumulated size of the resource stock, happiness recedes (even if satisfaction with life improves). However, if this is so, the happiness-seeking individual is impelled to engage in ever costlier actions for further resource acquisition, since the associated happiness interminably dissipates. This episodic lessening of happiness — and in a world with rational expectations, even the prospect of its lessening — is a stressor for the individual, serving as an impetus for present actions that enable the acquisition of yet more rewards. As such, this framework accords well with a biological explanation for the role of happiness life – as a necessary physiological phenomenon of human life, honed by processes of natural selection.

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<sup>2</sup> Frey and Stutzer (2002) provides a useful review of some interesting empirical research on this topic.

The Easterlin paradox and its associated strand of literature engage with important ideas pertaining to human flourishing, but they dismiss the potential role that the characteristics of a money might play by focusing attention on income instead. Similarly, the evolutionary relevance of happiness as a heuristic may, again, be a potential explanation, but it replaces the role of income with, generally, ‘survival’ in affecting happiness via an individual’s relative position within a distribution. In all of this, we simply take money as neutral over time and across places.

Two questions appear to be pertinent in examining the role of a money within this framework for a link between happiness and income? First, when a system of money alters, does this also entail an alteration in the relationship between happiness and income? Given that money systems alter infrequently, and that the effects of such changes may require long stretches of time to manifest themselves, it is possibly worth posing this question by appealing to the biological framework. So, in the long evolutionary history of humankind, what role did the changing nature of money systems play in shaping the dynamic between happiness and income?

As a money erodes in its value it ought to motivate a rational, happiness-seeking actor to alter behavior in some direct correlation with the rate of that erosion. This much seems obvious. For instance, in a study examining the effect of income on happiness, Morris et al (2021) used longitudinal survey data in Australia spanning 19 years. Even over that relatively short period of time, they show that the inflection point for diminished affective wellbeing from gains in income was delayed at a pace even faster than the rate of inflation.<sup>3</sup> While they attribute this additional delay to inequities arising from a changing income distribution, there is also a significant body of literature in economics that links inflation to a worsening of income inequality through a variety of channels.<sup>4</sup> Thus, it seems worth examining the intervening effect of money in the relationship between income and happiness with the benefit of a more holistic perspective rather than using the narrower framework of

inflation as merely a monetary phenomenon.

Second, why does an individual willingly assume the goal of maximizing happiness? Even at the outset, minimizing unhappiness ought to be a stronger motivation than maximizing happiness, given that individuals are strongly predisposed towards loss aversion. This, of course, is an observation that has been corroborated repeatedly in economics ever since the seminal work of Kahneman and Tversky (1979). This is hardly a minor semantic difference if the kinds of resources individuals acquire vary by whether they seek to maximize happiness or minimize unhappiness; the latter is arguably not the dual of the former, especially if the type of money an individual earns determines some significant proportion of the kinds of resources that can be purchased in a market and, of course, has a bearing on the individual’s evolutionary fitness.

We think that gainful headway in thinking about these questions can be made by adumbrating a Big History of Money. Doing so will permit us to draw out stark contrasts and consider the effects that are far too subtle to notice within the shorter timespans typical of studies on income and happiness.

## 2. On thinking big

Students of Big History concern themselves with the mammoth task of arranging significant epochs in the story of life on Earth – from their earliest beginnings to the present – and then examining the dynamics of the resulting time series. Of interest is the structure of this series, whether the timing of the next epoch might be extrapolated, and on the idea of some terminus or ‘singularity’. The singularity, in this context, can be understood as the eventual obsolescence of human biology and intelligence brought about by a suite of technologies that develop exponentially. While Kurzweil’s 2005 book brought the idea to wide attention, work by others that preceded his contribution and those that have built upon it deserve credit.<sup>5</sup>

An obvious criticism one might make is that any extrapolation made from this kind of analysis is suspect on grounds of presuming an invariant structure. Besides, such

3 The annual inflation rate in Australia during the period of the study – 2001 and 2019 – varied between 4.5% and 1.5%.

4 See, for example, Law and Soon (2020), which examines data for 65 developed and developing countries from 1987 to 2014. It argues that the effect of inflation is to worsen income inequality, though this effect is partially ameliorated by better institutional quality

5 A useful review of some key contributions in this area, as well as an explanation of the derivation of the approximate timing of the singularity can be found in Korotayev (2020).

datasets, perhaps unsurprisingly, may not always conform with one another. Dates for included epochs can vary and so can the epochs that are eventually included. Consequently, it is perhaps easy to dismiss the entire enterprise as relying on a somewhat subjective foundation.

However, doing so seems unduly dismissive at the very least, and it stands the risk of paying insufficient attention to a possibly momentous epoch in our collective future. First, there are several key epochs that do feature unfailingly across most such compilations because they rely on an historical record with a significant degree of consensus. These usually include the approximate age of the Earth, the onset of the Cambrian explosion, the extinction of the dinosaurs, the first hominids, the advent of lithic technology, the appearance of modern humans, the advent of settled agriculture, the invention of the printing press, the beginning of the Industrial Revolution, the description of the structure of DNA and the sequencing of the human genome.<sup>6</sup> When these compilations are analyzed, they each produce estimates for the singularity occurring surprisingly close to one another: Roughly in the first third of the 21st century. Second, this estimate holds true when the entire dataset is examined, stretching over millions of years, or when subsets of the dataset are considered, say, for example, examining relatively recent history alone. (Korotayev, 2020) Third, the *nature* of the singularity event is, after all, entirely separable from what the datasets suggest is its likely *timing*. It may indeed turn out to be an event without any material significance to the course of humanity, but to dismiss it as necessarily so with confidence presumes a great deal.

Regarding the self-similar nature of the hyperbolic growth that such studies establish when the durations being analyzed are progressively shortened, two explanations are worth considering. The first relies on the observation that a system's complexity comes from the degree of granularization of the knowledge it embodies. As knowledge sources become increasingly granular the extant system becomes unstable; the new form of knowledge essentially exposes some type of fatality in the outcomes emanating from the extant system's disequilibrium dynamic. This motivates a transition to a new and more complex system based upon the more granularized knowledge that again displays hyperbolic growth, albeit at a timescale that is

considerably accelerated.

A second explanation relates to the ability of complex adaptive systems that are regulated at points of critical change – or period-doubling bifurcations that would tend towards chaos – by an increase in the amount of usable energy (LePoire, 2015). Rather than being driven towards chaos by this change, a period of learning ensues, which has the effect of drawing the system away from chaos, and towards a new stable outcome. Thus, the effect is that of the complex adaptive system displaying a logistic growth pattern.

Note that both these explanations are related by the idea of learning – be it in a form that increases the rate of specialization or in the ability to leverage energy. Knowledge is by nature cumulative. It naturally becomes more granular over time as the process of learning yields finer and deeper insights on aspects of the accumulated knowledge. When some of this learning pertains to developing the capacity to use more energy in a complex adaptive system the second of the explanation above finds support.

These and other explanations on the mechanics of Big History approaching a singularity are provided in the context of life on Earth and its interplay with physical systems and technology. However, it may also be useful to adopt this approach for the analysis of money. Interestingly, we shall see that these general observations on the relevance of learning for the dynamics of Big History are relevant to a construction of a Big History of Money as well. Additionally, we may ask whether the evolution of money plays a significant role in the anthropocentric course of Big History and the nature of any impending singularity that affects human wellbeing.

### *2.1 A Big History of Money*

In this section we turn to a consideration of some of the most significant events in the history of money in an effort to construct an approximate timeline for its own big history. To do this, it is helpful to cast the remit broadly and evaluate how the various functions of money – now deemed so obviously essential – first became immanent in some prevalent system for interpersonal transacting, regardless how rudimentary such a system may seem to us in retrospect. If we take for granted that transactions have

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<sup>6</sup> A more contemporary list would arguably add the events such as the global financial crisis of 2008, the COVID-19 pandemic, the 2022 war in Ukraine and the emergence of AI in the form of broad-use LLMs such as ChatGPT and its peers in 2022.

existed since the beginning of prehistory, then the idea that a proxy for money was needed to exchange the products of knowledge and specialized effort from the very outset seems logical. Some medium or mechanism to facilitate all manner of exchange, in other words, was always required. As knowledge became more granular, there must have been a commensurate need for the money system to facilitate exchange of its more specialized products. The most primitive and, arguably, instinctual basis for such a medium may actually not have been something directly tangible, but the idea of prosociality. Prosociality works as a medium of exchange in the abstract, but its normalization as a proto-money subsequently enabled a whole host of monetary systems that required some degree of trust in an intermediary.

Prosocial behavior in the context of one transaction enables a member of a group to accumulate a form of social credit with others within the group, which can then be used by the member to ‘finance’ future transactions. It is important to note that there are enormous differences in the quality and characteristics of prosociality. It is, therefore, unsurprising that, in the Big History of Money, the evolution and refinement of prosociality required a significant stretch of time.

The evolutionary lines of mammals and reptiles diverged in the Carboniferous era, more than 310 million years ago. It arguably also marked the beginning of the story of prosociality, and, therefore, laid the foundations for the first event in the Big History of Money. Mammals are far more capable of prosocial behavior than are reptiles, a propensity attributed to the fact that mammalian brains possess the conducive structures – chiefly though not solely within the prefrontal cortex – that reptilian brains either lack entirely or for which they possess far simpler analogs. The substructures within the PFC (such as the vmPFC, dlPFC and the angular cingulate cortex) regulate a complex set of behaviors necessary to social living. These include the recognition of emotion and pain in others, empathizing, making appropriate decisions that enable cooperative behavior, and altruism. However, early mammals did not possess the dense granular layer of the PFC that is implicated in complex representational thinking and working memory (Preuss and Wise, 2022). There is reason to believe that this part of the PFC is specific to primates, and would thus not have appeared until 55 million years ago, though possibly somewhat earlier. The evolutionary lines of our hominin ancestors diverged from chimpanzees roughly 7

to 9 million years ago, and the PFC continued to become progressively more complex among hominins.

The long evolutionary story of prosociality from early mammals to modern humans is crucial to the Big History of Money. A principal reason is that its complex neurological basis leaves indirect clues for the types of monies that may have been practicable. Consider the role that the PFC plays in both subjective valuation and representational thinking, both key prerequisites for a monetary system that enable higher degrees of abstraction in a transactional medium. The functions of placing subjective relative values on items among a set of objects and, subsequently, making an informed choice among them are handled by parts of the PFC. Laboratory experiments with monkeys establish that relative activity at the neuronal level seems to behave as a numeraire currency for this task even prior to consumption (Kable and Glimcher, 2009). Thus, primates seem to be hardwired for at least this essential function of money via the PFC.

Besides representational thought, the PFC plays a crucial role in goal-directed behavior and forward planning (Carlen, 2017). Once the transactional value of prosocial behavior has been established within a small group, the benefits of employing tangible representations of credit was likely enabled by the refinements of the structures of primate and hominin PFCs. The first of these tangible representations in wide use as money were very likely stone tools and collectibles in the Paleolithic; a tantalizing reason for this proposition is that a connection exists between language and toolmaking in the evolution of the brain, and the evidence for such a connection becomes increasingly stronger as the complexity and abstraction of the toolmaking industry increased (Stout and Chaminade, 2012). Broadly, the nature of the object used as a money for indirect barter arguably has a close relationship to the social and cultural evolution of a social group. For example, it has been shown in the context of certain tribes that an object with no objective use can acquire a significant amount of exchange value by acquiring a ‘density’ of meaning that can come from its association with the identity of the owner, religious significance, aesthetic value and a variety of other factors beyond economic value. Understandably, the velocity of such dense objects in exchange drops as the propensity to hoard them increases, thereby giving the object that necessary capacity of a money to store value over time. (Weiner, 1994)

In other words, the abstraction required for substituting a greater variety of objects for money, rather than resorting to direct barter or prosociality, was similar to the increasing abstraction displayed by the successive toolmaking industries in the Paleolithic and the development of the capacity for language to convey the mechanisms of a system to a larger and more disparate set of individuals. If this premise has merit, this vital stage in the Big History of Money was reached by at least one million years ago, and possibly even several hundred thousand years before then. The reason for this dating is based on identifying which of the various stone tool technologies used throughout the Paleolithic was most definitely the first to be representative of two key aspects: First, that the tools and artifacts were being produced with purpose, planning and imagination in a collaborative social context, which would thus imbue them with a greater density of meaning, and, second, that there is evidence of the produce being used as gifts (which is a mechanism for accumulating prosocial capital) or as direct offerings in trade. On both counts, the most likely earliest candidate is the Acheulean stone tool industry, which was only possible with a greater capacity in our ancestral hominin species for learning through some form of instruction (Arbib, 2011). Further, attention was paid to the aesthetic value in the stone tools (chiefly, handaxes) for reasons that range from their relevance in sexual selection to an understanding of the golden ratio being inherently desirable; thus, tools were being produced no functional value at all (Spikins, 2012).

It comes as no real surprise that the logic of indirect or representational barter in prehistory – spanning a period of over a millennium or more – was expanded, albeit exceedingly gradually, with the use of a greater variety of commodities. Besides animals, cowrie shells, foods and stone collectibles, other commodities became possible by the Neolithic through discovery and gradual perfection of new technologies – principally metallurgy, but also pottery. Each such item preferentially facilitated indirect barter to the extent that it was more readily salable, an idea attributable to Menger (1892), referring to the relative ease with which any commodity can be disposed of over time

and distance, especially when its supply increases. Thus, what functions as a money approximates the chronology of the various archaeological periods, from the Paleolithic to the Iron age.

Some form of intermediated barter was very likely the norm for much of our prehistory, with a substantial overlap with the earliest forms of prosocial living among hominins. In the absence of a formal ledger of record, a third party may have proxied for an intermediary to facilitate transactions that lacked a direct correspondence of needs, either by using cave art, stone tools, or other objects such as beads and shells that we know were used as currency much later. Barter has been conducted in a variety of ways in recorded history, and is still used routinely as a means to effect transactions, especially when official monetary systems begin to collapse. We have several examples of modern-day hunter-gatherer tribes engaging in barter with farming communities, including by providing their labor to the farmers.<sup>7</sup>

The larger point is that, in the Big History of Money, the emergence of barter was likely just an extension of the logic of prosocial exchange, itself with neuropsychological bases, for transactions that were more complex, and likely aided by some representation of credit almost from the very beginning. The representation of credit by way of a record rather than with the aid of objects may also have been attempted much earlier than we commonly imagine.

Still, what we can venture is that the next stage in the Big History of Money was the transition from representational money as a tangible object to a supplanting of money by an indirect unit of account – a ledger. While not conclusive, there is some evidence that ‘representational records’ of transactions – proto-ledgers, so to speak – may have existed long before the Neolithic revolution, and certainly well before the antecedents of modern accounting were established in Asia. For example, tally sticks, such as the famous Ishango and Lebombo bones, as well as etched teeth and etched ochre were being used as far back as 77,000 years ago.<sup>8</sup> Even more tantalizingly, there is evidence of a remarkably concise set of symbols being used in cave art paintings all over the world, some of which are at least

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<sup>7</sup> See Peterson (1978) for several interesting examples and a more thorough case study of the Agta hunter-gatherers and the Palanan farmers in the Philippines.

<sup>8</sup> Regarding the numerical connection of etched ochre found at the Blombos cave in South Africa, see Bullington and Leigh (2002).

100,000 years old.<sup>9</sup> Key stages of advancements in ledgers were naturally only possible with the advent of writing and mathematics. Thus, we find evidence of intermediated transactions recorded on stone tablets in cuneiform – the earliest form of writing – by 3200 BC in the Sumerian city of Uruk, and we find the earliest evidence of accounting in India – where both base-10 numerals and negative numbers were invented – in Kautilya's *Arthashastra* by 300 BC. (Mattessich, 1998) The double-entry system as we know it today did not come about till much later, principally through the efforts of Islamic scholars such as al-Khwarizmi (800 AD) and in the Italian scholar Luca Pacioli's opus *Summa*, which was only published in 1494.

The use of gold, silver and electrum as specie was indisputably occurring in the Iron Age, in kingdoms within the Lydian, Indian, Chinese, Roman, Greek and Egyptian civilizations. Paper currencies evolved gradually from the idea of commercial promissory notes that were backed by gold or silver, eventually becoming adopted as a practice by governments. The earliest paper currency likely originated in the Song dynasty of China in the 11th century.

In the modern era, there has been far more rapid evolution of money from a state-issued currency that is backed by a commodity to one that is entirely money by state fiat. In the intervening decades, states routinely resorted to fractional backing even while still under regimes of specie money by way of debasement. For example, in a period of roughly five centuries under the Roman Empire beginning in 25 BC, the intrinsic silver value of the coin (primarily the denarius) fell from containing roughly 3.9g of high-grade silver per coin to little more than a thin coating of degraded silver, well under a gram. The development of a state-sanctioned banking system, beginning in 12th century Italy, permitted the issuance of private currencies in various parts of the world that were frequently backed by less than a 100 per cent of reserves of the official state currency or any commodity. While central banks arrogated this privilege from private entities, it only served to delay the slow march towards a fiat currency regime, a fact exemplified by the fate of the US dollar, which lost all connection to gold in

fewer than 180 years since its birth in 1792. While much of the world went on a gold standard during the latter half of the 19th century, virtually all countries had abandoned a peg to the value of gold by the end of the Second World War, and then even to the value of a gold-backed dollar by 1971.

The only significant change in money after the birth of fiat currency arguably came in 2008 with advent of Bitcoin, which is significant for at least two reasons when contrasted with a fiat currency. First, it is a peer-to-peer digital currency with a hard limit on its overall supply, thus reintroducing a money system that is based on a rare commodity. Second, it is issued on an open-access distributed network, yet its transaction history is made entirely immutable by its use of a ledger technology called the blockchain that is secured by an inordinately high energy cost barrier to any saboteur. Several thousand cryptocurrencies – admittedly, a sizable fraction of which are scams – now vie for a role within an ever-expanding ecosystem of digital tokens of value.

### **Proposed timeline for the Big History of Money**

Based on the preceding, we now summarize the key epochs of note in the Big History of Money. While one might argue for some other innovations in money systems to be included, the epochs that are included here were seminal in their influence on the nature of money systems. They are as follows –

Around 7-9 million years ago the idea of a medium of transaction firmly took seat in the brains of our most distant hominin ancestors. This crucial transformation was the ability to make prosocial commitments within a social group in exchange for value received, and it became the basis for a proto-money.

While we cannot intelligently make the case for when in human prehistory the practice of barter was employed as a monetary system, we can certainly advance a more convincing case for when approximately representational barter is likely to have emerged. We place this to be around 1 million years ago during the Acheulean tool industry.<sup>10</sup>

The emergence of money as a unit of account facilitated

<sup>9</sup> See Petzinger (2016).

<sup>10</sup> Note that this would be roughly half a millennium after the very first Acheulean tools emerged. At the beginning of this tool industry there was significant overlap with the older Oldowan technology. However, by 1 million years ago the Acheulean tool industry was clearly exhibiting the characteristics most likely to make it the basis of a money system based on representational barter.

by a proto-ledger system might be dated to as far back as 100,000 years ago, though a more formalized version of such a system that is based on an explicit legal code legitimizing the role of an intermediary can be said to have emerged only by 5,500 years ago.

By 3,000 years ago the use of specie as legal tender was widely prevalent. While stone artifacts, metals and bullion as money had existed well before then, the key innovation now was that state entities centralized the issuance of money and arrogated the privilege of seignorage and indulged in the practice of periodic debasements.

1971 is significant for the end of the Bretton Woods system, which had established the US dollar as the global reserve currency after the end of the Second World War, largely by virtue of its issuance being directly tied to the disproportionate global stock of gold that belonged to the United States. Its end finally severed even this indirect link between dozens of national currencies and national stocks of gold, be they in the United States, repatriated from there to domestic coffers or any local stocks of gold. Thus, 1971 marked the beginning of the era of fiat currencies as money.

The final epoch in our chronicle is that of the advent of cryptocurrencies, beginning with Bitcoin in 2008. Bitcoin introduced the idea of a peer-to-peer money with a publicly auditable and ultimately fixed supply that follows a predictable and decelerating schedule of issuance. The significance of a public blockchain, secured by a robust protocol that generates consensus over the state of a transactional ledger across a network, cannot be overstated; implemented effectively, they hold the very real potential to decentralize all manner of market orderings, thereby arrogating the roles of legacy banking, finance, and contracting infrastructures. It is, in part, a recognition of the scale of this disruption that has inspired several governments to retaliate with attempts at restrictive regulation and with offerings of central bank digital currencies.

### **3. Breaking happiness down**

While economics adopts the premise that individuals seek to maximize their happiness, issues pertaining to what

sort of happiness is being maximized or how its quality might vary is beyond its purview. However, empirical studies indicate that some factors do inhere in its definition across diverse groups. These include material concerns, family and social life, health, employment and the broader socio-political institutional environment.<sup>11</sup> Yet, each of those factors are arguably affected by the sort of money prevalent in a society, and so it seems odd that the quality of money is left out from debates on happiness.

It is a well-established fact, for instance, that the loss of income and unemployment both result in a reduction in the reported levels of happiness. At the aggregate level, a given unit of increase in inflation is associated with a significant though smaller drop in wellbeing than from a unit increase in unemployment. (Di Tella et. al, 2001) Inflation is an immanent feature of all modern monetary systems. It is a banal matter of fact that, at a minimum, if increases in wages do not outstrip inflation, perceived wellbeing would progressively deteriorate. In the United States, while real disposable per capita incomes did increase from \$21,000 in 1979 to \$41,000 in 2015, real weekly earnings for the full-time employed began at just under \$350 in 1979 and remained there until 2015.<sup>12</sup> Thus, even prima facie it would be hard to argue that subjective wellbeing for the majority in the United States rose over a period of 35 years. In addition to the direct effect on real income that inflation creates, this additional requirement to work introduces other sources of losses in happiness, such as that of changes in happiness that are attributable to the level of stress experienced in the work environment.<sup>13</sup>

Take health and material needs next. Experiments suggest that the mere psychological priming of an individual's mind for an abundance of wealth alters their behavior. They begin seeing themselves as more self-sufficient as well as less predisposed towards being social (Vohs et. al, 2006). A 2016 study covering over 100,000 adults in the United States suggested that individuals with higher incomes were more likely to spend time alone, less time with family and more with friends (Bianchi and Vohs, 2016). In the book, *Scarcity*, Mullainathan and Shafir propose the idea

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<sup>11</sup> Easterlin (2001) provides a review of the empirical literature on this conceptualization of happiness.

<sup>12</sup> These data are from the US Bureau of Economic Analysis.

<sup>13</sup> A 2023 Gallup report, makes for some sobering reading. The United States led the world in reported workplace stress, even in an especially good job climate. Globally, there has been a steady rise in workplace stress, rising from about 30% of employees in 2009 to 44% in 2022.



of a scarcity mindset that reduces an individual's mental bandwidth, leading them into adopting a range of adverse behaviors that breed yet more scarcity – sort of vicious feedback loop that entraps people into becoming resource poor. Generally, states of abundance and scarcity manifest real psychological changes in addition to the economic ones. The book suggests that scarcity causes a sort of psychological trauma that then creates real effects, ranging from a heightened focus on trying to resolve the immediate consequences of scarcity (perhaps emanating from a sharpened survival instinct that narrows the bandwidth of the mind) to even a measurable deficit in one's IQ.

Rather than this abundance-scarcity framework, though, what if we were to examine whether the immanent features of the money being used in a society play a role directly? What if, when a money's characteristics are altered, its ability to modulate behavior changes, and that this has physiological bases and effects? This would place the quality of money squarely within any feedback loop that concerns itself with human wellbeing. Indeed, one intervening variable in such a dynamic might be that of money systems affecting the sense of abundance vs scarcity, which then affects human flourishing, but there may also be other such factors to consider.

### 3.1 Money on the brain

In order to understand the physiological basis for the relationship between money and happiness, a useful place to start is the prefrontal cortex (PFC), the same area of the brain that played a crucial role in enabling incrementally more complex patterns of prosociality as the basis for money. Though other areas of the brain are involved, it is primarily the PFC that is responsible for the development of executive cognitive function (ECF) in humans. ECF comprises a group of behaviors that is especially developed in humans relative to other animals. Significantly, it includes self-regulation and motivation in the presence of a reward, but it also plays a role in memory, decision making, cognitive flexibility and deliberate attention.<sup>14</sup>

A majority of ECF skills are already developed by the time a human enters adolescence; while some tasks associated with ECF continue to develop, much of what is

readily accessible is already in place by early adulthood. This is significant for at least two reasons. First, a lack of adequate executive cognitive function –quite literally, its dysfunction– is implicated as a leading cause for a range of addictive behaviors, such as extravagance, gambling, substance abuse and alcoholism (Betancourt et. al, 2012; Giancola and Moss, 1998; Jones et. al, 2021). Second, dysfunction of ECF is linked with adverse financial conditions, from over- indebtedness to abject poverty (Achtziger, 2022) and even a self-perpetuating cycle of chronic pain and degrading abilities to regulate and motivate oneself (Caes et al., 2021).

The relevance of money can hardly be seen as peripheral here. Indeed, a long strand of literature has repeatedly observed that monetary rewards have the potential to reduce rather than enhance the motivation an individual has to perform, a key component of ECF.<sup>15</sup> Money is classified as an extrinsic reward in such studies and then contrasted to intrinsic motivation, which is shown to become attenuated in the presence of a monetary reward. The two forms of reward are seen as antipathetic and the phenomenon is called an 'undermining effect'. In addition to the PFC, the undermining effect appears to be a result of activity in the cortico-basal ganglia valuation system, which connects the PFC with other parts of the brain, such as the basal ganglia and the ventral tegmental area (VTA). The VTA is also the area of the brain that controls the brain's mesolimbic or reward system<sup>16</sup>, which is crucial to how we experience happiness. It is implicated in producing the reward prediction error, whereby the extent of neuronal activation in the brain's dopamine pathways depends on the difference between the expectation of a reward and reality rather than on the reward alone.

Two remarks seem pertinent at this juncture. First, if money – either directly or indirectly – exacerbates addictions and can demotivate performance, it seems worth understanding whether altering the form of monetary payment can help individuals curtail addictive behaviors and retain more of their ECF. Economics, for the most part, skirts the issue of the effect of monetary quality on motivation, choosing instead to address motivation through the manipulation of incentives through pricing and

<sup>14</sup> See Chan et al. (2008) for a review and discussion of ECF and its components.

<sup>15</sup> See, for example, Ma et al. (2014) and Murayama et al. (2010) for overviews.

<sup>16</sup> The broader reward system in humans is dauntingly involved and comprises a dizzying complex of neuronal pathways incorporating numerous parts of the brain besides the VTA, such as parts of the cerebellum and the brainstem.

contracts. For example, an explanation for the undermining effect in economics highlights situations of information asymmetries favoring the principal (Bénabou and Tirole, 2003). In such cases, the agent's reward is a substitute for trust in the short term. Over the longer term, though, the principal must bolster the contract with mechanisms that help build intrinsic motivation, for example, through progressively empowering the agent over time.<sup>17</sup> Thus, note that the contract is used to iron out the initial disjunction created by a monetary reward in the kinds of motivation rather than employ a mechanism that might correct for the quality of the money reward directly.

Second, to the extent that certain types of money in the Big History of Money have been less antithetical to individual wellbeing – at least regarding ECF and intrinsic motivation – can a money be devised that selects among these desirable features, performs adequately in its role as a money and, yet, does not come at the expense of retarding socioeconomic progress? It is easy to see that when a money consists of little more than direct prosocial credit it incentivizes reciprocal behavior, making extrinsic and intrinsic motivation reinforce each other. Each subsequent epoch in the Big History of Money introduced more abstract representations of money. The principal benefit of these abstractions has been that each subsequent form of money enabled economies that featured more specialized activity and more complex transactions. However, there have arguably been costs in subjective wellbeing to this progress through the Big History of Money. First, it has come with increased prospects for more friction between the two forms of motivation, and, second, over the last century and especially since the era of fiat money began, we have been witness to the dramatic financialization of markets. This rapid financialization has led to an increase in the relative incomes of capital to labor and an attendant increase in income inequality.<sup>18</sup>

Money can be seen as a placeholder for all manner

of resources that might be acquired in the future. In this respect at least, adjusting to changes in a money system ought to be relatively straightforward, involving chiefly just a rediscovery of the relative opportunity costs. However, this is less innocuous when one takes this statement in the context of the preceding remarks. In practice, money is best seen as a substitute for the expectation of a resource in addition to a proxy for it. Thus, depending on the money system, the expected utility from a given quantity of money is itself variable. When the expected marginal value of money erodes, however gradual that might be, it subsidizes behaviors that promise to provide earlier gratification; an individual's time preference for money is strongly influenced by the rate of at which her currency loses value in real purchasing power.

Indeed, some research suggests that the modulation of certain neurotransmitters in humans can affect both their perception of the value of a monetary reward as well as their subjective probability of acquiring it (Schutte, et. al, 2020). To the extent that expected utilities alter when moving from one form of money to another, we would naturally expect behavior to be different as well. This, however, is true not merely on the basis of the observation that it may be economically rational to behave differently under the two money systems, but also because each money system may itself be guiding behavior on a *physiological* basis.<sup>19</sup>

Evaluating the quality of a money, especially over vast stretches of time or between disparate national and cultural contexts, is fraught with difficulty. However, it may be possible to make some broad observations by examining our dopamine-regulated reward system.

The reward system in human brains is neither static nor modern, but evolved over millennia in our hominin ancestors to provide us with evolutionary fitness. Since the reward system was shaped by the evolutionary imperative to survive, it is attuned to dealing with behaviors that directly assist survival, especially the desire to mate and

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17 The ill effects of the setup are evident when the authors consider the converse of this logic, suggesting that, in team production, it is possible to imagine that one agent can unintentionally demotivate a partner through 'ego-bashing' in order to gain dominance in the relationship.

18 For the context of the United States, see Lin and Tomaskovic-Devey (2013). For a broad study across 20 countries since the beginning of the Industrial Revolution, see Piketty (2014), which additionally highlights the role of political and social processes in modulating the effects of an increasing capital share on income inequality.

19 To contend that these amount to the same thing would be placing an inordinate degree of faith on the rational choice framework in economics having some direct and tractable biological basis.

procreate<sup>20</sup>. Moreover, this system is also connected to other activities such as staving off disease<sup>21</sup>; feasting in order to build body stores of energy above homeostasis levels, presumably to ward off death from starvation longer<sup>22</sup> and even forming social hierarchies<sup>23</sup>. Generally, beyond the crucial role of the reward system in responding to expected rewards, it is also implicated in handling the variance of such rewards, which is to say that it plays a significant role in the principle of risk and reward.<sup>24</sup>

Notably, the various epochs in the Big History of Money would have each played an indispensable role in this process of shaping the human reward system. Prosocial credit as a form of rudimentary transactional money dominated the Big History of Money in terms of its longevity, and thus it ought to have had the greatest import on our reward system. Indeed, it has been argued that the reward system of the brain ought to be seen in conjunction with its social behavior network<sup>25</sup>, precisely because social behavior must be rewarding or punitive for the reward system to enable behaviors to become adaptive over time (O'Connell and Hofmann, 2011).

For well over ninety percent of the time that modern humans have been around we have lived in an environment devoid of any formal 'money system' that we would recognize now. Thus, once money systems were interposed to organize transactions across time and space, then repeatedly altered, our reward systems had to adjust. When money progressively began deteriorating in face value, our reward system conditioned us to modify behavior to restore the eroded value, on occasion even to transmute money into something that can be preserved or simply consumed more rapaciously.

#### 4. Reframing happiness

Observations made in the preceding section suggest a fatalistic conclusion: Our reward system ostensibly fuels a preference for alterations to our monetary systems that have malign effects on our wellbeing. The most recent epoch of the Big History of Money has especially enabled the financialization and proliferation of markets that leverage our proclivities for stimuli that provide ephemeral and addictive dopaminergic responses to our detriment. Thus, the Easterlin paradox of largely unchanged happiness levels in the face of significant gains in real incomes, especially in developed economies and precisely in the epoch of fiat money, is no surprise. Indeed, in light of the pivotal role of the brain's reward system in both depression and in the undermining effect, it seems an egregious error to minimize its role in any investigation of a relationship between happiness and income.

While one might point to the alarming rise in personal insolvencies over the past century<sup>26</sup>, the range of invidious addictions stands as an even greater testament to this destructive process – substance addictions such as to drugs and alcohol<sup>27</sup> or to calorie-dense foods<sup>28</sup>, as well as behavioral addictions to gambling<sup>29</sup> or a range of behaviors associated with a compulsive use of the internet<sup>30</sup>. Clearly such a trajectory does not bode well for our mental health and wellbeing.

Such a conclusion does, however, minimize our ability to rein in the destructive excesses of this process, emphasizing only our propensity for heedless reengagement. It suggests a certain moribund determinism in the face of abstract monetary systems and an ever deeper financialization

20 Fisher et al. (2005)

21 Ben-Shaanan, et al. (2016)

22 Alonso-Alonso, et al. (2015)

23 Ghosal, et al. (2019)

24 Preuschoff, et al., (2006)

25 The social behavior network involves several other different parts of the brain than the reward system, including the hypothalamus.

26 See, for the case of the United States, Garrett (2006), which presents the statistic that, "(a)s of 2004, the filing rate was 5.3 per 1,000 people, more than four times the 1980 rate and nearly 80 times the 1920 rate."

27 Wise and Jordan (2021)

28 Volkow et al. (2017) and Baik (2013)

29 Hasanović et al. (2021)

30 See, for example, Liu and Luo (2015) and Weinstein and Lejoyeux (2020). Cheng and Yee-lam Li (2014) presents a cross-country examination of the relationship between internet addiction and wellbeing, establishing some variance across countries but also an inverse relationship between internet use and the subjective quality of life.

of markets, denying any critical ameliorative role for individual agency over happiness.

As a matter of fact, there exists the tantalizing prospect that we *can* reframe the link between happiness and money to improve human wellbeing. It would require, however, a considerable and effortful change from the status quo.

For example, even the *self-recognition* of impaired ECF has been shown, albeit tentatively, to hold the potential for serving as a motivator for altering proclivities towards deleterious behaviors (Blume and Marlatt, 2009).

More fundamentally, the reward system in humans is patently amenable to being retrained. The dopamine neurons in the VTA region of the human brain play a key role in reinforcement learning by encoding the reward prediction errors that we experience through our choices and behaviors. Unlearning does not seem to occur merely in a passive manner when one systematically does not receive the expected reward whenever the trigger or stimulus is experienced. Instead, unlearning is actually a byproduct of *new* learning, which competes with the previously learned association<sup>31</sup>. In other words, we are entirely capable to undertake the effortful exercise of retraining ourselves in the pursuit of genuine long-term wellbeing, but it would require learning new behaviors.

While it is beyond the scope of this limited article to define and explore the determinants of genuine wellbeing, a few observations are pertinent in thinking about whether the impetus for change resides in the individual or whether, indeed, there is a role for market, institutions and government.

From the perspective of an individual, strikingly, we have the unique ability among animals to produce a dopamine response *endogenously* through meditation (Kjaer et al., 2002). Meditation releases dopamine in the ventral striatum, which is a crucial component of the reward system, within the mesolimbic pathway. The evidence is fairly compelling that meditation holds the ability to alter the brain's mechanisms, including the ability to self-regulate and alleviate stress<sup>32</sup>. Thus, we have, at least in theory, the powerful ability to govern how our brains process rewards, pleasure, and motivation without having to be entirely slave to external sources. It seems that the degree to which our

happiness can be held hostage by alterations in real income or the type of money in circulation is potentially within our control.

Further, in the pursuit of understanding genuine wellbeing, two insights are gained from the Big History of Money. First, the effect of money on wellbeing is very significantly, if not even principally, modulated by its effects on the mechanisms of the human brain's reward system. This point cannot be overemphasized enough. Monetary systems differ in their ability to create dysregulations in the reward system, such as reduced intrinsic motivation, lower self-regulation, higher stress, a greater propensity for deleterious addictions, and, quite clearly, adverse effects on human wellbeing. Thus, to take money and monetary policy as orthogonal to happiness seems to be profoundly misguided. Herein lies a key role for governance informed by a deeper appreciation over the quality of money in circulation within a society.

Second, the inherent logic of the monetary systems in the various past epochs of the Big History of Money is not invalidated by each subsequent innovation. Take, for example, the earliest epoch of a credit-based proto-money system built on prosociality. Despite the long history of formal money systems, there still remain indelible vestiges of that earliest form of transacting even in the modern era of easy credit and fiat currencies. In fact, an entire *economy*, largely understudied and underemphasized, runs in parallel to the one we apprehend on neoclassical principles of market exchange. This unseen economy still operates on the prosocial credit that accrues from interpersonal interactions that involve "the grant and pursuit of regard" (Offer, 1997); its existence explains the vital role that everyday transactions involving gifts, etiquette and favors play in completing the economic structure of a society that also includes markets for goods and services that cannot be priced effectively using formal monies. Similarly, the logic of a monetary system based on hard money has not been forgotten either. Indeed, it was the invidious harm of financial crises and an inflating fiat currency that inspired the creation of the first cryptocurrency, Bitcoin (Nakamoto, 2008). Bitcoin is routinely dubbed 'digital gold' by virtue of its fixed supply, and is deliberately built with an open

<sup>31</sup> Sunsay and Rebec (2014) provides a very useful review on this topic.

<sup>32</sup> As an example see the meta analysis in Fox et. al (2014) and Tang et. al (2016) on the ability for meditation to reduce propensity for addictive behavior.

access framework that employs a cryptographically-secured blockchain. The Bitcoin blockchain can be easily queried on several aspects, including its transaction history, issuance schedule of tokens and the difficulty involved in mining new tokens. In structure, therefore, it mimics the epoch of hard money – when circulating money was a desirable scarce commodity or, at least to some degree, backed by a scarce commodity.

Thus, it is not entirely impossible to exert agency even over the trajectory Big History of Money. Individuals and perhaps even states have the ability to delimit the effect that a money system creates on happiness. At the very least, money systems that are designed and operated entirely in a top-down manner without any explicit reference to its impacts on individual wellbeing ought to be carefully examined and possibly even reimaged.

#### Declaration

The author certifies that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

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