

THE EMBODIED FOUNDATIONS OF THE MONETARY INSTITUTION

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Abstract

Money is a fundamental and ubiquitous institution in modern economies. It has the distinctive characteristic of being at the same time a complex social phenomenon and a very easily manipulated object in everyday life. By bringing together Works Carried.

Keywords: Extended Cognition, Embodied Cognition, Cognitive Institution, Money, Value.

INTRODUCTION

Wherever we look, we see traces of it. From the most blatant signs to the most discreet testimonies, it reveals itself as an obsession. Even the products for which it is supposed to be only a means end up, by a strange inversion, serving as symbols of it. This almost omnipresent reality is money. Exchanges, prices and advertising are just some of the tangible manifestations that quickly spring to mind as soon as money is mentioned, without, however, exhausting its expressions. On the contrary, these monetary stimuli are only the visual face of a much more extensive and structuring phenomenon of human life.

There are serious reasons to consider that money is a phenomenon that is not limited to its most obvious manifestations, those most commonly perceived as such. Beyond the most familiar expressions in the form of money signs, beyond the classic conception of money as a simple neutral medium designed to facilitate exchanges, money can be presented as a phenomenon that structures human life. This means that money cannot be reduced to a single dimension or a specific use, but that it orders human reality as a whole, i.e., without this phenomenon, human reality would be different. It is not our intention to provide a complete explanation of the phenomenon, or an exhaustive explanation of the causal relationships that govern its occurrence and functioning, but simply to offer some food for thought on how to conceive and study it more adequately.

However, in line with work done in sociology (Simiand, 1934; Ingham, 1996; Zelizer, 2004), it appears that such an explanation cannot be limited to the conception of money as the simple production of market exchange, as supported by orthodox economic thought. Faced with the same observation of the inadequacy of the logic of exchange to understand money, our approach seeks to integrate into a social conception of money elements that could a priori fall solely within the purview of an economic logic.

Individualistic, psychological or even cerebro-centric conception of the monetary phenomenon. Rather than adopting a narrowly individualistic view of cognition, the study of money and the cognitive processes associated with it implies a social comprehension. Without subscribing to all the implications of Simiand's (1934) characterization of money as a total social fact, the idea that money modifies behaviour, thus contributing to the transformation of society, just as it is in turn permanently modified, is consistent with the

present work. In this sense, our approach is compatible with the aforementioned work exploring the social and psychosocial foundations of monetary uses, without being redundant, as it seeks to present in the somatic and sensory phenomena associated with money more the mark of monetary sociality than its foundation.

One of the strongest indicators of the importance of money in human life is its age. Far from being a social fact peculiar to modern societies, money is an ancient phenomenon. Mauss (1914), who in his article on the origins of the notion of money, did not seek the absolute beginning of money, but the simplest forms in which this notion presented itself, highlighted its primitive nature. So, if money is indeed a phenomenon that occurs under specific conditions - those of life in society - and can thus be qualified as a social fact, it is not the prerogative of modern societies. A certain continuity of the monetary fact (Orléan, 1998), i.e. the use of currencies in very different societies, calls into question the idea that money is inseparable from modernity. In his work, Mauss already emphasized that it was not certain that there would ever have been a human society entirely foreign to money, or at least to any notion related to it. Nor is it certain that money is in any way dependent on an earlier, founding phenomenon, and that its emergence requires the coming together of specific background facts other than life in society.

On the other hand, the ancient, primitive nature of money does not mean that it is natural, in the sense that it exists independently of life in society, but at least that there are brain structures dedicated to primary tasks that facilitate its emergence. To think of money as a primitive social fact, following Mauss, and dependent on natural conditions of possibility, is in practice to say that this social fact develops by soliciting neural processing pathways previously used for the categorization of natural objects. A brain imaging study (Tallon-Baudry et al., 2011) provided convincing evidence that the recognition of the validity of monetary stimuli, albeit of a conventional nature, were processed at cortical level according to pathways similar to the processing of biological stimuli such as faces or food. The hypothesis of a neuronal recycling of visual areas initially dedicated to the processing of natural objects was thus formulated on the basis of these observations for an object in the economic field (Bourgeois-Gironde, 2009).

The primitiveness of the notion of money, associated with the activation of brain areas involved in processing natural objects, can perhaps be explained by one of its functions, if not its main function, namely the embodiment of value. It is in

Indeed, it's hard to imagine a human community evolving without any reference to the notion of value, and the hypothesis of neuronal recycling of brain bases that once contributed to the processing of natural objects according to the food/poison parameter supports the idea that money is inextricably linked to value. In other words, and in view of the elements mentioned above, it is possible that the recognition of monetary validity follows neural pathways similar to those used for the recognition of natural objects, making it possible to discriminate between various elements according to their validity. So far, the terms "phenomenon" and "social fact" have been used to describe money.

These are appropriate choices, but they need to be clarified. More than a phenomenon, a simple observed fact, more than an omnipresent social fact, money must be understood

as an institution. Because of its primitive nature, money may have emerged as a separate institution, independent of other prior institutional facts, as has sometimes been argued in the past. In other words, money is an institution whose existence is not subordinate to that of another institution. In any case, it remains to be defined precisely what is meant by institution, as the notion is so plastic and subject to so many different meanings.

The most minimalist conception of the monetary institution, the neoclassical view of economics, sees money as a simple medium for expressing the utility of goods in a common measure. According to this view of the institution, money is a neutral exteriority, simply acting as a catalyst for the information available in a market in the form of prices. Such a conception of the institution appears too restrictive, in the sense that it fails to take account of the structuring aspect of money on human thought. Another conception of the institution, that proposed by Denzau and North (1993), opens up the possibility of thinking of money as an exteriority exerting a concrete action on cognition. This action takes the form of a constraint: for the two authors, the institution is akin to the rules of the game in a society, consisting of formal and informal constraints on interpersonal relations.

Although Denzau and North's conception of the institution has the advantage of highlighting the concrete action of this entity on cognition, it retains with the neoclassical conception the character of exteriority. Yet the neural processing involved in the recognition of money, which once again is closer to the processing of ecological stimuli than to more complex cognitive functions, seems to indicate a primitivity of money that does not fit in perfectly with the idea of an institution casting itself to pure exteriority and implying overly restrictive conditions in the form of "rules of the game". Moreover, calling the institution "rules of the game" may imply the use of specific cognitive abilities (a capacity for abstraction, meta-control. . .) and activate an assumption of strong rationality that do not seem strictly required to bring about the emergence of money. The conception of the institution as a cognitive medium serving as an extended cognitive resource into which limited rational agents can discharge a substantial part of their information-processing load (Aoki, 2011), which therefore partly extends pre-existing cognitive processes, offers on the contrary a transition from a conception of the institution as pure exteriority to that of extension.

For this reason, it seems preferable to adopt a conception of the institution that refuses to present it as purely external to cognition. The extended cognition movement offers a conceptual framework for conceiving money as an institution, no longer simply external to cognition, but a genuine extension of it. The main idea of extended cognition is that cognitive processes are not limited to what happens at the cerebral level, but are extended through components external to the individual. Elements external to the individual can thus be functionally integrated into the overall cognitive system. In this case, the notion of exteriority is very different from that which permeates the concepts previously discussed, since it is a question of prolonging a cognitive process with external elements, rather than constraining it. Just as a pen can be used to perform calculations, an institution such as money can be an extension of cognition, functionally included in a whole that goes beyond the individual. The functional integration of an

institution, on the model of the integration of simpler objects, has been advocated in certain works (Clark, 1997; Clark and Chalmers, 1998).

However, a final, decisive step still needs to be taken: moving on from pro- longement to engendering. It is no longer a question of considering an institution as a neutral given that fulfills the sole role of a vector of information, nor as a simple con- tract that exerts itself on cognition, while going beyond the mere extension of cognition. Going beyond the concept of the institution as a cognitive medium or the para- digm of extended cognition, we propose to apply to money the concept of cognitive institution forged by Gallagher in particular. In this way, money would not merely extend human cognition, as the extended cognition approach alone would suggest, but would enable and structure economic reasoning that would otherwise be impossible (Gallagher et al., 2019). Any undertaking that fits into this conceptual framework and has the vocation of understanding this major social phenomenon that money represents would then have to identify the cognitive processes enabled by the latter.

The aim of the present work is thus to present money as a cognitive institution, following on from Gallagher's work, while taking an embodied and extended approach to cognition. It's one thing to claim that money is a cognitive institution, it's quite another to explain how an embodied and extended approach to cognition helps us to approach it, and yet another to uncover the cog- nitive processes that this institution brings to light. Our aim here is to present money as a cognitive institution, i.e. a phenomenon that structures certain cognitive processes (mainly the perception of value in a particular social envi- ronment), within an embodied and extended approach to cognition. The first part will focus on the contributions that such work can draw from an embodied approach and cognition for understanding money as a cog- nitive institution. Following on from this, the second part will deal more specifically with the emotions linked to money and the affective dimension of this artefact. Finally, the third part will defend the inclusion of the study of money in the paradigm of extended cognition, and present it as a phenomenon that institutes cognitive processes and sets itself up as a necessary condition for the latter.

A NON-CEREBROCENTRIC CONCEPTION OF THE MONETARY INSTITUTION

To better understand the centrality of the monetary phenomenon in human life and its various implications from a cognitive point of view, the adoption of an embodied approach to cognition could prove relevant. Embodied cognition (Varela et al., 1991; Gallagher, 2005; for a review, see Foglia and Wilson, 2013) in fact presents itself as an alternative movement to classical cognitivism within the cognitive sciences offering interesting perspectives for understanding money as a cognitive institution. Briefly, to say that cognition is "embodied" means that it is "consubstantial with the vicissitudes of our body; a body that is not an automaton con- trolled by the brain, but an animate system with capacities for self-construction and self-organization, interacting with its environment and thereby creating meaning" (Versace et al., 2018). In a word, the various research works that fall under the umbrella of embodied cognition agree, beyond their differences, on the fact that the human body as a whole is a non-trivial condition of possibility for cog- nition, and this implies not limiting its role to mere data collection.

Behind this agreement in principle on the preponderant role accorded to the body as a whole in structuring cognition, which would stand in opposition to classical cognitivism focused on cerebral activity alone, the embodied cognition approach actually reveals a certain heterogeneity. From minimal incorporation, which limits the body's influence to the definition of bodily-formatted mental representations - in other words, a set of neural processes integrating bodily data ("B-formats", see Goldman and De Vignemont, 2009) - to radical incorporation, which takes the form of enactivism (Varela and Thompson, 2001), the range of interpretations of embodied cognition is wide (Gallagher, 2011). In the present work, we will not take a position on whether a weak or strong embodiment of cognition is necessary to understand the relevance of an embodied approach to cognition in the study of money, since even a weak embodiment may be consistent with a representation of money involving emotions. However, a strong conception of embodiment will tend to prevail in future developments of this work, as it is better reconciled with the conception of money as a cognitive institution.

Regardless of the conception of embodied cognition (moderate or radical) to which. On the contrary, there is no reason to believe that money would escape the observation that the highest cognitive processes derive from sensorimotor simulation. In other words, in the light of the studies presented above, it seems appropriate to think that the cognitive processes at play during a monetary experience are based at least in part on sensorimotor simulation. From a neurological point of view, as in the case of other cognitive processes, we can imagine that cerebral bases initially dedicated to sensorimotor tasks are reused for more "abstract" cognitive processes occurring with the use of money. This is a promising avenue of research for the study of money.

A first, widely-studied modality of the cognitive embodiment of money is in fact manifested by a large number of brain imaging studies. Whatever the conception of embodied cognition adopted, the study and understanding of money as a cognitive institution requires the identification of the neural bases involved in monetary experience. This term encompasses all situations in which an individual is directly or indirectly confronted with money or a monetary sign. Studies highlighting the brain areas active during a monetary experience are numerous and diverse. Some point to the neural anchoring of a general representation of money, while others focus systematically on the stimulation of reward brain areas by monetary incentives. It has been observed, for example, that the categorization of money occurs rapidly and independently of any familiarity, while relying on brain areas originally devoted to the processing of ecological stimuli (Tallon-Baudry et al., 2011). It has also been found that the perception of a monetary stimulus, even unconsciously, results in the activation of areas within the basal forebrain that form output channels for the limbic system dedicated to emotional and motivational functions (Pessiglione et al., 2007). In this vein, it has also been shown that monetary experience shares brain areas involved in reward evaluation with the processing of more primary stimuli (Sescousse et al., 2010). Multiple neuroscience studies thus tend to support a continuity between the evaluation of primary rewards and more complex forms, such as money, and the importance of the reward system, notably the dopamine circuit, in the valuing process (Serra, 2016).

A broader conception of embodied cognition extends beyond the collection and analysis of brain activity, and will consider not only that the nervous system but also the entire body, or in the development of some of its habitus, support monetary cognition. While cerebral activity is an essential element to take into consideration in order to better understand the monetary phenomenon, it cannot be the only element studied for a multifaceted phenomenon. However, neuroeconomics, as an extension of neuroscience, focuses on the neural substrates involved in the processing of monetary experiences, and thus neglects other dimensions of this phenomenon. In line with other works (Petracca, 2020a), the rejection of neuro-centrism and the adoption of an embodied approach to cognition appear necessary to address money. The mere example of the role played by the entero-nerve system in cognitive processes such as decision-making (Rao and Gershon, 2016; Sherwin et al., 2019) is enough to show the need to broaden the field of study and not limit ourselves to the brain. In particular, adopting the embodied cognition approach to studying money would result in avenues of research to be explored. The sensory-motor foundations and somatic markers that are linked to the monetary experience are all avenues to be pursued in approaching money. In particular, sensorimotor activities and somatic markers, which are associated with the experience of money, may provide interesting avenues of investigation for understanding the corpore anchoring of the monetary phenomenon.

An embodied cognition must fundamentally be sensory-motor, and thus lend an important role to sensory-motor processes in the emergence and structuring cognition (Petracca, 2020b). The sensory-motor foundations of cognition thus make it possible to grant the body as a whole a role whose importance varies according to theoretical bias. This raises the question of the status of representations, a fundamental concept in classical cognitivism. A moderate approach to embodiment, which retains the concept of representation, refuses however to present these representations as amodal, contrary to classical cognitivism. Following on from bodily-formatted representations ("B-formats"), which enable higher cognitive functions to be activated from the sensory-motor system (Goldman, 2012), multiple studies have noted the existence of sensory-motor representations. Neuroscience studies have shown that cognitive processes activate neuronal structures involved in perception (Slotnick and Schacter, 2004; Weinberger, 2004) or motor skills (Boulenger et al., 2006). Studies in cognitive psychology have also shown that access to knowledge relies on sensory-motor processes (Solomon and Barsalou, 2001; Riou et al., 2011). What all these studies have in common is that they show the sensorimotor bases of cognitive processes, and thus enable cognition to be presented from the angle of sensorimotor simulation (Barsalou, 1999; Jeannerod, 2006), i.e. the re-evocation of past sensorimotor experiences to anticipate future ones.

Mirror neurons provide a cerebral basis from which sensorimotor simulation can be approached, and offer an illustration of moderate incorporation. Moderate, because it's still a question of focusing on brain activity, while integrating the sensorimotor dimension of cognition into brain processing. Discovered in the mid-90s, mirror neurons have highlighted the importance of sensorimotor simulation (Rizzolatti et al., 1996). These neurons provide a concrete example of the sensorimotor basis of certain cognitive processes. They are involved in the understanding of others' actions (Gallese, 2005), or

enable the emergence of certain concepts through the sensorimotor simulation of certain properties (Gallese and Lakoff, 2005). More broadly, mirror neurons provide us with an example of neuronal recycling, i.e. brain areas initially devoted to sensorimotor tasks that will subsequently also be used for higher cognitive processes (Gallese, 2008; Anderson, 2014).

This identity of the brain areas involved in the processing of sensorimotor and cognitive processes highlights the true neural entanglement of decisions and actions. Decision-making requires the same sensorimotor neural substrate as action. The same neurons play different roles over time. The encoding of action values is carried out by the same sensorimotor neurons that encode the representation of potential actions (Cisek and Kalaska, 2010). This is a new element supporting the identity of the brain structures underlying sensorimotor and cognitive processes, and the idea that sensorimotor simulation is at the origin of higher cognitive processes. The body as a whole, through the sensorimotor underpinnings of higher cognitive processes such as decision making, thus contributes to shaping cognition. As motor and cognitive actions thus share a common substratum, it's not surprising that simple gestures can take on symbolic dimensions, leading to cognitive and affective modifications. For example, some people tend to judge more positively an object by squeezing their arm rather than extending it (Cacioppo et al., 1993). All this should also lead us to question the traditional distinction between perception, cognition and action as presented by a classical cognitivist approach.

The moderate conception of embodied cognition, in which the aforementioned work is embedded, remains focused on brain activity, however. Even if the body as a whole is integrated into cognitive processes via the neural substrates dedicated to sensorimotor, it is only integrated in a secondary way, since these studies remain focused on the brain. Enactivism, on the other hand, presents itself as a radical form of incorporation of cognition. According to the enactive reading of embodied cognition, sensorimotor processes coupling the organism to the environment have an effect on cognition (Gallagher, 2011). So it goes further to say that not only do cognitive processes considered abstract rest on sensorimotor foundations, but also that sensorimotor contingencies and environmental affordances do work that is often attributed to neural computation (Noé and O'Regan, 2001).

Broader than sensorimotor simulation, since it incorporates elements that are not limited to the brain, while allowing the body as a whole to be integrated into the understanding of cognitive processes, the somatic marker track presents itself as another worthy avenue for approaching money from an embodied approach to cognition. Whereas the sensorimotor simulation track only secondarily integrates the body as a whole into cognitive processes, focusing as it does on neural bases, somatic markers enable us to understand the direct role of the body as a whole in judgments and decision-making. In a nutshell, the SMH (somatic marker hypothesis) maintains that decisions are made, directed, by feedback loops between cognition and emotions. As these emotions are instantiated by bodily variables, the feedback loops involve the brain as much as the rest of the body (Bechara and Damasio, 2004).

In concrete terms, variables such as breathing, heart rate and skin conductivity influence decision-making and modulate brain function. These variables are thus fully integrated into higher cognitive processes, and in particular decision-making, so that they must be taken into account when studying certain cognitive processes. The feedback loop between these somatic markers and brain activity thus represents a learning process under conditions of uncertainty that guides decision-making. Even if somatic markers are not all consistent with each other, i.e. they do not univocally reflect the same state, it is likely that several markers pointing in the same direction will prevail. In short, the decision ultimately taken will be consistent with the strongest somatic markers. In this way, somatic markers offer us a facet, an expression of decision-making in the form of non-cerebral physiological variables.

Although the somatic marker hypothesis is no longer considered a fully satisfactory theory, sufficient to explain cognitive processes such as decision-making, the study of money as a cognitive institution could opportunely draw some lessons from this theory. By way of example, it is worth noting that one study has shown the relevance of taking somatic markers into account in understanding investment decisions (Cantarella et al., 2018). With regard more specifically to money, it would certainly be interesting to observe the behaviors towards money that somatic markers can predict.

MONETARY EMOTIONS

After somatic markers, which indicate an emotional state, it's easy to move on to the affective dimension of money. Beyond sensorimotor simulation and somatic markers, which are potential avenues for studying money from an embodied approach to cognition, the eminently emotive and affective dimension of this artefact appears to be the most promising avenue. The most promising because it is not limited to a study of brain activity, but must unite a multitude of determinants ranging from the brain to the environment, via the body as a whole. It's also promising because it overcomes the questionable, albeit classic, distinction between cognition and emotions. Since somatic markers merely translate or express an emotion in the form of defined physiological variables, it's natural to take an interest in these emotions themselves, and more broadly in the affective dimension of money. Converging evidence reveals the extent to which cognitive processes relating to money are marked by emotional and affective states. Although money has often been presented as an instrument of exchange, or even as a primitive social fact, it would be wrong to consider this object as neutral. Money cannot be considered neutral either in the usual sense of the term or in the sense of the theory of neutrality in economics. On the one hand, the hedonic experience that characterizes the relationship with money deprives it of any neutrality in the usual sense, and on the other hand, money, for reasons that will be explained, cannot be conceived of as a mere "veil" either, as Hume argued (Bourgeois-Gironde and Guille, 2011a and 2011b). The way in which this artefact conditions and prolongs human cognition is indeed revealing of the latter's affective character.

Understanding the affective dimension of money implies taking an interest in the resenti of individuals in contact with money, in the psychological effects of this artefact. In

short, it's a question of understanding how individuals experience money, and observing their behavior. Studies have shown that the possession of money, or even a simple priming by money, i.e. prior exposure to a monetary stimulus to influence the processing of another, generates in participants a feeling of self-sufficiency (Vohs et al., 2006; 2008). More concretely, these studies found that individuals who had been exposed to monetary stimuli tended to seek less help from others, and to be less receptive to third-party requests. From a psychological point of view, this was interpreted as reinforcing a sense of independence from others in participants stimulated by money. In other words, participants in these experiments tended to display more individualistic behavior. From a behavioral point of view, it was observed that subjects exposed to monetary stimulation tended to put more effort into their behaviour.

Distance between themselves and a third party than subjects not exposed to such stimuli, as well as persevere longer in completing a task. Exposure to monetary stimuli thus results in psychological and behavioral changes characterized by a form of self-sufficiency. A notable point that has been revealed by other work is that these results are found in adults as well as children (Gasiorowska et al., 2012; 2016). One possible interpretation is that money produces consistent effects on human psychology regardless of the degree of abstract understanding of this artifact and defined uses. Such an observation underlines the eminently affective nature of this phenomenon, which prevails over any form of rationality limited to reflexive and perfectly mastered cognitive processes.

Following on from studies on feelings of self-sufficiency and distancing behaviours following monetary stimulation, it has also been found that the evocation of money reduces distress linked to social exclusion and physical pain (Zhou et al., 2009). Since money conducts individuals to be more confident and less sensitive to the situation of others, it is possible to build on these psychological effects to conceive of money as a vector of power offering the possibility of manipulating life situations in society. The results of the above-mentioned study show that fear of social rejection or physical pain increases the desire for money; that the idea of owning money reduces fear of social exclusion and physical pain; that losing money makes people more vulnerable to distress following social exclusion or physical pain. In addition to confirming the ability of money to generate a feeling of power, these results tend to support the identity of response systems to both physical and social pain, and thus the hypothesis of an adaptation of systems originally dedicated to the treatment of physical pain to the treatment of pain caused by social rejection (for review, MacDonald and Leary, 2005). Responses to social rejection have been found to resemble responses to physical pain (Eisenberger et al., 2003), which can be interpreted as a new expression of neuronal recycling.

The few studies mentioned above are part of a larger body of work in experimental psychology which approaches money from specific angles and using different methodologies. The psychological effects of money observed in all these studies can be grouped into five trends, which echo and go beyond the results of the aforementioned studies. It appears that the collection of results gathered by the various studies on the psychological effects of money can be summed up in five trends: the accentuation of

egocentrism and self-valorization, the reduction of concern for others, a preference for inequality, the reinforcement of a feeling of power and, finally, the tendency to reify others to achieve one's ends (for review, Wang et al., 2020). In short, individuals exposed to money will tend to focus on themselves, inhibit other-oriented behavior, prefer inequality and competition to cooperation, be more trusting, and more readily see others as means to an end.

Beyond their methodological differences and the specificity of their results, all these studies seem to point in a common direction. These results, though specific, are far too close to one another not to consider uniting them under a unifying theoretical principle, of which they would be particular expressions. This principle should make the various effects of money on human thought intelligible and coherent. Such a unifying enterprise has recently been proposed by presenting money as an embodiment of social distinction (Wang et al., 2020). In a similar vein, we believe that a closely related notion, that of value, whose meaning needs to be clarified, provides us with a theoretical foundation that would unite the various psychological aspects of monetary experience. The writings of Spinoza, Tarde and Girard, three authors who have in common, on the one hand, to place desire at the beginning of any valorisation process and, on the other, to underline the importance of mimicry in human behaviour. Emulation (Spinoza, 2010), imitative rays (Tarde, 1902) and mimetic desire (Girard, 2011) are concepts that share both the emphasis on the affective dimension in individual choices, and the irreducible exogeneity of desire. What these three concepts have in common is the need to widen the focus in order to understand the processes of desire orientation and valuing, by not limiting ourselves solely to the individual's relationship to an object, but integrating relationships with other individuals.

Together, these concepts provide the basis for a unified theory of monetary emotions. Emotions that are part and parcel of human cognition, as part of an embodied approach to cognition. In this case, it is the eminently affective character of monetary experience that should guide our understanding of money as a cognitive institution. Few social artefacts appear as desirable as money, and are endowed with such a power of attraction. The possession or mere simulation of money is not only perceived as pleasurable, like many other stimuli, but also as the source of a feeling of power that sets money apart (Zhou et al., 2009). Money gives rise to a feeling of self-sufficiency, even a feeling of power, in those it affects because it is desirable, and desirable because it is desired by so many. From this desire, which it crystallizes, it offers a power - that of modifying the data of a situation in society - to all its holders, because this desire is widely shared.

To explain the psychological effects of money highlighted by the studies presented above, we propose, from a Spinozist perspective, to conceive of money as a cognitive institution whose vocation is to objectify desire, in the sense that it makes desire a tangible object from which and on which reasoning and action can take place. Placing desire, defined by Spinoza as the effort to persevere in one's being - or *conatus* - at the heart of our thinking on money, which must be understood as a dynamic principle independent of life in society and specific to each individual, is not enough to understand the eminently affective dimension of money without making two points clear. The first is that value, of which we

have considered money to be the principal embodiment, has no intrinsic reality, i.e. it is independent of the desire of subjects to value this or that action, this or that object. Contrary to classical and neoclassical conceptions of value, it is more relevant to consider, following Spinoza, that when "we strive for a thing, when we want it, or aspire to it, or desire it, it is never because we judge it to be good; but on the contrary, if we judge a thing to be good, it is because we strive for it, want it, aspire to it and desire it" (Spinoza, 2010). We value something because we desire it, not the other way around. This also implies that value in economics is only one particular form, that attributed to the objects and services that make up a market society and are subject to monetary processing. We'll see later what role we can attribute to money on the basis of this positioning. The second point that needs to be taken into account to better understand monetary emotions is that of mimicry. Since *conatus* is an intransitive energy, with no predetermined object, its determination necessarily comes from external elements that direct it towards one object or another. Despite certain nuances, the above authors agree on the importance of mimicry in understanding the orientation of human desire. If desire were insensitive to external determining factors, the valuing process would lead to a great diversity of results, whereas the values making up the social space are subject to relative consensus. The mimetic nature of desire thus makes it possible to understand how desire is determined exogenously, and why value is largely explained by intersubjective relations. In this respect, money is another phenomenon that facilitates such dynamics, as we shall see later.

The results of the various studies on the psychological effects of money can therefore be unified on a theoretical level by subscribing to a conception of value as a reflection of desire, a desire marked in society by mimicry, and by considering that money embodies value in an exceptional way. Studies in the cognitive sciences have produced results that support such a postulate. For example, it has been found that price, which is a nominal datum indicative of the amount of money required, directly influences the hedonic experience of consumers (Plassmann et al., 2008; Stanton et al., 2016). In this case, the same wine was judged as tastier by the same participants after an increase in its price. The most coherent interpretation of such a result is that the object in question will be cognitively processed in part according to the value attributed to it within the community. Above all, the price informs the individual about the value of the object in a given society, in a given situation, independently of its intrinsic qualities (material, sensory). In this case, it was the same wine that was served, and only the price varied. It therefore seems reasonable to assume that the higher price made the wine more desirable in the eyes of the participants, as they interpreted the higher price as a sign of greater desirability.

The importance of mimicry in determining desire has also been highlighted by certain experiments. One study, for example, established that women judged faces to be more attractive after hearing the majority opinion of the group they were in, and were thus led to modify their own judgment (Shestakova et al., 2012). Judging the beauty of a face, judging the pleasure provoked by a face that some would consider personal, proves to be subject to conformism like so many others. As in the previous example, where the quantity of money influenced the participants' judgement of the quality of the wine they

tasted, while the group's ratings of faces influenced the participants' judgement of the beauty of those same faces. If the results of such a study on mimicry can be extended to many other situations in society, money could effectively replace the notes of the previous study in the role of vector facilitating mimicry. In this way, money could inform each individual about the value attributed to a given object in a society, in the same way as the group's notes provide information to the participants, and thus imitate the community's preferences.

In short, adopting an embodied approach to cognition should lead future work that seeks to clarify the status of money as a cognitive institution to study the sensorimotor bases of the cognitive processes associated with this artefact, to integrate somatic markers into the field of observed physiological data, and to take account of the affective character of this object. If money is indeed a cognitive institution with an affective and mimetic dimension, then it seems necessary not to limit the study of this phenomenon to the body, and even less to the brain. A first line of research, a classic and rich source of numerous studies in social psychology since the '80s, consists in understanding the relationship between emotions and social cognition. Far from being merely individual phenomena, they often involve social relations (Parkinson, 1996). Two phenomena in particular have been studied and are of particular interest to the present article. The first is the phenomenon of emotional contagion, which refers to the ability to capture the emotions of another person (Hatfield et al., 1992), and is based on imitation (Neumann and Strack, 2000; Niedenthal, 2007). The perception of an emotion in another person would activate similar, albeit diminished, reactions in the individuals observing that emotion, presumably in order to better understand the state of the individual being observed. Secondly, the phenomenon of shared attention, which consists in thinking that we are paying attention to the same objects at the same moment as others, intensifies the emotions felt (Shteynberg et al., 2014). Shared attention would lead us to allocate more attention to the object and accentuate our reactions. These two phenomena can be seen as two particular facets of a broader phenomenon in human life: mimicry.

A recent research movement, in keeping with embodied cognition while at the same time extending it, goes further and proposes to conceive certain affects as extended, and not limited to individual experience (Colombetti and Krueger, 2014; Krueger and Szanto, 2016). In this way, in order to understand emotions and their relationship with social cognition, we are no longer content to consider the role played by social situations at the level of the individual, but consider that the social structure (the set of individuals, the elements making up the environment. . .) in itself makes it possible to give rise to emotions that would not otherwise exist (Slaby, 2014). The main idea defended by proponents of this line is that emotions integrate external resources beyond the neurophysiological limits of organisms, to the point that emotions can be socially extended and shared by several individuals. In other words, according to the theory of extended emotions, some of our emotional experiences are such that their quality, intensity and dynamics seem to come largely from outside. A typical case of extended emotion would be for an individual to feel an emotional experience that is outside his or her individual emotional repertoire, that he or she could not

The social context could thus serve as a vector for the emergence of emotions that would not otherwise exist. This leads us to consider the relevance of an extended approach to cognition for understanding money.

THE CONTRIBUTION OF EXTENDED COGNITION TO UNDERSTANDING MONEY AS A COGNITIVE INSTITUTION

Alongside work in social psychology on the relationship between social cognition and emotions, and the movement in philosophy of mind on extended emotions, a broader trend in cognitive science to decentralize cognitive processes from the neural substrate and even the individual alone, to integrate a multitude of factors, provides a relevant conceptual framework for studying money. Whether in a weak sense, by considering that the presence of others influences individual emotions, or in a strong sense, by presenting certain emotions as structurally linked to life in society, the work in social psychology and on extended emotions mentioned above have in common the study of cognitive processes by placing individuals in broader situations. Understanding cognitive processes thus implies a holistic approach aimed at reinscribing these processes at the cerebral level, in the body as a whole, but also in a natural and social environment. Rejecting neurocentrism means adopting the paradigm of embodied cognition, which gives the body a variable role, paying greater attention to emotions, and taking situations as a whole into account. Money as a cognitive institution can only be understood in a global situation, involving brain activity, the body as a whole, but also the entire social context.

The paradigm of extended cognition proposes a conceptual framework in line with that of embodied cognition and applicable to money. Although the principle of extending cognition to elements outside the cortex was formulated earlier, many authors attribute the birth of the extended cognition movement to the article by Clark and Chalmers. In their seminal article, these two authors laid the foundations for a current of thought that still permeates contemporary thinking on the limits of cognition (Clark and Chalmers, 1998). The hypothesis of extended cognition is, in essence, a critique of the internalism attributed to classical cognitivism, for which cognitive processes are explained solely in terms of states and processes limited to the brain. Clark and Chalmers' main idea is to postulate that cognitive processes do not stop at the brain alone, or even at the body as a whole, but extend beyond it by being driven by the environment. The emblematic thought experiment of this article, that of Inga and Otto, invites readers to question the functional equivalence of biological processes and external elements (in this case, memory and an agenda). The principle of parity that underpins this theoretical position holds that a process that would be considered cognitive if carried out by neurological resources, should then also be considered cognitive by involving neural, environmental and technical resources.

What has come to be known as the first wave of the extended cognition hypothesis, based on an analogy between neurological processes and functionally equivalent external processes, has been criticized as creating a form of "cognitive fuzziness" (Rupert, 2004; Brook, 2006). If, indeed, a cognitive system extends from the individual to other elements

according to the principle of parity, and even if criteria limit this extension (Clark and Chalmers, 1998), the risk is to extend a cognitive system indefinitely to the multitude of objects involved in a cognitive process. Partly in response to this criticism, the first wave of work on extended cognition has given way to a second wave (Merritt et al., 2013; Gallagher, 2018). In contrast to the first wave and its principle of parity, this second wave brings together work rallying around the thesis that cognitive processes extended by external elements do not duplicate those performed at the cerebral level alone, but rather augment and complement the latter by offering new capabilities. The principle of parity has thus been replaced by the principle of complementarity (Skorburg, 2017). But like the work in the first wave of extended cognition, that of the second wave remains focused on the individual, although the focus is broadened by integrating external elements. The work of the so-called third wave has in common that it abandons this individual-centered approach and draws attention to socially and culturally extended cognition (Merritt et al., 2013; Skorburg, 2017). The "socially extended mind" and the concept of cognitive institution championed by Gallagher (Gallagher, 2013; Gallagher et al., 2019) are two attempts that exemplify this third wave and can serve as a conceptual basis for the study of money.

Cognitive institutions are aggregations at the collective level of reasoning and individual decisions that make possible cognitive processes that would not otherwise exist at the individual level (Gallagher, 2013; Gallagher et al., 2019). Following an enactive approach, these institutions are as much produced by the cognitive activity of individuals as they transform and extend individual cognitive processes. In other words, individual cognitive processes are products of these institutions, and collectively they are their producers. So, according to such a conception of extended cognition, cognition does not, or at least not only, start from the brains of individuals and extend outwards. On the contrary, the direction must sometimes be reversed, from the outside in, when these institutions shape our cognition and lead us to reason in a defined way. As an extension of Gallagher's concept of cognitive institution, we believe it is relevant to conceive of money as a cognitive institution that extends human cognition, following a classical approach to extended cognition, and above all shapes it to the point of making certain cognitive processes possible - which is what Gallagher's concept of cognitive institution does.

Before discussing the appropriateness of adopting the concept of cognitive institution for money, and considering the cognitive processes that might be not only pro-longed but also enabled by money, the notion of institution needs to be clarified. As mentioned in the introduction, the notion of institution takes on different meanings, which should not be confused. To better understand money, institutions are not limited to "the rules of the game of a society consisting of formal and informal constraints constructed to order interpersonal relations" (Denzau and North, 1993). For his part, Aoki presents institutions as media

He takes up the idea of institutions as social rules and expands it (Aoki, 2011). In particular, he clarifies what is meant by "social rules": social rules are salient, commonly known patterns of how social activities are recursively fulfilled and expected to be fulfilled. These rules are thus observed recursively, even if the agents know nothing about them

prior to any observation. These rules are the endogenous result of inter-actions in society. The mimicry discussed in the previous section of this article is the process by which institutions in general, and money in particular, are recursively learned. As such, the substantial form of an institution serves as an extended cognitive resource from which limited rational agents can carry out a substantial part of the information processing in their environment. By taking it for granted and as a guide, agents can use this institution to focus their cognitive efforts on updating the situation in which they find themselves with the information they have collected. In contrast to Denzau and North's conception, for Aoki, institutions are no longer simply external social constraints, but are endogenously created and confirmed by interactions between agents.

These multiple, incessant interactions, which endogenously give rise to institutions, bring Aoki's concept of the institution into strikingly close contact with Gallagher's notion of the cognitive institution, which is part of an enactive, extended approach to cognition. Enactive, because cognition is formed by individuals themselves in the course of their interactions with each other and with their environment. Extensive, because cognitive institutions, according to Gallagher, cannot be understood by individual cognitive processes alone, but are phenomena that extend these processes on the one hand, and make other processes possible on the other. The concept of cognitive institution only takes on its full meaning from socially extended cognition, both the constraints imposed by social interactions and the possibilities offered by such interactions (Gallagher, 2013). Economic reasoning in general, and cognitive processes involving money in particular, are not purely individual processes, contrary to some spontaneous conceptions. Briefly, a cognitive institution "is formed by cognitive practices (e.g., problem solving) that involve multiple interacting agents pursuing multiple interrelated tasks, and conversely, such interactions are shaped by instituted (normative) practices that extend our cognitive processes when we engage with them (i.e., when we interact with, or are enactively coupled to them in the right way)" (Gallagher et al., 2019).

When applied to money, such a concept should make it possible to highlight the cognitive processes extended by this artifact in order to be fully operative. Without claiming to be exhaustive, three cognitive processes appear to be supported and extended by money to facilitate exchanges between individuals: calculation, memory and projection into the future. These three faculties are linked to the functions traditionally attributed to money (unit of account, medium of exchange and store of value). The first two involve calculation, the third projection into the future. Clearly, money is a societal artefact that extends the capacity for calculation. It considerably extends the calculating capacities of individuals by externalizing the numbers on which calculations are performed. Memory is also extended in a certain way by money. Indeed, it has been suggested that money is a primitive form of memory for past transactions (Kocherlakota, 1998). With regard to projection into the future, money also appears to be an object that extends this cognitive faculty in a particular way. As a direct consequence of its traditional function as a store of value, money enables us to project ourselves into the future without having to have a clear idea of what that future will be. Indeed, models of the emergence of money, whether based on assumptions of strong rationality or reinforcement learning (as will be discussed later), have in common, beyond their divergences, the fact that the adoption of money at

the expense of barter implies the ability of agents to project themselves into the future by accepting an object whose intrinsic utility is zero, with a view to obtaining other goods at a later date. In this way, the ability to speculate would be extended by money.

If money is an effective extension of cognitive faculties, it can also be seen as a *sine qua non* for some of them. In other words, certain cognitive faculties could not be exercised without money. Having reversed the relationship between desire and value, as we proposed in the second section, and postulated that money is the exceptional embodiment of value, the main cognitive function made possible by money, without which it could not exist, is a simplified cognitive processing of value and thus of the desire crystallized by the various objects and services making up a market economy. A brief look at the conceptual underpinnings of such a theoretical position is in order, however. What the concepts of emulation, imitative circles and mimetic desire have in common is that the source of value lies not in the objects being valued, but in the way we look at them. More precisely, value is founded on desire. Desire precedes value, not the other way around. But if value is simply a reflection of desire, how can we explain a relative consensus among the objects found within a society on which desire is focused? Clearly, certain features and characteristics of each object within a market society contribute to its evaluation by agents, and provide a kind of outlet for desire. Affordances, you might say.

However, another factor, external to the object being evaluated, is at least as important as its characteristics. Spinoza, Tarde and Girard all share, to varying degrees and in different ways, the view that human desire is fundamentally imitative. We can't understand a great deal of human behavior, and in particular the choice of certain objects in society, without acknowledging an essential anthropological fact: human beings imitate each other. Agents tend to imitate each other - in ways and under conditions that would have to be precisely defined - at the moment of choice on which their desire is focused, thus conferring value on the chosen object. Imitation is certainly the simplest and most effective way of directing desire in environments where objects are numerous and diverse. Imitation is a primitive anthropological phenomenon that enables us to understand why the affective economy is relatively stable, yet characterized by sometimes violent reversals, the causes of which are not linked to the objects on which the transactions take place.

If, on the one hand, and following the writings of Spinoza, Tarde and Girard, we consider that value is the reflection of desire, i.e. that it does not exist in itself, but is a reflection of desire mediated by objects manufactured under particular technical and social conditions, and if, on the other hand, money is a primitive embodiment of value, then it's conceivable that one of the main functions of money is to enable agents to apprehend objects presented as desirable in a given society, and thus to direct their desire. Desire is often difficult to perceive - in fact, it can only be expressed through more or less subtle gestures or attitudes - and even more difficult to evaluate, so money offers, notably through its nominal indications (prices), a clear sign of an object's desirability. In this sense, money is not simply an extension of a cognitive process, but a condition of possibility. As the embodiment of value, money is a cognitive institution whose vocation

is to guide desire in society, to make the value of each thing - and thus catalyzed desire - a reality that can be processed by everyone. As the value of objects is extrinsic, dependent on the desire of individuals, and not an intrinsic datum, the structure of the affective economy of a particular society is objectified by money. The latter provides each participant with information on the value attributed to almost any element - depending on the limits of the market sphere or, more precisely, the objects of desire that can be grasped in monetary terms - of a given society. This function is undoubtedly facilitated by the material characteristics of this artefact, i.e. an object that does not present a precise affordance in the Gibsonian sense, and for this reason offers the ideal support for the social practice that grants it an importance detached from its intrinsic characteristics and from each particular judgment. In this way, money as the embodiment of value is seen as a social phenomenon that shapes society by making the value attributed to each object an objective, identifiable element. It's information that needs to be integrated and structure reasoning. This would explain why money can modify the cognitive processing of valued objects (see the studies mentioned in the second section), by making an object with a large amount of money associated with it better in an agent's eyes.

Moreover, money is a cognitive institution that provides agents with a means of acting in society. From the moment money is adopted and used in a market society, from the moment it is recognized by each agent as an artefact of exchange with the vocation of influencing all or part of social interactions, then money becomes a cognitive institution enabling not only to evaluate the elements making up the social environment, but also to act in this environment. To act in society by making actions possible and fluid - the most obvious facet of money, and the subject of much work in microeconomics - and, at an earlier stage, even by enabling actions to become conceivable, cognitively integrated into a planning process. In the section on the emotions linked to monetary experience, we discussed the role of money in the valuing and orientation of desire, as well as the feeling of power, or self-sufficiency, that characterizes the psychological experience of this experience (see the studies mentioned in the second section). The ability to act in society granted by money to agents could potentially explain the feeling of power that accompanies the manipulation of money. More concretely, as money is the artefact par excellence for expressing desire, holding and manipulating money generates a feeling of empowerment, as agents know that this artefact is desired by others, and thus that they possess a means of acting on them to modify a given situation. By opening up the field of possible actions in society - any object, any act being potentially subject to monetary treatment, the limits of such treatment often being conventional (the legal or more broadly cultural rules specific to each society) or individual (what each agent considers exchangeable for money) - and by offering power over others, it's hardly surprising that money gives rise to a feeling of power. For the same reasons, money - and more precisely, the distribution of the quantity of money among the members of a society - serves as the basis for a form of social hierarchy: the individuals with the most money are also generally the most powerful, at least in a given type of society, and those who most effectively catalyze desire in particular ways.

Finally, it should be noted that while this conception of money, which is part of the embodied and extended paradigm of cognition, as a cognitive institution whose vocation

is to objectify the value of the elements making up social space and to act in society through the manipulation of desire, is difficult to reconcile with classical models of the emergence of money based on assumptions of strong rationality, it is, on the other hand, consistent with models of reinforcement learning. There is a relative consensus in microeconomics on the idea that money serves to smooth out the friction arising from a temporary misalignment of agents' expectations in an exchange system, so to speak, to compensate for the mismatch of desires. This is less true when it comes to modeling the emergence of such an artifact. In a recent study, it was shown that a reinforcement learning model provided a better model of currency emergence than models based on strong rationality assumptions (Lefebvre et al., 2018). In this case, the experimental protocol followed demonstrated the value of a reinforcement learning model for the emergence of money in a multi-stage exchange task, and highlighted the importance of counterfactual feedback processing of opportunity costs in the learning process of speculative money use. By acting as a catalyst of desire, money, in line with the store-of-value function postulated by classical theory, enables agents whose desires are not immediately congruent to find a way to agree on transactions. Because it is desired by all, or at least the vast majority, of the members of a community, money is accepted despite its lack of precise use - or perhaps because of it - because it presents itself as the unanimously coveted object, thus offering the widest possibilities for action in the future.

CONCLUSION

The concept of money as a social phenomenon structuring human thought - or, more precisely, as a cognitive institution, in the sense proposed by Gallagher, enabling us to grasp value and act in society - seems to us to open up a new way of studying this artifact. A path that should shed as much light on the emergence and status of money as it does on aspects of human cognition. As desire has no predetermined object, once certain needs have been satisfied, it takes shape or is seized by objects defined in society through mimicry. By objectifying desire and enabling it to be acted upon, money has a fundamental role to play: that of a cognitive institution shaping the reasoning and actions of agents. The inclusion of money in the paradigm of embodied cognition and extended cognition therefore appears necessary to study an object whose understanding cannot be limited to cerebral activities alone, but involves the body as a whole, and beyond that, the entire environment of agents. More than any other approach to money, the adoption of the concept of value as a reflection of desire, and the importance of mimicry in determining desire, invites us to consider its possible reorientation. As has already been outlined (Wang et al., 2020), there is no a priori reason to believe that it would be impossible to value other behaviours and actions by reallocating quantities of money, or even by developing new ways of orienting desire at the societal level.

Summary

Money is a fundamental and omnipresent institution in modern economies. It is unique in that it is both a complex social phenomenon and an object that is easily manipulated in everyday life. By bringing together work done in cognitive science and philosophy of mind, while extending certain ideas of classical authors, this

article proposes to conceive of money as a cognitive institution whose study would be anchored in the paradigm of embodied cognition and extended cognition. Inscripting the study of this artifact within embodied cognition and extended cognition would imply a refusal of all cerebrocentrism, and more broadly to address its multiple facets such as its affective dimension in relation to the embodiment of value. Moreover, to present money as a cognitive institution would mean not only that it would be an extension of certain cognitive processes, but also a condition of possibility for others. The cognitive processes in question have to do with the objectification of value in a market society, in order to guide agents' desires, and with the structuring of certain inter-individual actions.

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