

Georg Simmel's Theory of Money and its Relevance for the Methodology of Neuroeconomics

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Abstract:

The paper develops a conceptual framework for the neuroeconomic analysis of money that conjoins neuroeconomics with recent theories of distributed cognition. In doing this, I show that a unique historical contribution to the theory of money, Simmel's 'Philosophy of Money', receives full support by ongoing research in psychology and neuroscience. I take this issue as a litmus test that allows for a methodological evaluation of the recent controversies over the appropriate frames for neuroeconomics (neoclassical vs. behavioural), levels of analysis (basic reward circuits vs. higher-level concept/model based learning), units of analysis (mechanisms versus emotions), and over the relationship between reductionist versus multi-level explanations that involve external entities in neuroeconomic mechanisms ('molecular' vs. 'molar' explanations). Assessing recent empirical evidence on the psychological and neuronal aspects of money in relation to human behaviour, I propose that the artefact of money activates somatic markers that embody social reciprocity, thus triggering distinct neuronal activity patterns that have been identified experimentally in the context of money illusion and other related phenomena. This shows how neuroeconomics can help to explain the peculiar functioning of human institutions without succumbing to neuronal reductionism, and vindicates Simmel's comprehensive theory of money in terms modern 'molar' approaches to neuroeconomic methodology.

1. Introduction: Money and neuroeconomic methodology

In the concluding chapter of his magistral ‘Foundations of Neuroeconomic Analysis’ Glimcher (2011: 423f) identifies a number of central issues in current neuroeconomic research. One is the question ‘What is the neural organ for representing money?’. Glimcher argues that the institution of money diffused with such a great speed among human societies, rapidly assuming an all-encompassing status, so that it is implausible assuming that there might have been sufficient time for biological evolution to develop a neuronal structure that is specific to money. So, he believes that the money institution might involve a pre-existing mechanism. This mechanism, Glimcher muses, might relate with the specific capacity of humans to enter into relations of social exchange with other humans. He concludes that ‘The algorithmic structure, let alone the identity, of that organ remains one of the greatest mysteries in neuroeconomics today’.

This paper aims at clarifying some methodological issues in neuroeconomics in discussing this challenge to neuroeconomic research. In doing this I also present a hypothesis about the general nature of the neuronal representation of money. This hypothesis builds on Glimcher’s idea that money might actually piggyback on a pre-existing structure. Yet, based on the methodological considerations, I also show that money can only properly be analysed if we follow an analytical framework in which external entities such as the artefact of money play an independent causal role. That means, in order to understand the neuronal mechanisms underlying the money institution, we need to go beyond the neuroeconomic framework established by Glimcher.

In current methodological debates about neuroeconomics, I can discern four strands of thought. One is the straightforward rejection of neuroeconomics as being irrelevant to economics: That means, economic theory does not need further foundations in neuroscientific research because economic models are sufficient to explain observed phenomena in economic behaviour (Gul and Pesendorfer 2008; Bernheim 2009). I do not consider this view here and focus on the internal debates. Then, the first strand is Glimcher’s approach which is explicitly reductionist. Glimcher’s central idea is that the economic category of utility can be reduced to certain neuronal mechanisms even to the degree that measurable assignments of value could be directly measured in terms of intensities of certain neuronal representations of value.

Glimcher uses a modern version of the neoclassical framework of utility, namely random models of expected utility.

The second strand is represented by Camerer (seminally stated in Camerer et al. 2005). In his review of Glimcher's book, Camerer (2013) argues that neuroeconomics does not need to be built on the neoclassical framework but should adopt the approaches of behavioural economics. Then, higher-level cognitive processes need to be explicitly included, especially in the context of learning and complex choices. This reliance on behavioural economics leads to the consideration of many hypotheses and phenomena that are not yet integrated into one coherent framework comparable to the 'neuroclassical' view, such as social preferences or emotions. In terms of theoretical parsimony and elegance, this is a drawback, which is balanced by what is claimed to be greater realism.

The third strand has been developed by Don Ross (2005, 2008) who distinguishes between 'molecular' and 'molar' approaches to neuroeconomics, following the seminal psychological exposition of 'picoeconomics' by Ainslie (1992). In this classification, Glimcher's reductionism appears to be a 'molecular' approach in trying to identify the specific neuronal mechanisms that are causes of particular behaviours, such as the use of money. A 'molar' approach argues that this 'bottom-up' explanation remains incomplete and needs to be extended to including 'top-down' processes by which neuronal mechanisms are organized via higher level cognitive structures that involve external entities. Then, the molar approach introduces distinct theoretical entities which encompass certain patterns of behaviour but which are not directly embodied in particular neuronal structures.

On first sight, Ross's distinction might appear to differentiate Glimcher's and Camerer's approaches, too. But Camerer's approach in fact remains 'molecular' insofar as the behavioural economics hypotheses are still seen as being reducible to certain neuronal mechanisms. The difference only lies in the complexity of those mechanisms, both empirically and conceptually. In comparison, Ross distinguishes between three analytical levels: first, the level of neuronal mechanisms (molecular), second, the level of molar structures which is sub-personal ('picoeconomic') but involves external structures, and third, the level of human individuals whose behaviour is seen as a result of the interplay between the molar structures, further undergirded by external scaffolds such as language (Ross 2007). In this three-level approach, the original Glimcher (2003) version of neuroeconomics applies,

namely that ‘economic agents’ can be equated with molecular mechanisms in the human brain, but neither with higher-level molar entities nor entire individuals.

I think that the difference between ‘molecular’ and ‘molar’ neuroeconomics can be pinpointed in distinguishing neuro-internalism and neuro-externalism (Herrmann-Pillath 2012). Neuro-internalism, the molecular view, submits that for explaining observed behaviour, the generating causes lie ‘inside’ the brain and therefore can be identified by means of the appropriate neuroscientific methods. Neuro-externalism agrees that neuronal mechanisms are essential for producing the behaviour, but that they can only count as intermediating mechanisms; the causes for the behaviour are external to the brain in the sense that top-down cognitive mechanisms are essential for organizing neuronal phenomena into intermediating causal structures, and that these top-down mechanisms include external phenomena in an essential way. In neuroeconomics, a related view has been proposed as ‘social neuroscience’ that would emphasize the role of behavioural coordination among dyads and groups of individuals in eliciting certain neuronal phenomena and the related behaviour (Oullier et al. 2008).

I think that these distinctions are not only important for philosophical reflections about neuroeconomics, but also for defining research strategies and even methods. For example, the tension between neuro-internalist and neuro-externalist views is salient in research on empathy, where ‘bottom-up’ and ‘top-down’ mechanisms seem to interact (Singer and Lamm 2009). On the one hand, empathy has a clear foundation in certain neuronal mechanisms that produce the pertinent emotions and behaviours. But at the same time, the activation of the mechanisms is entirely contingent on the organization and symbolic representations of social groups and identities of individuals towards which empathy is directed. In other words, we meet a methodological principle akin to the wave-particle dualism in modern physics. On the one hand, we can approach the particular neuronal phenomena as being the physical causes of observed behaviour; on the other hand, we might assign the role of the root cause to external symbolic systems that are processed by the cognitive systems which are in turn physically embodied in neuronal structures. In the methodological view championed by Ross, this shows that a proper approach to empathy would require a ‘molar’ theory and would fail as a purely ‘molecular’ one.

Subsequently, I will take the example of money to illustrate this methodological problem and its implications for empirically based hypothesizing. In doing this, I begin with an unexpected move. I go back to a classic of modern sociology, Georg Simmel's 'Philosophy of Money' published in 1900 (second edition 1907). At his time, the book was considered to be revolutionary, but its theoretical innovations failed to exert substantial impact outside the field of sociology. Originally, the book builds on a 'psychology of money' (Simmel 1889). Indeed, it is a unique cross-disciplinary view on psychological, sociological and economic aspects of money. The key point that is relevant for our methodological considerations is that money as an institution has transformative powers on human behaviour in enabling cognitive processes that are impossible without money. These processes shape the internal organization of behaviour, in particular the organization and expression of emotions. Simmel proposes a fundamental principle in analysing these processes which he takes from the contemporary debates in economics: this is 'exchange'. So, he adopts, broadly speaking, the emerging neoclassical analysis of value of his times. In this regard, his thinking is congenial to the Glimcher approach, but at the same time he argues in terms of externalism. So, I think that Simmel's grandiose view on money is of great significance in formulating a neuroeconomic theory of money today.

The paper proceeds as follows. In the second section, I present a brief overview of Simmel's theory of money, which I conclude by putting it in the context of modern theories of distributed cognition which are a leading example of neuro-externalism today. In the third section, I connect Simmel's approach with modern neuroeconomic and psychological research that involves money, thus demonstrating the relevance of his thought. This is followed by discussing a possible answer to the Glimcher challenge that builds on the seminal work by psychologists Lea and Webley. Section five concludes.

2. Georg Simmel's theory of money

Simmel's theory of money has never been received in economics (if only at the fringes), remaining a part of the sociological tradition, but even there it appears to be a solitaire. One reason is certainly that only after decades it was translated into English, immediately leading to a very sympathetic JEL review by leading scholars in monetary theory (Laidler and Rowe 1980). Yet, there was no further development of these beginnings. The reason is obvious, as

Simmel presents a grand picture of money in the context of economic theory, psychology, sociology and cultural history that was difficult to receive in the heyday of Beckerian economic imperialism across the disciplines and the rational expectations revolution. So, I claim that his insights only can be fully appreciated today, precisely in the context of neuroeconomics and psychology, which today actually provide us with strong empirical support for Simmel's theory.

Simmel received the incipient neoclassical revolution in his work (especially, Menger and Wieser) and proposed a theory of value that is firmly based on the opportunity cost principle. However, whereas the subjectivist theory of value clearly counts as an internalist approach, Simmel emphasizes the externalist view in viewing 'value' as an objective category that is ontologically defined as a purely relational phenomenon (Simmel 1907: 53ff, 77ff). In defining value as 'economic', exchange is foundational: Exchange is the more general phenomenon, and individual opportunity cost thinking is just an internalization of the principles of exchange. The other analytical foundation for value is the effort that is necessary to obtain a good: This presupposes a distinction between subject and object, which Simmel sees as an outcome of cultural evolution. Once this distinction is established cognitively, the process of overcoming the distance between the object as a goal and the desire to achieve that goal moves to the core of human choice. Basically, effort to achieve a goal is also a process of exchange, as something else has to be given up in expending effort: This has been later dubbed the opportunity cost principle.

As is well known to teachers of economics, the opportunity cost principle is by no means a 'natural' way of thinking in humans. For Simmel, the opportunity cost principle is what makes choices 'economic actions' as opposed to non-economic ones. The domain where economic choices play a central role is exchange. This is why the evolution of exchange also affects the internal mechanisms of choice. The notion of exchange is a comprehensive one, encompassing all human interactions which involve a mutual flow of benefits. Exchange is the more fundamental category in understanding economic choice than internal mechanisms because it is only exchange that ultimately turns the objects of choice into 'objective' entities (Simmel 1907: 204). This process of 'objectification' is essential for Simmel's sociological theory (Simmel 1907: 442 calls humans 'objective animals', see also 492f). Exchange is not simply seen as a meeting of two sides, hence supply and demand, but as a 'Third', that is an evolving sphere of objective social facts in the sense that the valuation of objects becomes

increasingly independent from individual desires (Simmel 1907: 80, 99ff). Individual valuations, of course, still play an essential role in driving exchange because of the opportunity cost principle.¹

Simmel's notion of objectification is externalist and points the way to a radically different view of the standard neoclassical model of exchange and money, though retaining some of its core formal features. This is why it appears congenial to Glimcher's 'neuroclassical' approach, though adding the important twist that external processes and entities play a crucial role in explaining individual behaviour. Actually, it is dualist in terms of analytical approach. On the one hand, Simmel argues in strictly neoclassical terms in following the quantity theory of money and referring prices to relative valuations exclusively (Simmel 1907: 152f, 167ff). In this view, money appears to be a mere medium of exchange. However, the ontological status of money differs from the modern and standard idea of 'neutrality': Money is the highest possible level of abstraction over the set of all possible transactions of exchange in being the most fungible and universally accepted item of exchange. That means, money also achieves a most advanced level of objectification, so is 'real' in the strict sense (Simmel 1907: 146ff, 280). For Simmel, money actually embodies the generalized opportunities for exchange in society.

This 'reality' of money is essential for the second analytical perspective, in which exchange is seen in the temporal dimension. In sequences of exchange transactions, money cannot be neutral but carries value on its own. Interestingly, Simmel therefore argues that money illusion is an essential factor in stabilizing more complex chains of exchange. Indeed, the independent valuation of money in the temporal dimension enables increasingly complex and indirect chains of exchange that enlarge the distance between original desires or intentions and goals or purposes of actions, hence the increasing division of labour (Simmel 1907: 302ff, 690, 732ff). The essence of the division of labour is the growing indirectness of goal fulfilment: This is only possible with the existence of money. Money emerges as the most abstract and universal means of goal achievement, which is reflected in the central role of

¹ Simmel's account of 'objectification' is vindicated by modern analytical philosophy, in particular Searle's (1995, 2010) notion of 'observer-relative facts' by which institutional reality is constituted. I cannot explore these issues here. Suffice to point out that money is also used as a prime example in these contexts (for a related view, see Tuomela 2007).

money in the expansion of individual freedom in social and political systems (Simmel 1907: 341ff, 643ff, 757f).

On first sight, this idea may look like the presumption that money is just an indirect measure of utility. The great difference between Simmel's theory and established economic theories of money is that Simmel elaborates on the transformative effects of money: This is why Simmel's theory is also a 'psychology of money'. Then, we see that the standard neutrality assumption is an internalist one, whereas Simmel's position is externalist. These transformative functions work out in the same way as exchange in general drives the objectification of valuations. There are two classes of transformations, cognitive and emotional. The cognitive transformations result from the role of money as a unit of account (Simmel 1907: 421ff, 444ff, 711ff). The existence of money allows new cognitive operations over valuations which otherwise remain incommensurable. Comparisons of values across different domains become possible as well as arbitrary divisions into fractions. This process, however, evolves gradually, so happens in the time scale of cultural and civilizational history. Then, through time monetary valuations increasingly become the measures of objective value in terms of mediating the entire web of exchange transactions.

These cognitive transformations also affect emotional structures. Basically, the diffusion of money drives a process of increasing individualization and growing autonomy of the individual from particularistic social groups and the pertinent norms and obligations (Simmel 1907: 455ff, 521ff, 541ff). So, money transforms social relations into most abstract relations based on the commensurable valuation principles, but at the same time allows for a maximal degree of individualization and idiosyncratic valuations: Objectification goes hand in hand with the growth of domains of subjectivity and its expressions.

These transformations also affect the emotional structures depending on context and individual conditions. Simmel muses about distinctly new emotional phenomena such as 'blasé attitude' which all result from the fact that the existence of money as an abstract valuation principle drives a wedge between original desires or judgments and the expressed behaviours which are mediated by monetary valuations (Simmel 1907: 321, 384ff). Emotional transformations also lead to distinct emotional attitudes towards money such as close to pathological phenomena of 'miserliness' (Simmel 1907: 364ff). I do not go into the details of his extremely rich historical and psychological analyses here, but just notice the basic insight.

However, one general idea needs emphasis: These emotional transformations clearly run against the idea that money is just an indirect vessel of derived utilities because the existence of money also transforms the subjective perceptions of what might be seen as primordial ‘utilities’, i.e. valuations. For example, Simmel argues that the perception of universal availability of a large range of choices may ultimately lead to the incapacity of enjoyment, thus ending up in a state of dullness.

To summarize what is already a highly condensed abstract of Simmel’s 800-pages work: Simmel receives a basically neoclassical theory of money in an externalist interpretation, thus linking the notion of ‘neutrality’ with its ultimate objectification. Objectification endows money with transformative properties that impact on cognitive functions and emotional structures. These properties unfold through historical time.

In the subsequent section, I will relate Simmel’s theory to modern neuroeconomics and psychology of money. At this point, I only locate Simmel in the context of modern developments in cognitive sciences. Simmel argues that the emergence of a social artefact is the cause of fundamental transformations of cognitive and emotional structures and processes. This view corresponds with modern approaches to distributed cognition (Clark and Chalmers 1998; Clark 2011). These approaches are neuro-externalist, because they emphasize the interaction between neuronal processes and phenomena in the external world. This includes both general physical features of the world, but especially highlights the role of social interaction and artefacts (the seminal contribution is Hutchins 1995). Here, the notion of artefact is a very broad one that includes, among others, but most important, human language. So, we can also generalize the insights of distributed cognition theories in the way that they highlight the interaction between neuronal mechanisms and external symbolic media that are involved in coordinating human action across individuals. Language is a prime example which also matches with Simmel’s philosophical concerns. Language and derived techniques such as writing transforms human cognitive capacities, while being at the same time an irreducibly ‘social’ phenomenon. The sociality of language is rooted in the principled impossibility of fixing meanings individually: The meaning of words can only be rooted in mutual understandings of words which result into coordinated actions, linguistic or other.

So, Simmel’s approach can be characterized as a precursor of modern theories of distributed cognition. Money as a historically evolved artefact would count as a transformator and

mediator of cognitive and emotional processes. That means, the causal sequence that we need to consider when analysing money is a complex one. There are cultural processes that lead to certain activations of these effects of the money institution, and there are the ontogenetic processes in human socialization that result into the particular neuronal embodiment of certain money functions. Then, once these cultural and ontogenetic developments have taken place, money is causally connected with particular neuronal structures which, however, do not per se represent money functions. Yet, in the neuroeconomic mode of experimental analysis we can hypothesize that certain neuronal structures might be involved in triggering behaviours related to money, thus counting as 'causes'. So, as we see, the distributed cognition approach implies the recurrent switching between the neuro-externalist and the neuro-internalist perspectives, though ultimately sticking to the former, once we consider the entire evolutionary trajectory of the institution of money.

Arguments based on distributed cognition approaches seem to be rare in recent neuroeconomic research. Interestingly, one exception is Dickhaut et al. (2009) who analyse accounting as a means to enhance brain functions related to reciprocity and exchange. They argue that accounting builds on existing mechanisms of memorizing and calculating costs and rewards in exchange relations, but adds substantial leverage and enhancements in terms of objectification, memory, or comparability. For example, whereas the human brain tends to process larger numbers with less accuracy, accounting schemes activating external artefacts remove this constraint on operations in the context of social exchange. Now, the foundation of accounting lies in the institution of money. Subsequently, I will present recent neuroeconomic and psychological evidence that supports Simmel's views and therefore provides the methodological rationale for combining neuroeconomics and distributed cognition approaches into one coherent neuro-externalist paradigm.

3. The special role of money in modern neuroeconomic and psychological research

It is interesting to notice that economists normally treat money as 'objectified' in the Simmelian sense. One of the essential differences between experimental research in psychology and economics is that economists insist on the use of money as a pay-off. They

argue that money can serve as an incentive that incorporates ‘real’ value to the recipients and is also commensurable across different subjects in a pool of test persons.

However, although this approach seems intuitive on first sight, it tends to ignore a question that is fundamental for economics: Does money carry utility on its own? In Glimcher’s framework, that would imply that there would be a distinct neuronal correlate to money that would be independent from other kinds of rewards. On the one hand, this assumption would contradict to the established neoclassical approach to money which does not assign value to money, because money is only a technology of organizing exchange. That means, the value of money as a merely nominal quantity would consist in the basket of goods that a certain quantity of money represents. This ‘neutrality’ of money matches with the distinction between primary and secondary reinforcers in psychology. Then, the question is whether money as a merely cultural phenomenon is only a secondary reinforcer that mediates the perception of primary rewards ‘which money can buy’.

In neuroeconomic research the status of money is therefore ambiguous. Phenomenologically, money clearly has to count as a secondary reinforcer, since, as Glimcher argues in his challenge, there is no reasonable hypothesis that might explain why natural selection and evolution might have endowed human beings with a biological value function for money. But at the same time, money seems to work as a primary reinforcer to the extent that its neuroimaging performances in experiments are congruous with other primary reinforcers (Camerer et al. 2005: 35; Phelps 2009: 240). That would imply that the concept of ‘money’ would qualify actually as an institutional oxymoron, namely a ‘cultural primary reinforcer’. This ambivalent nature of money is also evident in economics. In the majority of economic models with a neoclassical grounding, money is indeed treated as neutral, thus representing a basket of goods (Harrison 2008: 306f.). Yet, there are also many more specific models in which money is treated directly as having utility. But in my view, these models merely use a shorthand approach to implementing a simple measure of utility. For example, using money as a direct linear measure of utility in game theoretic modelling of pay-offs does not have the status of an empirically grounded hypothesis but is simply a modelling device. A full theoretical foundation would lead us back to the first approach.

The idea that money is only a derived representation of baskets of goods actually would cause considerable difficulties for interpreting experimental data because this actually presupposes a

complex cognitive operation on part of the subjects. Why should people perceive money in terms of baskets of weighted shares of different goods? Alternatively, they might value money just depending on their individual context: So, depending on the value of expected rewards after leaving the lab and the implied delays, people would value money differently. After all, money is often used in experiments with delayed rewards, but then the delay between receiving the pay-offs and spending them off-site is also relevant for explain observed behaviour. This means, however, that in typical delayed reward experiments there is the possibility that two different frames interfere. One is the experimental context with certain controlled delays and rewards, and the other the individual and idiosyncratic context of the experimental subjects, who, for example, would implicitly consider the monetary reward as a means to respond to an urgent need (they might have joined the experiment in a hungry state and yearn for a burger, or they might just be considering to open a savings account for acquiring a car etc.). These interferences could only be excluded if the subjects indeed consider money as a measure for composite utility that can be gained from consuming a ‘virtual’ basket of goods. Clearly, that would presuppose a complex learning process by which the individuals actually conceptually constructed such a basket that would remain stable across contexts (so that the urgent need for burgers would not interfere with their valuation of money). In Camerer’s terms, the value of money would then be an instance of model-based learning. This learning process would have to take place in the larger contexts of market exchange, thus actually presupposing the entire institutional setting of markets. So, the idea of approaching money in terms of a basket of goods is deeply Simmelian, as it factually introduces an ‘objectified’ notion of money. Experimentalists implicitly use money as a ‘real object’. Indeed, this viewpoint matches with the aforementioned Dickhaut et al. (2009) hypothesis that accounting schemes and principles are homologous to brain mechanisms that process relative rewards and costs: This idea also seems to suggest a homology between a ‘common currency’ involved in the brain mechanisms and the external currency of money in terms of both being a homogenous quantity that can be the object of quantitative operations. The question is whether this homology is actually based on a direct neurophysiological anchor for money that is not dependent of complex cognitive operations such as constructing baskets of goods representing a monetary unit.

Neuroeconomic research does not support a purely economic version approach to money because there is strong evidence that money is valued like other primary reinforcers which

would imply that the utility of money is not only derived from the goods which money can buy. The most impressive evidence is the neuroscientific confirmation of money illusion. Money illusion is one of the most disputed concepts in modern macroeconomics. The existence of money illusion had been rejected by the rational expectations theory in modern macroeconomics which supposes that rational individuals are able to correctly distinguish between nominal and real quantities and therefore would also reflect money neutrality in their individual choices. The refutation of money illusion on the micro-level is one pivotal assumption that led to the strange neglect of the financial sector, credit intermediaries and so on in modern macroeconomic equilibrium approaches, even in the specific context of modelling effects of monetary policies. Therefore, and to the contrary, the acceptance of money illusion is also a building block in macroeconomic approaches that explicitly include empirical insights of psychology into economics (Akerlof and Shiller 2009).

The existence of money illusion as a stable characteristic of human choice is proven in a large number of experiments in which subjects fail to differentiate between real and nominal quantities (Shafir et al. 1997). Subjects assign an independent value to gains and losses of purely nominal nature, thus implicitly revealing an independent valuation of money as a good. This valuation could also be confirmed in replications of simple behavioural experiments with including brain imagining techniques (Weber et al. 2009). The convergence of the behavioural and the brain imaging data is so close that variations in BOLD intensities in the reward processing brain areas (ventromedial prefrontal cortex) directly match with the expressed valuations of purely nominal quantities of money. This is a most interesting empirical evidence for the hypothesized homology between monetary valuations and neuronal valuations: I notice that in modern accounting and credit and debt relations, the nominal principle holds, that is, changes in the real value of money are not taken into account.

I take these results as favouring the use of the aforementioned oxymoron, money appears to be a 'cultural primary reinforcer'. To this we can add a number of further observations on the behavioural changes that are triggered by money. A typical approach in psychology is to apply different priming schemes on experimental subjects. So, different from the standard experiments in behavioural economics, money is not introduced as a pay-off in the experimental interactions, but the environment of experiments varies with different cues that obviously change the cognitive frames by which the subjects approach the different decisions and behaviours that they adopt in the experiment proper. The research by Katherine Vohs and

collaborators is highly representative for this kind of research (Vohs et al. 2006, 2008). They could demonstrate that priming with money changes behaviour in a substantial way. For example, people primed with money lend much less support to other people in simple situations which would elicit cooperative behaviour (such as helping a person picking up spilled materials). Similarly, they would manifest more self-sufficient behaviour, such as preferring to work alone when solving certain tasks that could be solved faster in cooperation. Priming with money even affects the choice of spatial positions, typically enhancing the distance taken to other people. There are other effects that work on higher cognitive levels. Caruso et al. (2013) showed that certain political attitudes shift when priming with money occurred. So, American individuals enhance their support for a free –market system and their approval for social inequalities. Interestingly, this effect does not exist for Non-American subjects when dollar bills are used. This is evidence for the role of ontogenetic fixations in anchoring the psychological effects of money.

There is experimental psychological research that also demonstrates the disjunction between subjective utilities and monetary valuations, thus directly refuting the idea that money represents derived utilities (Amir et al. 2008). In these experiments, the question is how reservation prices for certain goods differ depending on whether there are transaction cues versus experience cues. An experience cue gives test persons certain information about the pleasure or suffering that one might experience when consuming the good or service. A transaction cue provides information about monetary aspects of the good, such as reference prices or costs of production. If money indirectly reflected subjective utilities, there should be no significant difference between choices under impact of different cues. However, reservation prices are much more strongly influenced by transaction cues than by experience cues. That means, a frame shift happens when monetary valuations are active. This is the frame of market exchange in which, for example, information about production costs would be interpreted as an indirect indicator of the quality of the good, or reference prices would suggest information about fair deals. So, the monetary frame does not reflect the subjective utilities that people directly associate with the goods. In the most extreme form, this might even lead to substantial welfare losses, because people might consistently underestimate the subjective utility that can be gained by adopting a certain action if their reservation price is biased against this because of the transactional cues that activate notions of transactional fairness.

This discussion also shows that the money frame is complex. This complexity is also apparent in brain imaging studies which aim at identifying the mechanisms that result into behavioural changes such as shifts in attitudes towards fairness (Zhou et al. 2014). Most interestingly, activation patterns differ if test persons interact with other humans or a computer, thus highlighting the special role of social exchange in a Simmelian fashion. Money seems to affect both emotional responses to certain exchanges (mediated via parts of the insula) and cognitive controls (mediated via parts of the prefrontal cortex). Especially, the resulting behavioural changes affect the balance between fairness considerations and self-interest. This indicates that money indeed appears to be an embodiment of social exchange, thus also reflecting its complex dimensions: On the one hand, social exchange mediated by money is driven by self-interest, but at the same time the shift to the transactional domain may trigger related notions of equity and fairness on the cognitive level. Therefore, as Kouchaki et al. (2013) argue, depending on context money can trigger different frame shifts, which remain wedded to the monetary dimension, yet result into behavioural differences: A ‘business decision frame’ highlights self-interest and objectification of social exchange partners, thus possibly leading towards violations of fairness principles, whereas a ‘market pricing frame’ turns fairness aspects more salient. Both frames can be activated by money, depending on contextual modulations. These more complex effects of money have been also manifest in the illuminating experiments conducted by Qing et al. (2013) who could show that banknotes which are dirty trigger more selfish and unfair actions, whereas clean and new banknotes exactly cause the opposite.

Summarizing these selected results from empirical research in neuroeconomics and psychology, I reach the conclusion that these vindicate Simmel’s theory of money in substantial ways. Most important, there is clear evidence on the transformative powers of money that converge with Simmel’s views, such as on individualization. There is also evidence that money activates frames that relate with exchange in Simmel’s sense, and which therefore lead to different valuations than under a frame that would only activate experiences with actually consuming the goods. This matches with the Dickhaut et al. (2009) hypothesis about the homology between accounting and brain mechanisms processing rewards and losses. In their view, modern accounting represents the same ‘logic of social exchange’ that is embodied in different brain mechanisms: Interestingly, this even applies for those mechanisms that are often seen as contradicting perfect and formal economic rationality. For

example, Dickhaut et al. argue that prospect theory (that is, the differential treatment of losses and gains) is reflected in accounting principles such as valuation according to historical costs, thus realizing losses but not gains (which, I notice, has been changed in recent applications of mark-to-market principles and goodwill valuation that contributed to the financial crisis of 2008, according to some observers). That would imply that modern accounting based on monetary valuations enhances and extends the brain's processing of social exchange, especially by means of enabling commensurable comparisons of valuations across different individuals, with the explicit aim to contain the risks of cheating. So, neuroeconomic and psychological research seems to support the most basic of Simmel's ideas, namely that money embodies exchange. This idea I pursue further in the next section.

4. The molar and neuro-externalist approach to money: A proposal

Our account so far can be cast into the distinction between 'molecular' and 'molar' approaches in neuroeconomics. Simmel's theory clearly is molar in the sense that it allows to extract theoretical principles about certain patterns of behaviour without necessarily implicating a particular neuronal embodiment that is a specialized neural organ in Glimcher's molecular sense. Then, the question arises whether we can submit a specific hypothesis about a molar subsystem in human choice that fulfils two criteria: First, it relates with the money institution as an external fact, and second, it connects with behavioural patterns that in principle involve brain mechanisms of a particular kind.

There is a specific proposal how to envisage the relationship between the artefact of money and certain neuronal mechanism which connects up with the reported research on the divergence between subjective utilities and monetary valuations. This divergence can be explained by the fact that people shift to a social exchange framework once monetary valuations are introduced. This matches with Glimcher's observation that money might be related to generic human capacities of social exchange.

This is the proposal by Lea and Webley (2006). Its reception in the literature appears to be somewhat muted (but see Qing et al. 2012), presumably because they cast their hypothesis in terms of the 'money as tool' versus 'money as drug' imagery, even suggesting that money can trigger behavioural effects that come close to a drug. The drug theory of money is problematic,

however, because it does not match with established theories about addiction which recommend great care in extending the notion of addiction over a broader range of behaviours. There is a setting in which the drug metaphor certainly applies, which is addiction to gambling. However, this special context does not seem to be relevant when considering money functions in general.²

Therefore, the major contribution of the Lea and Webley theory is to suggest a neuronal anchor for money that matches with Glimcher's ideas. This is to root the independent valuation of money in an emotional pattern that relates to human social exchange.

This hypothesis goes back to recent contributions by evolutionary psychologists who aimed at explaining certain intricate patterns in failures and successes of human rationality. As this literature is well-known, I just highlight the central insight (Cosmides and Tooby 2005). There is overwhelming empirical evidence that humans have ecologically adapted capacities of cognition and do not apply a more fundamental 'general purpose' rationality in guiding choices. The famous example is the Wason Selection Task, which leads to very different performances if it is coined in terms of a general task in logical reasoning or if it is explicitly framed as a problem of how to detect cheaters in social exchange. The conclusion is that there is no generic capacity of 'logic' embodied in our brains, but a logical and calculatory capacity adapted to social exchange. This is a 'cognitive instinct' in the sense of Pinker.

It is also well-known that the cognitive performance of individuals is strongly influenced by the way how the information is coded and represented. This is a special case of framing, however particular kinds of framing actually enhance performance. Especially, human individuals seem quite capable in extracting true probabilities and taking the appropriate choices if they experience relative frequencies of events through time (the basic idea behind the Iowa Gambling Task) compared to formal representations of probabilities as numbers (Gigerenzer 1996 is a seminal argument on this). Framing effects of these alternate representations can even overturn the basic directions of valuations, such as in prospect theory

² Addictive gambling is seen by Ross et al. (2009) as the purest case of addiction as it presumably builds on a loss of control of dopaminergic circuits in the brain, thus triggering behaviours which recurrently drive search for goal attainment without fulfilment, yet leading to enhanced levels of dopamine which is actually the object of addictive craving. Other elements of explanations of addictive gambling can be arranged with this view, such as the role of 'illusion of control', see Clark (2010). So, the central factor in addictive gambling is not the money per se, but the special context of activities of goal attainment in general, and the related learning processes (Redish et al. 2008).

(switching from overweighting high-probability events to overweighting high-probability events, see Glimcher 2011: 383ff).

It is essential to notice that this dependence of performance on representations clearly vindicates the externalist approach of distributed cognition. There is no single and unequivocal determinant of cognitive performance ‘within’ the brain, but the brain needs to rely on certain external representations in order to realize its functions.

Now, the concept of ‘cognitive instinct’ implicitly suggests a role of emotions in enabling certain cognitive operations. This corresponds to the research tradition inspired by Damasio’s and Bechara’s work and can be regarded as a fundamental idea also in evolutionary psychology (Reimann and Bechara 2010). Then, considering a certain cognitive performance based on external phenomena, we may ask for the correspondent emotional structure, or, even following Damasio more explicitly, ask for a possible somatic marker that anchors the role of money in human choice. I claim that this possibility underlies the fact that experimentalists in neuroeconomics and psychology have converged on the use of money as a ‘currency’, as it happened, in particular, in the creation of the Iowa Gambling Task by Bechara. I claim that the very fact that money unequivocally triggers the non-cognitive capabilities of valuing different decks reveals its causal connection with a somatic marker. I argue that this is exactly the molar entity that would be essential in understanding the money institution, i.e. a causal pattern between artefact and marker. Here the Lea and Webley argument comes into play.

It is well-known that cooperation in humans also triggers the standard dopaminergic reward mechanisms, thus indicating a direct relevance of social preferences in eliciting behaviour, even in the sense that cooperation is not ‘sacrificing’ individual interests but actually is translated into the standard currency of reward, thus unifying different degrees of alleged ‘individual’ vs. ‘social preferences’ (Fehr 2009). Therefore, it seems reasonable to suggest the hypothesis that a cognitive instinct for social exchange is also embedded into larger emotional structures that include the standard reward mechanisms that stay at the centre of the Glimcher model. So, this argument actually puts together Glimcher’s view and one part of Camerer’s critique that highlights the neglect of emotions in the former. In evolutionary psychology, emotions are higher-level patterns of behaviour and correlated neurophysiological mechanisms that coordinate the more basal mechanisms such as the dopaminergic circuits with other mechanisms that play together in eliciting regularized actions towards external

stimuli (Tooby and Cosmides 2005). This is also the reason why emotions are essential for enabling appropriate, that is 'rational' responses to certain stimuli, thus actually enabling cognitive performances which might otherwise fail to take heed of the complex internal conflicts of different mechanisms which are highlighted in the picoeconomics approach. That matches with the observations about a specialized 'molar' system that enables rationality in social exchange.

Then, and following Lea and Webley, we can surmise the hypothesis that the artefact of money actually triggers this emotional complex of 'social exchange' in representing the sheer unlimited possibilities of exchange, within the constraints of the available quantity of money. In indicating these possibilities, money carries value of its own, which has been demonstrated empirically by neuroeconomic research on money illusion. Interestingly, this hypothesis matches with the proposal by Vohs and Baumeister (2011): 'Money is not a happiness-giver but rather a fungible facilitator of unfettered goal pursuit.' And this observation leads us back to Simmel in a straightforward fashion, again.

So, Simmel's theory, combined with modern evolutionary psychology and neuroeconomics, helps us to understand why money is a 'cultural primary reinforcer'. Simmel saw money as the embodiment of exchange opportunities and therefore as an irreducible social fact. We can now surmise that this 'embodiment' could be possibly interpreted as a causal pattern involving the artefact and a somatic marker that triggers certain emotional responses that relate with social exchange. So, when neuroscience experimentalists converge on money as an external trigger of reward mechanisms in the brain, they implicitly rely on this hypothesis on a stable causal circuitry that anchors money in a somatic marker of social exchange, such as in the IGT. So, Glimcher is right in speculating that money piggybacks on a pre-existing neuronal mechanism. But this mechanism is not completely 'hijacked' by money and remains autonomous, in our molar view. The causal pattern is a theoretical and molar entity which might be interpreted as a higher-level pattern of brain processes, otherwise only including the common 'molecular' mechanisms which are involved in human valuation and choice.

5. Discussion and conclusion

The characterization of money by Vohs and Baumeister is given in the context of discussing the question why money does not unequivocally relate with 'happiness'. Indeed, happiness research has been facing serious conceptual and empirical muddles and difficulties in relating any kind of measures of material prosperity with subjective feelings of happiness (Di Tella and McCulloch 2006). In this, aggregation invariably involves monetary valuations which are then treated as mere technical means of measuring material prosperity.

Simmel's approach in conjunction with modern neuroeconomics helps to resolve these problems. As Vohs and Baumeister argue, the acquisition of money as measured in levels of income is not simply an indicator of availability of goods but indicates growing capacities to act and to pursue goals. Simmel already analysed in much detail that this process, however, goes hand in hand with structural changes in society such as increasing individualization. These lead to trade-offs: Most importantly, as shown also in current experimental research, the diffusion of money may lead to the erosion of sources of happiness that reside in social interaction in closer-knit groups.

This leads to the simple conclusion that if money is a 'cultural primary reinforcer', there are universal trade-offs between money and other goods. One particularly intriguing question is how money interacts with social preferences (Bowles and Polonía-Reyes 2012). There is a broad range of empirical data that the substitution of other incentives, especially intrinsic ones, by monetary incentives changes behaviour in a substantial way: This is presumably caused by a frame shift towards market exchange (or, as in Kouchaki et al. 2013, more specifically a 'business decision frame'). Against the background of our previous considerations, one can speculate that the availability of money triggers reward mechanisms related to the possibilities for social exchange and therefore diminishes the strength of motivations for other forms of social exchange which activate similar emotions, but rely on other cues, in particular fairness cues. There is strong empirical evidence that money diminishes the valuation of fairness in social exchange, thus apparently triggering 'egoistic' behaviour. However, there is no real explanation for this phenomenon apart from actually invoking folk ideas about money and greed and other asocial behaviours. But this does not explain why money triggers this, since, after all, money is a wonderful tool to enhance the scope of cooperation: And indeed, as I have reported, money can also trigger frames that highlight fairness aspects. Therefore, the real cause must lie in the fact that money carries value on its own, and that therefore there are possibilities for complex relations of both complementarity and substitutability with other

goods. This is suggested by the proposal to see money as being causally connected with somatic markers in the context of brain mechanisms regulating social exchange behaviour.

In conclusion, Glimcher's challenge is a seminal testing ground for testing and evaluating competing methodologies in neuroeconomics which also translate in strategies of empirical research. Building on Simmel's theory of money, I have shown that a 'molar' or neuro-externalist approach is most promising to meet this challenge (Ross 2012). The molar approach recognizes the pivotal role of intermediating neuronal mechanisms, but highlights the organizing role of external entities, especially all kinds of symbolic systems that shape higher level cognitive processes and their embeddedness in emotional structures. This means that neuroscientific research needs to be combined closely with research that investigates into the interaction between money and emotions. This can be done via experiments, such as when investigating into social preferences and empathy and the impact of money on pertinent behaviour, but also via historical research on money and emotions, such as when considering the history of taboos or social regulations of the use of money across different domains of social interaction. Thus, the molar approach is thoroughly cross-disciplinary, and may lead to the interesting consequence that interpretive approaches in the humanities might regain significance, precisely in the context of what is intended to be an endeavour that closely follows methodological prescriptions of the sciences.

References

- Ainslie, George (1992), *Picoeconomics: The Strategic Interaction of Successive Motivational States within the Person*, Cambridge: Cambridge University Press.
- Akerlof, George A. and Robert Shiller (2009), *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*, Princeton and Oxford: Princeton University Press.
- Amir, O., D. Ariely and Z. Carmon (2008), 'The Dissociation Between Monetary Assessment and Predicted Utility', *Marketing Science*, 27(6), 1055–1064.
- Bernheim, B. Douglas (2009), *The Psychology and Neurobiology of Judgment and Decision Making: What's in it for Economists?*, in: Glimcher, Paul W., Colin F. Camerer, Ernst Fehr and Russel A. Poldrack (eds), *Neuroeconomics: Decision Making and the Brain*, Amsterdam: Elsevier, pp. 115-126.
- Bowles, S. and S. Polanía-Reyes (2012), 'Economic Incentives and Social Preferences: Substitutes or Complements?', *Journal of Economic Literature*, L(2), 368–425.

- Camerer, C. (2013): A Review Essay about Foundations of Neuroeconomic Analysis by Paul Glimcher, *Journal of Economic Literature* LI(4), 1155-1184.
- Camerer, C., G. Loewenstein and D. Prelec (2005), 'Neuroeconomics: How Neuroscience Can Inform Economics', *Journal of Economic Literature*, XLIII, 9–64.
- Clark, A. and D.J. Chalmers (1998), 'The Extended Mind', *Analysis*, 58, 10–23.
- Clark, Andy (2011), *Supersizing the Mind: Embodiment, Action, and Cognitive Extension*, Oxford: Oxford University Press.
- Clark, Luke (2010): Decision-making During Gambling: An Integration of Cognitive and Psychobiological Approaches, *Philosophical Transactions of the Royal Society B* 2010 365: 319-330.
- Cosmides, Leda and James Tooby (2005), 'Neurocognitive Adaptations Designed for Social Exchange', in Buss, David M. (ed.), *The Handbook of Evolutionary Psychology*, Hoboken: Wiley, pp. 584–628.
- Dickhaut, John, Sudipta Basu, Kevin McCabe, and Greg Waymire (2010) *Neuroaccounting: Consilience between the Biologically Evolved Brain and Culturally Evolved Accounting Principles*. *Accounting Horizons* (24)2: 221-255.
- Di Tella, R. and R. MacCulloch (2006), 'Some Uses of Happiness Data in Economics', *Journal of Economic Perspectives*, 20(1), 25–46.
- Fehr, Ernst (2009), 'Social Preferences and the Brain', in Glimcher, Paul W., Colin F. Camerer, Ernst Fehr and Russel A. Poldrack (eds), *Neuroeconomics: Decision Making and the Brain*, Amsterdam: Elsevier, pp. 215–232.
- Gigerenzer, Gerd (1996), 'Rationality: Why Social Context Matters', in Baltes, Paul B. and Ursula M. Staudinger (eds), *Interactive Minds: Life-span Perspectives on the Social Foundation of Cognition*, Cambridge: Cambridge University Press, pp. 319–346.
- Glimcher, Paul W. (2003), *Decisions, Uncertainty, and the Brain. The Science of Neuroeconomics*, Cambridge and London: MIT Press.
- Glimcher, Paul W. (2011), *Foundations of Neuroeconomic Analysis*, Oxford and New York: Oxford University Press.
- Gul, Faruk and Wolfgang Pesendorfer (2008), 'The Case for Mindless Economics', in Caplin and Andrew Schotter (eds), *The Foundations of Positive and Normative Economics*, Oxford: Oxford University Press, pp. 3–41.
- Herrmann-Pillath, C. (2012a), 'Towards an Externalist Neuroeconomics: Dual Selves, Signs, and Choice', *Journal of Neuroscience, Psychology and Economics*, 5(1), 38–61.
- Herrmann-Pillath, C. and I. Boldyrev (2014): *Hegel, Institutions, and Economics: Performing the Social*, Routledge.
- Hutchins, Edwin (1995), *Cognition in the Wild*, Cambridge and London: MIT Press.
- Kouchaki, M., Smith-Crowe, K., Brief, A. P., Sousa, C. (2013): Seeing Green: Mere Exposure to Money Triggers as Business Decision Frame and Unethical Outcomes, *Organizational Behavior and Human Decision Processes*, 121: 53-61.
- Laidler, D. and Rowe, N. (1980) 'Georg Simmel's Philosophy of Money: A review article for economists', *Journal of Economic Literature*, XVIII: 97–105.

- Lea, S. G. and P. Webley (2006), 'Money As Tool, Money As Drug: The Biological Psychology of a Strong Incentive', *Behavioral and the Brain Sciences*, 29, 161–209.
- Oullier, O., A. P. Kirman, Alan P. and J. A. S. Kelso (2008), 'The Coordination Dynamics of Economic Decision Making: A Multilevel Approach to Social Neuroeconomics', *IEEE Transactions on Neural Systems and Rehabilitation Engineering*, 16(6), 557–571.
- Qing, Y., Wu, X., Zhou, X., Mead, N. L., Vohs, K. D., Baumeister, R. F. (2012): Diverging Effects of Clean Versus Dirty Money on Attitudes, Values, and Interpersonal Behavior, *Journal of Personality and Social Psychology*, 104(3): 473-489.
- Redish, A David, Jensen, Steve, Johnson, Adam (2008), A Unified Framework for Addiction: Vulnerabilities in the Decision Process, *Behavioral and Brain Sciences* 31: 415-487.
- Reimann, M. and A. Bechara (2010), 'The Somatic Marker Hypothesis as a Neurological Theory of Decision-Making: Review, Conceptual Comparisons, and Future Neuroeconomics Research', *Journal of Economic Psychology*, 31, 767–776.
- Ross, D. (2007b), 'H. sapiens as Ecologically Special: What Does Language Contribute?' *Language Studies*, 29, 710–731.
- Ross, D. (2008), 'Two Styles of Neuroeconomics', *Economics & Philosophy*, 24, 473–483.
- Ross, D. (2012), 'Neuroeconomics and Economic Methodology', in Davis, John B. and D. Wade Hands (eds), *The Elgar Companion to Recent Economic Methodology*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar, pp. 61–93.
- Ross, Don (2005), *Economic Theory and Cognitive Science: Microexplanations*, Cambridge, MA, USA and London: MIT Press.
- Ross, Don (2012), 'Neuroeconomics and Economic Methodology', in Davis, John B. and D. Wade Hands (eds), *The Elgar Companion to Recent Economic Methodology*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar, pp. 61–93.
- Ross, Don, Carla Sharp, Rudy E. Vuchinich and David Spurrett (2008), *Midbrain Mutiny: The Picoeconomics and Neuroeconomics of Disordered Gambling*, Cambridge, MA, USA MIT Press.
- Searle, John R. (1995), *The Construction of Social Reality*, New York: Free Press.
- Searle, John R. (2010), *Making the Social World: The Structure of Human Civilization*, Oxford: Oxford University Press.
- Shafir, E., P. Diamond and A. Tversky (1997), 'Money Illusion', *Quarterly Journal of Economics*, CXII(2), 341–374.
- Simmel, G. (1889) 'Zur Psychologie des Geldes', reprinted in Rammstedt, O. (ed.) *Georg Simmels Philosophie des Geldes, Aufsätze und Materialien*, Frankfurt am Main: Suhrkamp.
- Simmel, G. (1907), *Philosophie des Geldes*, second edition, reprint 2009, Cologne: Anaconda.
- Singer, T. and C. Lamm (2009), 'The Social Neuroscience of Empathy', *Annals of the New York Academy of Sciences*, 1156, 81–96.
- Tooby, John and Leda Cosmides (2005), 'Conceptual Foundations of Evolutionary Psychology', in Buss, David M. (ed.), *The Handbook of Evolutionary Psychology*, Hoboken: Wiley, pp. 5–67.
- Tuomela, Raimo (2007), *The Philosophy of Sociality*, Oxford: Oxford University Press.

Vohs, K. D., Mead, N. L. and Goode, M. R. (2008) 'Merely activating the concept of money changes personal and interpersonal behavior', *Current Directions in Psychological Science*, 17(3): 208–212.

Vohs, Kathleen D., Nicole L. Mead and Miranda R. Goode (2006): *The Psychological Consequences of Money*, *Science*, 314: 1154-1156.

Weber, B., A. Rangel, M. Wibrals and A. Falk (2009), 'The Medial Prefrontal Cortex Exhibits Money Illusion', *Proceedings of the National Academy of Sciences*, 106(13), 5025–5028.

Weber, B., A. Rangel, M. Wibrals and A. Falk (2009), 'The Medial Prefrontal Cortex Exhibits Money Illusion', *Proceedings of the National Academy of Sciences*, 106(13), 5025–5028.

Zhou, Y., Wang, Y., Rao, L.-L., Yang, L.-Q., Li, S. (2014): *Money Talks: Neural Substrate of Modulation of Fairness by Monetary Incentives*, *Frontiers in Behavioral Neuroscience*, 8, article 150.