

Before Markets: The Cognitive Foundations of Economic Exchange

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Abstract

Despite centuries of economic inquiry, the origins and underlying mechanisms of economic behavior remain unclear. Accounts of economic origins often begin with Adam Smith’s narrative of barter, while economic theory more broadly has developed from assumed preferences and optimizing agents rather than from an empirical account of how economic behavior first emerged. Yet findings from behavioral economics show that human behavior frequently departs from these assumptions. Here we challenge the barter-first narrative and argue that economic exchange originated in reciprocity, a basic biological form of social interaction. Drawing on evidence from anthropology, primatology, and developmental psychology, we specify how reciprocity gives rise to economic exchange by identifying three cognitive mechanisms underlying reciprocal exchange: individual-specific memory, reciprocity expectation, and cost-return sensitivity. Together, these mechanisms provide a unified, empirically grounded foundation for economic exchange and a common basis for understanding broader forms of cooperation and the emergence of more complex economic arrangements.

Keywords: Reciprocity, Economic Exchange, Cooperation, Comparative Cognition, Behavioral Economics

1 Introduction

The standard account of the origins of economic exchange begins with barter: individuals trading goods directly, with money and markets later emerging to reduce the frictions of exchange [1, 2]. Yet ethnographic and historical research offers no evidence that early human exchange was originally organized through barter. Instead, early exchange appears to have been organized around *reciprocity*—a temporally extended

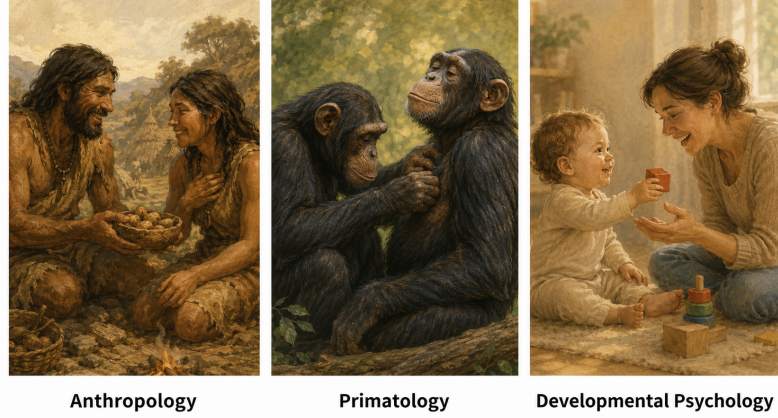


Fig. 1 We use the comparative method to integrate converging evidence from anthropology, primatology, and developmental psychology, thereby identifying the foundational cognitive mechanisms underlying economic exchange.

system of giving, receiving, and returning benefits embedded in social relationships [3–5].

This missing account of how economic exchange emerged has broader consequences for economic theory. In its absence, economics largely proceeded from assumptions about optimizing agents with given preferences. Increasingly elaborate theories of choice and markets were derived from these premises without first establishing their connection to observed human behavior. Yet decades of behavioral economics have revealed systematic departures from these assumptions [6–8], suggesting that the canonical economic agent reflects the structure of the theory more than the empirical organization of economic behavior.

We therefore challenge the Smithian account of barter and advance an alternative account in which economic exchange originated in biologically grounded reciprocity. Drawing on converging evidence from anthropology, primatology, and developmental psychology, we identify three cognitive mechanisms that make reciprocal exchange possible: individual-specific memory, reciprocity expectation, and cost-return sensitivity.

In this work, we reframe the origins of economic exchange as reciprocity and develop an account of the mechanisms through which reciprocal exchange becomes possible. This synthesis provides a unified foundation for understanding economic exchange, broader forms of cooperation, and the development of more complex economic arrangements as extensions of biologically grounded reciprocity.

Our contributions.

- We provide an empirically grounded account of the origins of economic exchange, replacing the barter-first narrative with an account based on biologically grounded reciprocity.

- We identify three cognitive mechanisms underlying reciprocal exchange: individual-specific memory, reciprocity expectations, and Cost-return sensitivity.
- We provide a unified foundation for understanding economic exchange, broader forms of cooperation, and the development of more complex economic arrangements as extensions of biologically grounded reciprocity.

2 The Missing Foundations of Economic Exchange

2.1 The Barter-First Origin Story

Accounts of the origins of economic exchange have often begun with Adam Smith's claim that exchange emerged through barter [1]. In this narrative, individuals first traded goods directly, while money and markets later developed to overcome the inefficiencies of such exchange. Barter thus became the conventional starting point for explaining the emergence of economic life.

Historical and ethnographic research, however, provides no evidence that societies were primarily organized around barter. Early exchange was instead embedded in enduring social relationships, obligations, and systems of credit [3–5]. The barter-first account therefore begins from a hypothetical form of exchange rather than from the social organization in which exchange is empirically observed.

2.2 The Missing Empirical Foundation of Conventional Economics

In its methodological starting point, conventional economics retains a conception of exchange structurally similar to the barter-first account: exchange occurs between individuals whose preferences, resources, and capacities for choice are already given [2, 9]. From these assumptions, economic theory derives models of choice, exchange, and market organization without first establishing whether its starting point corresponds to observed human behavior [10–12]. The foundations of economic behavior are thus presupposed rather than empirically established.

This gap became increasingly apparent with the rise of behavioral economics. Human choices were found to depart systematically from predictions based on stable preferences and consistent optimization, exhibiting framing effects, reference dependence, and bounded rationality [6, 7, 13]. Yet these findings were largely treated as biases or deviations from standard economic theory, rather than as evidence that the theory itself may rest on a mistaken account of economic behavior.

3 Reciprocity as the Elementary Form of Economic Exchange

3.1 An Empirical Account of the Origins of Economic Exchange

In contrast to Adam Smith’s barter-first claim [1], anthropological research indicates that early human exchange was organized through reciprocity embedded in enduring social relationships, obligations, and delayed returns [3–5].

Primatological research extends this account by showing that reciprocity predates human economic institutions. Nonhuman primates display reciprocity in food sharing, grooming, and social support, with behavior shaped by previous interactions and expected returns [14, 15]. Together, these findings show that economic exchange emerged from preexisting forms of reciprocity rather than from isolated barter among fully formed economic agents.

3.2 Reciprocity, Exchange, and Cooperation

These findings establish that reciprocity, not direct barter, is the elementary structure of economic exchange. Reciprocity relaxes several constraints that make direct barter difficult to sustain:

- **Double coincidence of wants.** Direct barter requires both parties to want what the other offers at the same time. Reciprocity allows benefits to be returned later, removing the need for an immediate matching of wants.
- **Strict equivalence.** Direct exchange requires the parties to agree on the relative value of the goods or services being traded. Reciprocity permits returns to differ in timing, form, and magnitude without requiring an exact valuation in every interaction.
- **Cognitive load.** Continuous calculation of exchange ratios, prices, and outstanding balances is cognitively costly, especially in the absence of formal accounting systems. Reciprocity instead relies on socially manageable expectations of return across repeated interactions.

Reciprocity is also the basic structure of cooperation. Cooperation is sustained through long-term interactions of mutual giving and receiving, in which individuals continue to provide benefits because others also contribute and return benefits over time. The economy can therefore be understood as cooperation at scale: the extension of reciprocal relationships across larger populations, longer time horizons, and more complex forms of coordination.

Economy = Cooperation at Scale. At its core, the economy is reciprocity extended across larger populations, longer time horizons, and more complex forms of coordination. In this sense, the economy is cooperation at scale.

A simple example is that A helps B, B helps C, and C later helps A. Once reciprocal returns can circulate through many agents rather than return directly between two individuals, cooperation can scale beyond face-to-face exchange.

3.3 The Motivational Basis of Reciprocity

Because reciprocity often produces socially positive behaviors such as giving, helping, and sharing, it can appear to be driven by moral motivation. However, this appearance is misleading. At a more fundamental level, reciprocity is a feature of social animal life: it enables individuals to survive and cooperate in a world that is dangerous, information-limited, and uncertain. The motivational basis of reciprocity can be understood through three interrelated functions.

- **Relationship maintenance.** Social animals must maintain relationships with others. Reciprocity helps sustain these relationships through repeated interactions in which benefits are given and returned over time.
- **Cooperative interdependence.** Social animals cannot meet all practical demands by themselves and therefore require cooperation with others. Reciprocity helps organize such cooperation by allowing benefits to be exchanged across contexts and over time, without requiring exact accounting in each interaction.
- **Cooperative balance.** Cooperation cannot remain one-sided indefinitely. Reciprocity helps balance cooperation by preserving the expectation that benefits will eventually be returned, whether directly, indirectly, or in another form.

Thus, reciprocity is best understood as a social coordination mechanism. Its deeper function is to make cooperation workable among interdependent agents who must maintain relationships, divide tasks, and navigate uncertain future returns.

4 The Three Cognitive Mechanisms Enabling Reciprocity

If reciprocity constitutes the foundation of economic exchange, the next question is how to move beyond a descriptive narrative and identify the mechanisms through which it operates.

Using the comparative method, we take anthropological evidence as the empirical basis and integrate findings from primatology and developmental psychology. This comparative analysis identifies three cognitive mechanisms that enable reciprocity:

- **Individual-specific memory:** distinguishing specific individuals and retaining information about previous interactions with them;
- **Reciprocity expectation:** forming and updating expectations about whether cooperation will generate future benefits;

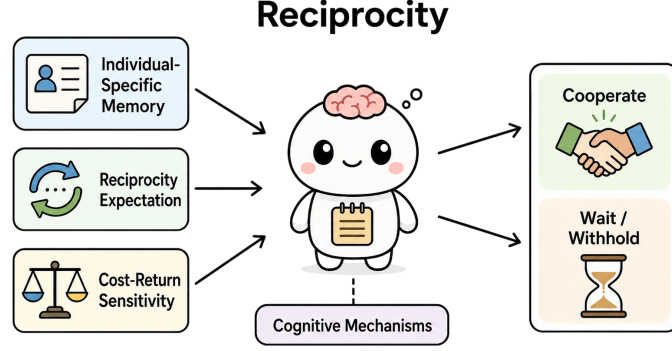


Fig. 2 Core cognitive mechanisms of reciprocity. Using anthropology as the empirical basis, the framework draws on comparative evidence from primatology and developmental psychology to identify the mechanisms underlying reciprocity.

- **Cost–return sensitivity:** tracking cooperative costs and returns and adjusting subsequent behavior accordingly.

In humans, these mechanisms need not rely on explicit or prolonged calculation. Instead, they often take the form of rapid, intuitive feelings:

- **Individual-specific memory:** appears as a judgment about whom to trust [16];
- **Reciprocity expectation:** appears as a sense of whether cooperation is likely to be returned [17];
- **Cost–return sensitivity:** appears as a sense that someone may be taking advantage of oneself [18].

Together, these mechanisms constitute a biological capacity that enables humans, as social animals, to coordinate cooperation rapidly despite limited information and uncertain outcomes.

4.1 Individual-specific memory

Definition 1 (Individual-specific memory) Individual-specific memory is the capacity to recognize specific individuals over time and retain information about previous interactions with them. By storing information about who cooperated or defected in the past, it provides a baseline for deciding how to respond to different individuals in future interactions.

Empirical Support.

Nonhuman primates exhibit strong memory for specific individuals. Chimpanzees and bonobos remember familiar individuals after decades and preferentially attend to former social partners [19].

In cooperative tasks, chimpanzees adjust behavior based on partner identity and prior interactions, initiating coordination through glances, pauses, or approach behaviors, and succeed more often with tolerant, familiar partners [20, 21].

In humans, this ability emerges in infancy. By 14 months, children selectively help those who previously acted prosocially [22], indicating that individual-specific memory guides subsequent social interaction by linking particular individuals to their past behavior.

4.2 Reciprocity Expectation

Definition 2 (Reciprocity Expectation) Reciprocity expectation is an updatable expectation about whether cooperation with a given individual, group, or social context can be expected to generate future benefits. It shapes an agent’s willingness to initiate, sustain, or withdraw from cooperation.

It arises from two temporally grounded types of inference:

- **Retrospective inference:** based on memory of past prosocial behavior directed toward the self or others;
- **Prospective inference:** based on contextual signals that indicate whether future cooperation is likely to be beneficial, such as social roles, reputational cues, or institutional incentives.

In practice, reciprocity expectations are grounded in three principal sources of information:

1. **Direct interaction history:** where an agent has experienced prior cooperation, prosocial behavior, or successful outcomes from interaction with a specific individual.
2. **Third-party inference:** based on observed or reported behavior toward others, which supports expectations about how an individual is likely to behave in future cooperation.
3. **Role-based or contextual expectation:** where social roles, environmental incentives, or normative structures lead to default assumptions about whether cooperation is likely to generate future benefits, even in the absence of personal history.

Empirical Support.

Direct interaction history provides the most robust foundation for reciprocity expectation. In chimpanzees, prior grooming increases subsequent food sharing by the individual who received grooming, and this effect is partner-specific rather than generalized across group members [14]. Chimpanzees also preferentially collaborate with partners who have helped them before [23], indicating that past cooperative behavior can shape expectations about whether future cooperation with a given partner will be beneficial.

In humans, reciprocity expectation appears early in development. By age three, children avoid helping agents who previously harmed others, even when the harm was unsuccessful [24], indicating early sensitivity to past intent in guiding prosocial choice.

By contrast, third-party inference and role-based expectation are much more elaborated in humans than in nonhuman primates. In human social life, these mechanisms

form the basis for reputation systems, institutional roles, and generalized cooperation beyond direct experience.

4.3 Cost–return sensitivity

Definition 3 (Cost–Return Sensitivity) Cost–return sensitivity is the capacity to regulate cooperative behavior based on perceived payoff asymmetries over repeated or long-term interactions. Rather than relying on fixed heuristics, agents adjust participation by tracking whether cooperation yields sustained net benefit, enabling them to avoid exploitation and reinforce beneficial exchange.

Empirical Support.

In nonhuman primates, cost–return sensitivity appears in the long-term regulation of reciprocity. Among wild chimpanzees, grooming balance is not always visible within single encounters or short-term intervals, but a regular pattern of balance appears when relationships are measured over longer periods. This indicates that individuals can regulate grooming and other cooperative behaviors by maintaining a balance of costs and returns across repeated interactions [15].

In humans, long-term reciprocal balance is difficult to capture directly in experimental settings with young children. However, children negatively evaluate and sanction free riders, especially when noncontribution is intentional rather than accidental [25]. This suggests an early sensitivity to whether others contribute to cooperative arrangements or exploit them without paying corresponding costs.

5 Financial Institutions as Extensions of Reciprocity

Financial institutions can be understood as institutional extensions of reciprocity. By institutionalizing different variants of reciprocity, they enable more complex forms of coordination, allowing resources to be allocated more efficiently and to move more rapidly.

- **Token exchange** is a token-mediated form of reciprocity. Tokens serve as a medium of return, allowing reciprocal relations to extend beyond direct bilateral ties and scale across a wider exchange system.
- **Credit and debt** are delayed forms of reciprocity. The borrower receives present access to resources, while the lender receives a future return, often with interest. This transforms reciprocal return into an institutionally enforceable obligation across time.
- **Insurance and risk pooling** are collective forms of reciprocity. Members contribute resources in the present so that support can be provided to those who face future losses. This transforms reciprocal return into an institutionally organized mechanism for distributing risk across a group.
- **Investment** is a contingent form of reciprocity. Investors commit present capital in exchange for the possibility of future rewards, while recipients gain immediate access to deployable resources. This transforms reciprocal return into an institutionally organized claim on uncertain future outcomes.

Together, these institutions extend and transform reciprocity across social distance, time, collective risk, and uncertain future value. Financial exchange can therefore be understood as an institutionalized extension of reciprocity.

6 Discussion: The Economy Is Not a Human Invention

Because modern economies appear highly complex, they are often treated as artificial systems created by human invention. This makes it easy to overlook their much simpler underlying logic. Economic behavior begins from reciprocity, while markets, money, debt, and financial institutions extend and transform this logic into larger and more complex systems. Reciprocity can then operate across larger populations, longer time horizons, greater uncertainty, and wider social distances.

This view is supported by evidence that several patterns commonly classified as economic biases, including loss aversion [26], framing effects [27], and inequity aversion [28], are also observed in nonhuman animals. Their presence across species further demonstrates that economic behavior is not a uniquely human invention, but an extension of biological social behavior.

7 Conclusion

The evidence reviewed here suggests that economic exchange did not originate in barter among autonomous traders, but in biologically grounded reciprocity. Across anthropology, primatology, and developmental psychology, reciprocal exchange depends on individual-specific memory, reciprocity expectation, and cost-return sensitivity. These capacities provide the cognitive foundation on which more complex forms of exchange and economic institutions are built. Economic inquiry should therefore begin not with assumed preferences and optimizing agents, but with the empirical mechanisms that make exchange possible.

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Competing interests

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Data and code availability

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Author contributions

The author conceived the study, developed the central argument, and wrote and revised the manuscript.

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