Money and trust among strangers

Gabriele Camera[a,b,c,1,2], Marco Casari[d], and Maria Bigoni[d]

[a]Economic Science Institute, Chapman University, Orange, CA 92866; [b]Department of Economics, University of Basel, CH-4002 Basel, Switzerland; [c]Department of Economics, Purdue University, West Lafayette, IN 47907; and [d]Department of Economics, University of Bologna, 40126 Bologna, Italy

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What makes money essential for the functioning of modern society? Through an experiment, we present evidence for the existence of a relevant behavioral dimension in addition to the standard theoretical arguments. Subjects faced repeated opportunities to help an anonymous counterpart who changed over time. Cooperation required trusting that help given to a stranger today would be returned by a stranger in the future. Cooperation levels declined when going from small to large groups of strangers, even if monitoring and payoffs from cooperation were invariant to group size. We then introduced intrinsically worthless tokens. Tokens endogenously became money: subjects took to reward help with a token and to demand a token in exchange for help. Subjects trusted that strangers would return help for a token. Cooperation levels remained stable as the groups grew larger. In all conditions, full cooperation was possible through a social norm of decentralized enforcement, without using tokens. This turned out to be especially demanding in large groups. Lack of trust among strangers thus made money behaviorally essential. To explain these results, we developed an evolutionary model. When behavior in society is heterogeneous, cooperation collapses without tokens. In contrast, the use of tokens makes cooperation evolutionarily stable.

fiat money | repeated games | matching models

The impersonal interactions typical of industrialized societies (1, 2) stand in sharp contrast with those of our ancestors. Humans have spent most of their evolutionary past in small bands of hunters and gatherers whose survival depended on their ability to cooperate, reciprocating help over time rather than behaving opportunistically (3, 4). If our attitudes toward cooperation have evolved genetically and culturally to fit face-to-face interactions (5), then there is an open question regarding what allowed humans to succeed in cooperative tasks involving millions of individuals (6).

Here, we study two issues: (*i*) Do individuals develop cooperative norms in large groups as easily as they do in small groups? (*ii*) How do monetary systems affect behavior in a society of strangers?

Field evidence on the first issue is ambiguous, as many factors covary with group size. Typically, payoffs to cooperation are lower in small groups—as the result of a reduced scope for specialization—but members can monitor each other better than in large groups and can communicate more easily. Consequently, we designed an experiment to remove these confounds. In the Control conditions, a stable group of N subjects interacts in pairs with changing opponents. Every encounter involves a helping game, in which one subject may provide a benefit to the other (= help) by sustaining a small cost (7). The treatment variable is the group size $n = 2,4,8,32$. In groups larger than two, interaction is impersonal in the sense that subjects cannot observe the opponents' identity and are rematched randomly after each encounter (8); hence, direct or indirect reciprocity is impossible (9). A long-run horizon is implemented through a random stopping rule (10). A main result is that larger groups cooperate less. Subjects cannot enforce common rules for the voluntary provision of help, and they do not trust one another. Therefore, in large groups, institutions have an important role to play (1).

We focus on money. Why money? If there is one lesson to draw from the recent spate of financial crises, it is that modern societies need money to function. Breakdowns in the functioning of monetary systems are highly disruptive events, with devastating consequences not only for the economy but also for society. Consider, for example, the sudden demise of the Argentine currency board in 2001 (11) or the fears associated with Greece's possible exit from the eurozone (12).

Given that money is a basic economic institution in society, it is crucial to understand its behavioral properties. Money usually is described as an object or symbolic artifact that is used mainly or solely to facilitate exchange (13, 14). The standard theoretical reasoning is that monetary exchange breaks down barriers between geographically and temporally separated producers and consumers, enabling complex sequences of exchanges that improve social welfare (15, 16). Money matters only if it enables transactions that could not occur otherwise through impersonal exchange.

To study the behavioral relevance of money in society, the experiment included a Tokens condition in which participants could voluntarily transfer intrinsically worthless tokens to their opponent. If tokens function as money, exchanging tokens for help provides an immediate reward for cooperators. However, tokens can become money endogenously only if there is sufficient trust that others will reciprocate help in exchange for a token. We report that such trust emerged, and it was particularly valuable when groups got large. Simply put, strangers did not trust one another but put their trust in a symbolic object that could be circulated.

To study the behavioral properties of money, the design ensured that full cooperation theoretically was possible in all Control and Tokens conditions, and without the need to consider tokens. Hence, in the experiment, norms of voluntary provision of help were enough to maximize joint payoffs, unlike in prior experiments, in which, by design, the use of money was necessary to maximize joint payoffs (17–19). As a consequence, in our experiment, the presence of money did not introduce biases from increasing payoffs from cooperation or from lowering trading costs. This setting may provide a clean answer to questions such as the following: Do intrinsically worthless tokens take on the role of money? If the institution of monetary trade arises endogenously, does it promote group cooperation? Laboratory experiments allow the study of these kinds of issues in a controlled environment. We find that money preserves cooperation as groups get larger, but it displaces norms of voluntary provision of help. To explain these results, we developed an evolutionary model for societies in which behavior is heterogeneous. Without tokens, cooperation collapses, whereas individuals following a monetary strategy survive better than others. The use of tokens thus makes cooperation evolutionarily stable.

There are two unique elements relative to existing studies about group size and cooperation: interactions are impersonal (= strangers), and there is a random stopping rule. These elements were not present in many past experiments (20–22). Some

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[1]To whom correspondence should be addressed. E-mail: camera@chapman.edu.

[2]Present address: Economic Science Institute, Chapman University, Orange, CA 92866.

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studies considered impersonal interaction but finite repetition (10), whereas the monitoring assumed in other studies reduced the incentives to cooperate as the size increased (23). We model impersonal exchange through a design that makes the intertemporal dimension of cooperation transparent and exhibits a multiplicity of equilibria, ranging from full defection to full cooperation. Importantly, in this design, payoffs from cooperation are invariant to group size. We are not aware of other experiments investigating the impact of money on cooperation in small and large groups.

1. Measuring Cooperation in Anonymous Societies

The experiment comprises Control and Tokens conditions. Each condition is carried out with group sizes $n = 2,4,8,32$. Players interact in pairs, one as a producer and one as a consumer. In the Control conditions, participants play a "helping game" (7). Each player starts with 8 consumption units (CUs). The producer may choose to help or not. The consumer has no choice to make (Fig. 1). Helping yields a benefit of 12 CUs for the consumer and costs 6 CUs to the producer, creating a social surplus of 6 CUs (= gift). A producer who does not help has no costs, bestows no benefits, and generates no surplus (= inaction). Cooperation occurs whenever help is given; otherwise, defection occurs. Cooperation maximizes the number of CUs in the pair, hence the total surplus. CUs cumulate across rounds and, at the end of the session, are converted into dollars according to a preannounced rate.

In the experiment, a group of subjects repeatedly face a cooperative task with an uncertain duration. Within a stable group of N players, half are consumers, half are producers, and everyone randomly switches roles in every round. Consumers and producers meet in random pairs in every round. Identities are undisclosed, hence there is no scope for direct reciprocation. After each round, the number of defections in the group is made public. Participants interact in an average of 17 rounds in the group: they know they will play for three rounds and then, from round 3 on, there is a 93% probability that an additional round will take place (*Methods*).

In this environment, self-interested players can achieve 100% cooperation if all of them follow a simple common rule or a social norm. A producer helps as long as every producer in the group helps; otherwise, he stops helping anyone forever after. If everyone in the group follows this norm, then the frequency of cooperation is 100% and no individual has an incentive to deviate from this norm. In the theory of infinitely repeated games, this is known as a situation of equilibrium (24). It is the quality of monitoring that matters for cooperation, not the group size per se. What is crucial is that group members can observe one another's behaviors and anticipate a continuing relationship. Given that in the experiment defections were made public, cooperative equilibrium is sustainable in groups of any size N (25, 26).

The Tokens conditions introduce the possibility of monetary exchange (for details, see *SI Text*). Money in the experiment is represented by a symbolic artifact we call a "token." Tokens are intrinsically worthless; they have no reference to outside currencies and cannot be redeemed for CUs or dollars. Here, the producer has an additional option: she can choose to sell help in exchange for a token. The consumer has three options: do nothing and carry over the token to the next round, unilaterally transfer a token, or buy help in exchange for a token (Fig. 1). Producer and consumer choose simultaneously and without prior communication. The consumer receives help (= cooperation) if decisions are compatible: either a token is exchanged for help (= trade) or the producer gives help unconditionally (= gift). Intuitively, a monetary system relies on participants trusting that help today will be reciprocated tomorrow by a stranger in exchange for a token. Therefore, the presence of tokens introduces additional equilibria. However, it neither adds Pareto superior equilibria nor removes any equilibria of the Control conditions. In particular, trading tokens for help theoretically is unnecessary to sustain a cooperative outcome. By design, cooperation is self-enforcing without the need to exchange tokens. The presence of tokens neither forces subjects to use them nor precludes the adoption of a social norm of cooperation (details in *SI Text*).

We introduce a fixed number of intrinsically worthless tokens in each group of players by endowing every first-round consumer with two tokens. With this supply, tokens have a chance to acquire value endogenously. A larger supply would depress their value as money. A smaller supply would lower the volume of potential trades. The design allows us to differentiate subjects' behavior in two different decisional situations: one in which help can be provided only voluntarily and one in which help also may be sold for a token. In most encounters, participants have the option to exchange help for a token (= trade possible). In some encounters, however, consumers have no tokens to give, and hence trade is impossible. Subjects cannot choose between participating in an encounter in which trade is possible or impossible, because of randomness in role assignment and pair formation. Situations in which trade is impossible characterize theories of money and reflect the reality of everyday interactions in which consumers face liquidity constraints (*SI Text*). In the experiment, buying help for two rounds in a row leaves a subject without tokens, even if this subject always follows a cooperative strategy. Such an example also illustrates that tokens at best may serve as a noisy proxy of an image score (27).

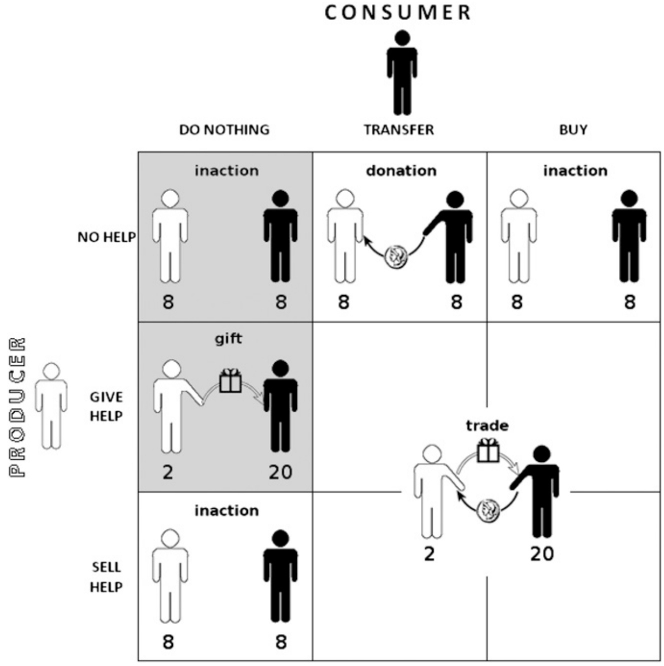

Fig. 1. A modified helping game. Control condition (shaded cells): Producer may help or not, Consumer makes no choice; possible outcomes are inaction or gift. Tokens condition (all cells): players have tokens. Producer chooses a row: no help, give help, or sell help in exchange for a token. Consumer simultaneously chooses a column: do nothing, transfer a token unilaterally, or buy help in exchange for a token. Possible outcomes are inaction, gift, donation, or trade. When Consumer has no tokens, the actions available in the Tokens and Control conditions coincide (trade impossible). Numbers are payoffs in CUs.

2. Larger Groups Cooperate Less

Experimental results support the hypothesis that larger groups cooperate less. In the Control conditions, the larger the group, the lower is the cooperation rate: it drops from 70.7% in groups of 2, to 49.1% in groups of 4, to 34.2% in groups of 8, and to 28.5% in groups of 32 (Fig. 2; additional statistics in *SI Text*). The effect of the group size on cooperation is statistically significant according to a linear regression model ($P < 0.0001$; Table 1).

In naturally occurring environments, as societies grow larger, cooperation may become increasingly difficult to sustain because of issues related to monitoring, frequency of interaction, and coordination. Monitoring others is a key requirement to sustain cooperation (28), and in the field, observing the actions of everybody else is more difficult in larger groups. In the experiment, instead, monitoring is equally accurate in small and large groups because participants can observe the fraction of cooperators in the group. Consequently, this confound is absent, and we can rule out monitoring difficulties as the primary explanation for the decline in cooperation.

Cooperation may suffer in larger groups because of a lower frequency of interaction: the probability of consecutively meeting the same person declines from 100% when $n = 2$, to 3.2% when $n = 32$. If cooperation relies on direct reciprocation, then it becomes increasingly difficult to achieve in larger groups, because in our design, the interaction is anonymous and participants cannot build a reputation.

Cooperation also may suffer as the result of miscoordination of strategies. According to the theory of repeated games, a group can sustain cooperation by coordinating on a common rule of behavior. When group members are drawn randomly from a generic population, large groups are more likely to be heterogeneous than small groups, hence they are less likely to adopt a common rule.

3. Money Preserves Cooperation as Groups Get Larger

When participants can engage in monetary trade, cooperation rates remain constant even if groups increase in size. The average frequency of cooperation is 52.1% (computed attributing equal weight to each condition $n = 2,4,8,32$). The dashed line in Fig. 2 reports disaggregated data; there is no significant difference across group sizes (trade possible, $P > 0.10$, $n = 199$; Table 1).

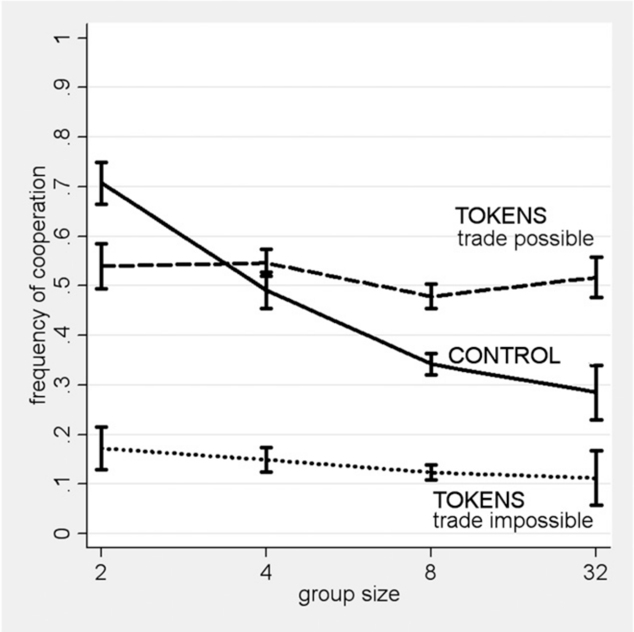

Fig. 2. Cooperation and group size. The possibility of engaging in monetary trade increases cooperation relative to the Control condition in large groups ($n > 2$). As groups get larger, cooperation declines in the Control condition but not in the Tokens condition. Tokens condition: the dashed (dotted) line considers encounters in which participants might (might not) trade help for a token. The lines represent the mean frequency of cooperation, i.e., the fraction of producer–consumer encounters in which the producer helps. The error bars represent the SEM. The surplus generated in the group is proportional to cooperation rates. Unit of observation: frequency of cooperation in a group of N players, in a cycle.

Table 1. Cooperation and group size

Variables	Control conditions	Tokens conditions: Trade possible	Tokens conditions: Trade impossible
Group size	−0.079* (0.010)	−0.016 (0.022)	−0.011 (0.008)
Group size-squared	0.002* (0.000)	0.000 (0.001)	0.000 (0.000)
Constant	0.775* (0.019)	0.521* (0.080)	0.261* (0.041)
Dummies for cycles	Yes	Yes	Yes
N	199	199	190
R-squared	0.245	0.028	0.042

The three linear regressions estimate the impact of group size on the frequency of cooperation. SEs are robust for clustering at the session level. Dummies for cycles 2–4 are used to control for possible learning effects (*Methods*). The unit of observation is the frequency of cooperation in a group of *N* players, in a cycle.
*Significance at the 1% level for the estimated coefficient.

The possibility of monetary trade significantly boosts cooperation (hence, surplus) only if groups are large enough. In large groups ($n = 32$), the frequency of cooperation is 28.5% in the Control condition and 51.7% in the Tokens condition when trade is possible ($P = 0.015$, $n = 21$, and regressions in *SI Text*). The opposite holds true when participants interact as partners ($n = 2$). In this case, individuals cooperate significantly less in the Tokens than in the Control condition (54.0% vs. 70.7%; $P < 0.01$, $n = 184$; see regression results in *SI Text*).

4. Money Displaces Norms of Voluntary Help

Our findings suggest that the use of money increases a sense of self-sufficiency, thus changing individuals' motivations and their disposition toward others (29). Behavior is dramatically different in the Control and Tokens conditions. When trade is possible, producers no longer make gifts, but they mostly choose to help for tokens (50.4%; column 1 in Table 2) or not to help at all (44.0%).

Especially revealing is the behavior when trade is impossible. The actions available in these encounters are identical to those available in the Control conditions, in which the observed frequency of cooperation is 45.6%. In contrast, cooperation is minimal in the Tokens condition (13.9%): when trade is impossible (Fig. 2, dotted line), the frequency of cooperation does not exceed 17.2% in any Tokens condition, a frequency that is below the lowest level recorded in the Control conditions (28.5%). As a consequence, the overall cooperation frequency is greater in the Tokens than in the Control condition only when the group is sufficiently large (45.2% for $n = 2$, 38.3% for $n = 4$, 32.8% for $n = 8$, and 34.0% for $n = 32$; *SI Text*).

5. Monetary Trade Is Evolutionarily Stable

To interpret the previous results, we show that in a society of strangers the use of money makes cooperation evolutionarily stable. Cooperation never emerges as a stable outcome when there are only two types of players: cooperators, who always help, and defectors, who never help. Instead, a cooperative outcome can prevail when the population includes a sufficiently large share of traders, who cooperate only in exchange for a token.

The intuition is as follows. Traders adopt a discriminatory strategy that penalizes defectors and rewards everyone else. This protects traders from free-riders and allows them to reap the gains from intertemporal exchanges with those interested in cooperation. Money here substitutes for the ability to rely on indirect reciprocity (7), which is difficult in societies of strangers.

To see this, consider a sequence of generations whose members may be of three possible types: cooperators, defectors, and traders. Because encounters are random within a generation, the mixture of types in the population influences everyone's payoffs.

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Table 2. Frequencies of consumers' and producers' actions

Producer's choice	Consumer's choice: Control condition	Tokens condition: Trade impossible	Trade possible: Do nothing	Trade possible: Transfer or sell
No help	0.544	0.861	0.059	0.381
Give help	0.456	0.139	0.007	0.048
Sell help	—	—	0.077	0.427
Totals	1	1	0.143	0.857

Each cell reports the average frequency of consumers' and producers' choices. The unit of observation is the frequency in a group of *N* players, in a cycle. Averages are computed attributing equal weight to each condition $n = 2,4,8,32$.

Now, suppose we give one token each to a share $\tau \in [0,1)$ of players of the initial generation and then follow how the mixture of types evolves across generations. According to standard replicator dynamics, the share of a type increases from one generation to the next as long as the payoff of that type is greater than the average payoff in the same generation. With our experimental parameters, only four equilibria exist: either τ traders coexist with $1-\tau$ defectors, or all players are of the same type (*SI Text*). When all three types of players are present, only two equilibria are stable, because the dynamics lead either to a population of all defectors or to a population of all traders. The basins of attraction depend on τ as the amount of tokens affects the threshold in the population mix that leads to either all defectors or all traders ($\tau = 0.3$ in Fig. 3). With many tokens, the population is more likely to be invaded by defectors. When cooperators coexist with some other type, then the situation is neither stationary nor stable because cooperators earn a payoff below average.

The evolutionary model rests on the assumptions of large populations and long-run horizons, conditions that are hard to reproduce in an experiment. Nonetheless, evolutionary stability offers a way to interpret the prevalence of monetary trade over gift exchange in our experimental societies of strangers. One also may think of other explanations for our findings. Consider, for instance, the cognitive load of different strategies: monetary trading is simpler than history-dependent social norms of cooperation and punishment. Money also may serve as a tool for coordination: whereas social norms may break down in the absence of widespread agreement, monetary trade can be sustained even within a minority of the population (27). Finally, the institution of money is more robust to agents' random mistakes compared with social norms of cooperation that rely on community punishment.

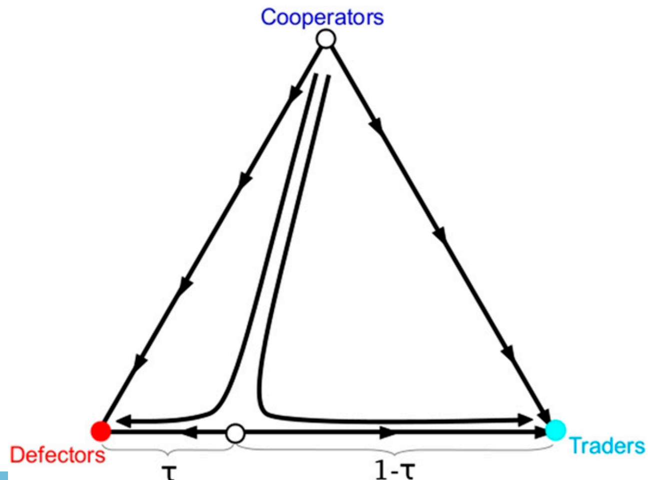

Fig. 3. Basic evolutionary dynamics of monetary trade.

6. Discussion

This study has identified a behavioral reason for the existence of money, in addition to standard theoretical arguments. The experiment finds evidence consistent with "the indispensable role money plays in making possible the extended order human cooperation" (ref. 30, p.104).

Our research suggests that norms of voluntary cooperation are difficult to use in a society of strangers, unless they are mediated by some institution. In the experiment, monetary exchange, one of the most basic economic institutions, emerged endogenously and supported a stable level of cooperation in small as well as large groups. Inherently worthless tokens acted as a catalyst for cooperation, acquiring value because of a self-sustaining belief that they could be exchanged for future cooperation. Trust in others is a bridge between the present and the future. When trust is missing, the exchange of tokens for cooperation acts as a substitute way to link the present to the future. In a population with a mix of cooperators and free-riders, the type of counterpart one meets is uncertain. Hence, a producer may refuse to participate in gift exchange for fear of being exploited by free-riders. In the experiment, a consumer who has tokens is statistically less likely to be a free-rider. By demanding a token in exchange for help, cooperators achieve two complementary objectives: they acquire the means to signal their type, and they prevent free-riders who hold tokens from misrepresenting their type in future encounters (31). In this sense, the exchange of tokens may be seen as a remedy for a "market for lemons" (32).

Furthermore, we uncovered the presence of a social cost in monetary exchange. Once the convention of money took hold, participants replaced norms of voluntary cooperation with a norm of exchange, i.e., trading cooperation for a token, *quid pro quo*. Consequently, the institutions of money and gift exchange did not coexist, because monetary exchange crowded out gift exchange. We can interpret this outcome as an "institutional invasion." This damaged cooperation whenever monetary trade was unavailable. The resulting social cost was minimal in large groups because norms of voluntary cooperation were hard to establish.

The type of monetary system we study is known as "fiat" money. It corresponds to the systems in place worldwide since the demise of the gold standard in the early 1970s. One may conjecture that the emergence of a fiat monetary system in the experiment was facilitated by a human predisposition for social exchange, as help was traded for an object, although intrinsically worthless (5). Another possible reason is the evolutionary stability of money as an institution. Here, we have focused on the role of money, but this experimental setting may be extended to behavioral studies of financial institutions such as banks and information-processing institutions such as rating agencies and to studies of the behavioral implications of liquidity crises and monetary policy.

Methods

The experiment included 448 undergraduate volunteers, each of whom participated in only one session and played five long-run interactions (= cycles). Each subject played the first four cycles of a session in groups of fixed size. The size of the group was 32 in the last cycle of every session. In the first cycles, group size was 2, 4, or 8. We ran 10 sessions of 32 or 64 subjects: 5 for the Control and 5 for the Tokens condition. The experiment involved no deception. On average, sessions lasted 2.5 h, and subjects earned $US27.28.

The design reduced possible contagion effects from cycle to cycle. In each round, group members knew nothing about the choices made in other groups in the same session. No one ever met the same person in more than one cycle, except for the last. Forming a large group in the last cycle prevented defection (s) in an early cycle from spreading to all groups in the following cycles. At the end of each round, subjects were informed about their payoff, their stock of tokens (in the Tokens conditions), and the number of defections in their group. At all times, subjects had access to a history of the above information for all rounds in the cycle. Cycles ended simultaneously for all groups in the same session, and their duration differed across cycles and across sessions.

Instructions were read aloud, and subjects received a written copy (*SI Text*). The instructions explained the session's structure, the random continuation rule, the payoffs, the formation of groups, and the random pairing process, and made clear that earnings would be paid in cash privately at the end of the session. Neutral language was used to the greatest extent possible in the instructions; words such as "help," "cooperation," and "money" were never used.

After giving the instructions, we administered a quiz with hypothetical examples about the experiment and publicly provided the correct answers. Subjects interacted through computers, using custom-made software. Subjects were seated at visually separated desks in two computer laboratories on the same floor of the Krannert Building at Purdue University. No eye contact was possible. Sessions proceeded simultaneously in both laboratories. After the session, the subjects filled out a questionnaire.

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1. North DC (1991) Institutions. *J Econ Lit* 5(1):97–112.
2. Binmore K (2005) *Natural Justice* (Oxford Univ Press, New York), p 82.
3. Kaplan H, Schniter E, Smith V, Wilson B (2012) Risk and the evolution of human exchange. *Proc R Soc B* 279(1740):2930–2935.
4. Bowles S, Gintis H (2011) *A Cooperative Species: Human Reciprocity and Its Evolution* (Princeton Univ Press, Princeton, NJ).
5. Barkow J, Cosmides L, Tooby J (1995) *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (Oxford Univ Press, New York).
6. Seabright P (2004) *The Company of Strangers: A Natural History of Economic Life* (Princeton Univ Press, Princeton, NJ).
7. Nowak MA (2006) Five rules for the evolution of cooperation. *Science* 341(5805):1560–1563.
8. McCabe K, Rassenti S, Smith V (1998) Game theory and reciprocity in some extensive form experimental games. *Proc Natl Acad Sci USA* 93(23):13421–13428.
9. Camera G, Casari M (2009) Cooperation among strangers under the shadow of the future. *Am Econ Rev* 99(3):979–1005.
10. Palfrey TR, Rosenthal H (1994) Repeated play, cooperation and coordination: An experimental study. *Rev Econ Stud* 61(3):545–565.
11. Spiegel M (August 23, 2002) Argentina's currency crisis: Lessons for Asia. *FRBSF Economic Letter*, 25.
12. Anonymous (September 16, 2012) Greece euro exit would be catastrophic, say Samaras. BBC News.
13. Winick C (1956) *Dictionary of Anthropology* (Philosophical Library, New York).
14. Polanyi K (1971) The semantics of money uses. *Primitive, Archaic, and Modern Economies: Essays of Karl Polanyi*, ed Dalton G (Beacon, Boston), pp 175–203.
15. Jevons WS (1875) *Money and the Mechanism of Exchange* (Appleton, London).
16. Ostroy JM, Starr RM (1990) The transactions role of money. *Handbook of Monetary Economics*, eds Friedman BM, Hahn FH (Elsevier, New York), Vol 1, pp 3–62.
17. Lian P, Plott CR (1998) General equilibrium, markets, macroeconomics and money in a laboratory experimental environment. *Econ Theory* 12(1):21–75.
18. Duffy J, Ochs J (2002) Intrinsically worthless objects as media of exchange: Experimental evidence. *Int Econ Rev* 43(3):637–673.
19. Camera G, Noussair C, Tucker S (2003) Rate of return dominance and efficiency in an experimental economy. *Econ Theory* 22(3):629–660.
20. Fonseca MA, Normann H-T (2012) Explicit vs. tacit collusion—The impact of communication in oligopoly experiments. *Eur Econ Rev* 56(8):1759–1772.
21. Isaac R, Walker JM, Williams AW (1994) Group size and the voluntary provision of public goods: Experimental evidence utilizing large groups. *J Public Econ* 54(1):1–36.
22. Isaac RM, Walker JM (1998) Group size effects in public goods provision: The voluntary contributions mechanism. *Q J Econ* 103(1):179–199.
23. Duffy J, Ochs J (2009) Cooperative behavior and the frequency of social interaction. *Games Econ Behav* 66(2):785–812.
24. Friedman JW (1971) A non-cooperative equilibrium for supergames. *Rev Econ Stud* 38(1):1–12.
25. Kandori M (1992) Social norms and community enforcement. *Rev Econ Stud* 59(1):63–80.
26. Ellison G (1994) Cooperation in the prisoner's dilemma with anonymous random matching. *Rev Econ Stud* 61(3):567–588.
27. Camera G, Casari M, The coordination value of monetary exchange: Experimental evidence. *Am Econ J Microecon*, in press.
28. Levine D, Pesendorfer W (1995) When are agents negligible? *Am Econ Rev* 85(5):1160–1170.
29. Tooby J, Cosmides L (1996) Friendship and the banker's paradox: Other pathways to the evolution of adaptations for altruism. *Proc Br Acad* 88:119–143.
30. Hayek FA (1991) *The Fatal Conceit: The Errors of Socialism* (Univ Chicago Press, Chicago).
31. Camera G, Vesely F (2007) Trading horizons and the value of money. *Eur Econ Rev* 51(7):1751–1767.
32. Akerlof GA (1970) The market for "lemons": Quality uncertainty and the market mechanism. *Q J Econ* 84(3):488–500.