

# In-Group versus Out-Group Trust: The Impact of Income Inequality

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In this article, we adopt a variant of the trust game by Berg, Dickhaut, and McCabe (1995) and the dictator game by Cox (2004) to determine if income inequality can activate in-group favoritism and, if so, whether such a bias is strong enough to survive the removal of income inequality. We find evidence of in-group favoritism only on the part of rich first movers. Rich first movers trust their in-group members significantly more in the presence of income inequality not only before but also after they gain enough experience. Poor first movers, in contrast, do not exhibit such in-group bias. They do not discriminate between in-group and out-group at the very outset of the experiment, and once they become experienced, they behave with significantly more trust toward the rich than toward the poor. We also find that in-group and out-group favoritism established in the past can be alleviated, but not completely removed, by an equal income distribution.

**JEL Classification:** C90, D63

## 1. Introduction

What promotes trust and what destroys it? Various studies have shown that institutional development, age structure, population size, religious composition, income inequality, and ethnic diversity are linked to, and may directly impact, the overall trust level in a society or community (see, for example, Knack and Keefer 1997; La Porta et al. 1997; Zak and Knack 2001; Knack and Zak 2002; Uslaner 2002; Zelmer 2003; Berggren and Jordahl 2006; Bjornskov 2006). Of all these variables, income inequality, measured by the Gini coefficient, is perhaps the most consistent and robust determinant of social solidarity and trust: Greater income inequality widens the social distance between different income classes and thereby reduces the overall level of trust.

There are two things worth noting about this particular result. First, while it can be shown with cross-country data that income inequality is strongly associated with lower trust, the

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We are particularly grateful to the Center for Research on International Economics at the University of Wisconsin-Milwaukee, City University of Hong Kong, and Hong Kong University of Science and Technology for financial and laboratory support. We thank Kenneth Chan, John Heywood, Kamhon Kan, Steven Tucker, two anonymous referees, and participants at the 2007 Economic Science Association North American Regional Meeting and the 10th Experimental Economics Days, Dijon for valuable comments. We thank CiCi Lo and Jennifer Tse for excellent research assistance.

Received September 2008; accepted June 2009.

causal relation between these two variables is not yet clear due to omitted variables and endogeneity problems. Second, the measure of trust used in most of the empirical literature is based on responses to the question “Generally speaking, would you say that most people can be trusted or that you can’t be too careful in dealing with people?” from the World Values Surveys. Responses to this survey question reflect at best respondents’ attitude regarding *generalized trust*, to say nothing of the finding by Glaeser et al. (2000) that they are a much better predictor of a society’s overall level of trustworthiness rather than of trust. Note that to study exactly how income inequality affects trust, it is necessary to first identify what type of trust—*generalized* or *particularized* trust—that the research question is meant to address. Contrary to generalized trust that involves faith in a wide range of strangers, particularized trust, also called in-group trust, concerns faith in primarily in-group members—people of “one’s own kind” or people who share the same values and norms—via social ties or social identities (Uslaner 2002). Inequality influences particularized trust by allowing social identities that are associated with different income classes to be developed. Social identities create similarity, and similarity cultivates trust among in-group members (see, for example, Allport 1954; Coleman 1990; Fukuyama 1995; Alesina and La Ferrara 2000; Hardin 2006). While Allport (1954) argues that in-group positivity does not necessarily imply out-group negativity, income inequality could nevertheless activate out-group hostility and further facilitate in-group favoritism if it creates conflicts over scarce resources or political power between different income classes (Sherif and Sherif 1953; LeVine and Campbell 1972; Brewer 1999).

Given the limited field data that can be directly used to measure the impact of income inequality on particularized trust, this article contributes to the literature by studying the relationship between inequality and in-group favoritism in a stylized laboratory environment. The specific research questions are as follows: Does income inequality induce in-group favoritism in the sense that people trust their in-group members more than they trust out-group members? And if so, would such an in-group bias be strong enough to survive the removal of the inequality?

We divide the experiment into two parts. To introduce income disparity in the first part of the experiment, we follow Anderson, Mellor, and Milyo (2006) and randomly reward half of the subjects with a common participation fee.<sup>1</sup> In other words, subjects are equally and randomly divided into two groups: the rich and the poor (they are referred to as “Type A” and “Type B,” respectively, in the experiment). Two treatments are adopted in order to investigate if participants trust in-group and out-group members differently. The first treatment involved a variant of the investment game introduced by Berg, Dickhaut, and McCabe (1995). In this game, subjects are divided into pairs that consisted of a first mover and a second mover. The first mover is given the opportunity to transfer none, some, or all of his 10-franc cash endowment to his paired counterpart. The first mover has no information regarding the second mover’s identity, and is required to specify the amount of money he wishes to transfer given two possibilities: (i) the second mover is Type A, and (ii) the second mover is Type B. Given the second mover’s type and the first mover’s corresponding decision, all money passed on is tripled by the experimenter and given to the second mover. The second mover, after receiving

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<sup>1</sup> In Anderson, Mellor, and Milyo (2006), income inequality was introduced by varying show-up fees across participants. For instance, in the treatment with symmetric distribution, three of the eight subjects recruited for a given session received \$10, two received \$7.50, and three received \$5 as a show-up payment.

the money, has the opportunity to return none, some, or all of the money. The second mover, also having no information about her counterpart's identity, is required to make a contingent decision similar to the first mover's.

Note that if we simply compare the amounts sent to different types in the above investment game, we will likely pick up motivations that do not concern in-group and out-group trust. Therefore, we follow Cox (2004) and introduce a variant of his dictator game as our second treatment to disentangle transfers motivated by trust from transfers motivated by other-regarding preferences. The dictator game is very much like the investment game described above except that the second mover has no decision to make and thus is not able to return any money even if she wishes.

We study the impact of removing income inequality in the second part of the experiment under two income conditions. Under the high condition, a participation fee is rewarded to all subjects in a given session. Under the low condition, no participation fee is rewarded to anyone. In other words, subjects become either equally rich or equally poor after experiencing the phenomenon of income disparity. No redistribution policy is employed in order to avoid its effects being compounded with those of trust and other-regarding preferences. Finally, group labeling and thus affiliation (Type A and Type B) remain in effect even after the income disparity is removed. Note that even though social psychologists have found that the mere categorization of people into two groups (the minimal group paradigm) is extremely effective in cultivating in-group favoritism, there exists mixed evidence as to whether or not group affiliation by itself would affect trust in the economics literature. For example, while Guth, Levati, and Ploner (2005) find no significant impact of group identity on first movers' transfer decisions, Buchan, Johnson, and Croson (2006) find support for in-group bias from a pool of American subjects.<sup>2</sup>

Our main findings are as follows. In the presence of income inequality, we find that first movers, regardless of their income level, tend to trust the rich significantly more than they trust the poor. Since, for a given type of first movers, the proportions returned from the rich and the poor are not statistically different from each other, we believe that such in-group and out-group trust on the part of first movers is less likely to be a calculative move based on a norm or an expectation that poor second movers, out of perhaps fairness concerns, would keep more and return less. After income inequality is removed, we find that most first movers, except those originally rich, become equally trusting toward both the rich and the poor. This result suggests that in-group as well as out-group favoritism can be alleviated by an equal income distribution.

The rest of our article is organized as follows. Section 2 describes the experimental design and procedures and sections 3 and 4 report the results. Section 5 concludes with a brief summary and discussion.

## **2. The Experiment**

The experiment consisted of two treatments (games) and 16 sessions executed in a between-subjects design. Sessions were conducted at the University of Wisconsin-Milwaukee (UWM), Hong Kong University of Science and Technology (HKUST), and City University of

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<sup>2</sup> See Anderson, Fryer, and Holt (2006) for an extensive survey of experimental evidence on discrimination.

**Table 1.** Summary of Experimental Sessions

Session	Treatment (Game)	Condition in Part II (No Inequality)	Number of Subjects	Location
1	Trust	High	16	UWM
2	Trust	High	20	UWM
3	Trust	Low	16	UWM
4	Trust	Low	16	UWM
5	Trust	High	20	HKUST
6	Trust	Low	16	HKUST
7	Trust	High	16	HKUST
8	Trust	Low	16	HKUST
9	Dictator	High	16	HKUST
10	Dictator	High	20	HKUST
11	Dictator	High	16	HKUST
12	Dictator	High	16	HKUST
13	Dictator	Low	16	CityU
14	Dictator	Low	16	CityU
15	Dictator	Low	16	CityU
16	Dictator	Low	16	CityU

Hong Kong (CityU) between March 2006 and July 2007. A total of 268 subjects were recruited either from introductory economics courses (at UWM and CityU) or via a university-wide e-Recruit system (at HKUST). Some of the subjects may have participated in economics experiments before, but none had any experience in experiments similar to ours. No subject participated in more than one session of this study. On average, sessions lasted about 50 minutes including initial instruction period and payment of subjects. The experiment was conducted in an experimental currency, called “francs,” which was converted to local currencies at a predetermined and publicly known conversion rate. Subjects earned an average of US\$9.58. The experiment was computerized using the Z-tree software package (Fischbacher 2007).

The two treatments were an investment game, built on Berg, Dickhaut, and McCabe (1995), and a dictator game, built on Cox (2004). Each treatment was made of eight sessions and each session was divided into 20 rounds and two parts (Part I: rounds 1 to 10; Part II: rounds 11 to 20). At the beginning of each session, subjects were evenly and randomly assigned to be one of the two types, labeled as Type A and Type B, and to assume one of the two roles, labeled as First Mover and Second Mover. It was equally likely for a participant to be a Type A First Mover, a Type A Second Mover, a Type B First Mover, or a Type B Second Mover. Types and roles remained fixed throughout all 20 rounds. All participants received 10 francs as a cash endowment at the beginning of each round to play the investment game or the dictator game, depending on the treatment. To create income inequality in Part I of the experiment, we followed Anderson, Mellor, and Milyo (2006) and gave each Type A participant an extra 10 francs as a participation fee in each round. The participation fee was not allowed to be used when playing either one of the two games. To study the impact of eliminating income inequality on trust in Part II, we introduced two income conditions: the high condition and the low condition. Participants in a given session, regardless of being Type A or Type B, all received a participation fee under the high condition and nothing under the low condition. In other words, participants in a given session became either equally rich (under the high condition) or equally poor (under the low condition) in Part II of the experiment. Summary information about each of the 16 sessions is given in Table 1.

In the investment game, the computer randomly paired a first mover with a second mover at the beginning of each round without revealing each other's identity, including ID number and type. The first mover was given the opportunity to transfer none, some, or all of his 10-franc cash endowment to his paired counterpart. Since the first mover had no information regarding the second mover's identity, he was required to specify the amount of money he wished to transfer given two possibilities: (i) if the second mover was Type A or (ii) if the second mover was Type B. The first mover made each of these two decisions by clicking a button that indicated the amount he wished to transfer on the computer screen.<sup>3</sup> Given the second mover's type and the first mover's corresponding decision, all money passed on was tripled and given to the second mover. The second mover, after receiving the money, had an opportunity to return none, some, or all of the money she received. The second mover, having no information about her counterpart, was required to specify the amount of money she wished to return given two possibilities: (i) if the first mover was Type A, and (ii) if the first mover was Type B. Like the first mover, the second mover made these decisions by clicking buttons that indicated the amounts she wished to return on the computer screen. Money was returned to the first mover based on his type and the second mover's corresponding decision.<sup>4</sup>

At the end of each round, the computer displayed a summary screen of both counterparts' types, the amounts of money received and returned by the second mover, and their final period earnings including the earnings from the game and, if applicable, the participation fee. The intended amount of transfer or return that did not match the other counterpart's type was not reported as part of the summary. To minimize the impact of wealth effects, we randomly chose one round from each part for payment at the end of the session.

The dictator game was very much like the investment game except that the second mover had no decision to make and thus was not able to return any money even if she wished.

The timing of activity in a session was as follows. Upon arriving at the experiment, subjects were seated by their own choice of a computer terminal in the laboratory. Once everyone was seated, the instructions for Part I of the experiment were read aloud for the subjects who followed along with their own copy of the text. The fact that the experiment consisted of two parts was also written in the instructions and thus was common knowledge to all participants. Nevertheless, the exact contents of Part II were not revealed to subjects until after Part I was completed. Subjects were allowed to ask questions relating to Part I's rules or procedures at any time during the instructional period. Rounds 1 to 10 proceeded after all questions were answered. The instructions for Part II were handed out and read aloud for the subjects after round 10 was concluded. Round 11 to 20 took place soon afterwards.

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<sup>3</sup> Transfers were restricted to integers.

<sup>4</sup> Falk and Zehnder (2007) adopt a similar design feature in their citywide trust experiment conducted in Zurich, Switzerland. In their experiment, both first and second movers were asked to make transfer and return decisions based on Zurich's 12 residential districts.

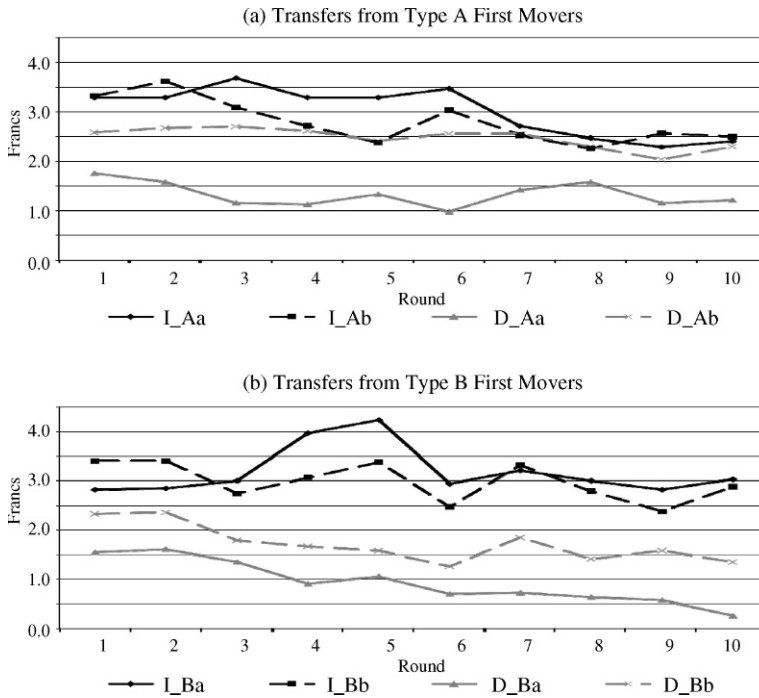


Figure 1. Time Series of Average Transfers: Part I (Inequality)

### 3. Results from Part I

#### *Behavior of First Movers*

Figure 1a presents the time series of the average transfers to different income groups from Type A (rich) first movers from rounds 1 to 10 in the investment game. The black solid line, labeled I\_Aa, represents the average transfers to Type a (rich) second movers, whereas the black dashed line, labeled I\_Ab, represents the average transfers to Type b (poor) second movers.<sup>5</sup> It is apparent from these two time series that the amounts of transfers to the rich are slightly higher than those to the poor. Across all 10 rounds in the eight sessions of the investment game, Table 2 shows that the mean amount of transfers from rich first movers was 3.02 to their rich in-group members and 2.80 to poor out-group members. Nevertheless, using each session as an observation, a Wilcoxon matched-pairs signed-rank test suggests that the difference between these transfers is not statistically significant at any conventional level.<sup>6</sup>

The time series of the average transfers from Type B (poor) first movers in the investment game is shown in Figure 1b. As in Figure 1a, black solid and dashed lines, labeled I\_Ba and I\_Bb, represent transfers to Type a (rich) and Type b (poor) second movers, respectively. The general behavior pattern of poor first movers is very similar to that of the rich in that they, too, slightly preferred rich rather than poor second movers. The mean amount of transfers from

<sup>5</sup> In the rest of the article, we will use upper- (A and B) and lower-case letters (a and b) to distinguish between first and second movers.

<sup>6</sup> Since allowing subjects to interact with each other is most likely to result in observations that are not independent, here we choose a whole session rather than an individual decision maker as an observation.

**Table 2.** Data Summary of Amount Sent in the Investment Game

	Part I (Inequality) All		Part II (No Inequality) High Condition		Part II (No Inequality) Low Condition	
	To Type a	To Type b	To Type a	To Type b	To Type a	To Type b
Type A First Movers	3.02 (3.35) [340]	2.80 (3.35) [340]	1.91 (3.32) [180]	1.82 (3.21) [180]	2.37 (3.11) [160]	2.36 (3.18) [160]
Type B First Movers	3.19 (3.54) [340]	2.99 (3.42) [340]	1.45 (2.56) [180]	1.48 (2.72) [180]	3.06 (3.64) [160]	2.79 (3.43) [160]

Amount sent is out of 10 francs. Standard deviations are in parentheses. The number of observations appears in brackets.

poor first movers, as shown in Table 2, was 3.19 to rich second movers and 2.99 to poor second movers. Again, a Wilcoxon matched-pairs signed-rank test indicates that these transfers are not significantly different from each other.

Next, we adopt a generalized least squares (GLS) random-effects model that allows us to take advantage of the cross-sectional and time-series variation in the data to investigate the effect of income inequality on the relative amount sent. The dependent variable is the difference between the amounts wished to send to a Type a (rich) and a Type b (poor) second mover by subject  $i$  in round  $t$ . We control for the difference between the actual proportions returned by a Type a (rich) and a Type b (poor) second movers in the most recent previous rounds.<sup>7,8</sup> In addition to the return difference, we also include round  $t$  to capture the learning effect and a dummy variable that equals 1 for sessions conducted in Hong Kong and 0 otherwise. Finally, as subjects interacting with one another throughout 10 periods are more likely to provide observations that are not independent, we correct such a within-session correlation by clustering observations on the session level. As a result, the statistical significance of our estimates is less likely to be exaggerated. The results are summarized in Table 3.

Table 3 suggests that the relative amount sent was partially motivated by the difference in the proportions returned. When the proportion returned from Type a (rich) is 1% higher than that from Type b (poor), Type A (rich) and Type B (poor) first movers, respectively, sent 0.02 and 0.05 francs more to Type a (rich) relative to Type b (poor). Also, a significantly positive constant term in Column 1 suggests that rich first movers at the beginning of the experiment sent significantly more money to the rich than to the poor, although this kind of in-group favoritism, as indicated by the estimate of round  $t$ , decreases as time went by.

To sort out the part of transfers that was motivated by other-regarding preferences, we need to turn to the data from the dictator game. The time series of the average transfers from Type A (rich) and Type B (poor) first movers in the dictator game are also shown in Figures 1a and 1b. Gray solid lines in these two figures represent transfers to rich second movers in the

<sup>7</sup> Note that, in our experiment, money was returned to the first mover based on his type and the second mover's corresponding decision. That is, even though the second mover in our experiment was required to indicate the amounts of money she wished to return to different types of first movers, her matched counterpart nonetheless had no information about her alternative return decision. Therefore, in the regression, we consider only the *actual* proportions returned that were observable by the first mover.

<sup>8</sup> For example, suppose that a given first mover happens to be paired with Type a (rich) second movers in rounds 1 and 2, and Type b (poor) second movers in rounds 3 and 4. In round 5, we control for the difference between the proportion returned by the Type a second mover in round 2 and the proportion returned by the Type b second mover in round 4.

**Table 3.** Results of GLS Random-Effects Models for Difference in Amount Sent in Part I

	(1)	(2)
	Type A	Type B
Constant	2.17** (0.99)	-0.23 (0.91)
Difference in proportion returned	0.02* (0.01)	0.05*** (0.01)
Period	-0.22* (0.12)	0.08 (0.07)
HK	-0.25 (0.61)	-0.57 (0.82)
Observations	181	186

Standard errors, shown in parentheses, are adjusted for within-session correlations. \*\*\*, \*\*, \*: significant at the 1%, 5%, and 10% levels, respectively.

dictator game (D\_Aa in Figure 1a and D\_Ba in Figure 1b), whereas gray dashed lines represent transfers to poor second movers (D\_Ab in Figure 1a and D\_Bb in Figure 1b). The first thing to note regarding the behavior pattern in the dictator game is that first movers, regardless of their income level, wished to transfer considerably more to the poor than to the rich throughout all 10 rounds. Table 4 reports the mean amount of transfers from first movers to second movers in the dictator game. Overall, rich (poor) first movers in the dictator game intended to transfer 1.33 (0.94) to the rich and 2.47 (1.72) to the poor. Using each session as an observation, Wilcoxon matched-pairs signed-rank tests reject the hypothesis that the two transfers are the same for both rich and poor first movers at the 1% level, suggesting that subjects on average had significantly more other-regarding preferences toward the less fortunate ( $p = 0.0117$  in both cases).

Considering that there are substantial other-regarding preferences especially toward the poor, our next focus is to investigate if there exists any evidence indicating that first movers trust in-group members more than they trust out-group members *after* the effect of other-regarding preferences is being excluded. One can get an initial sense of the data by examining Figures 2a and 2b. There are two stacked columns in Figure 2a that represent average transfers from Type A (rich) first movers in the investment game. The column labeled Aa shows the average transfer to Type A’s in-group members, and the column labeled Ab shows the average transfer to their out-group members. For each of these stacked columns, the white portion represents the average transfer in the dictator game, and thus the remaining black portion indicates the average transfer that is motivated by trust. Figure 2b is read in a similar way.

**Table 4.** Data Summary of Amount Sent in the Dictator Game

	Part I (Inequality) All		Part II (No Inequality) High Condition		Part II (No Inequality) Low Condition	
	To Type a	To Type b	To Type a	To Type b	To Type a	To Type b
Type A First Movers	1.33 (2.40) [330]	2.47 (2.99) [330]	1.18 (2.67) [170]	1.83 (3.15) [170]	1.18 (2.28) [160]	1.00 (1.87) [160]
Type B First Movers	0.94 (1.83) [330]	1.72 (2.40) [330]	0.36 (1.32) [170]	0.32 (0.99) [170]	0.44 (1.32) [160]	1.11 (2.33) [160]

Amount sent is out of 10 francs. Standard deviations are in parentheses. The number of observations appears in brackets.



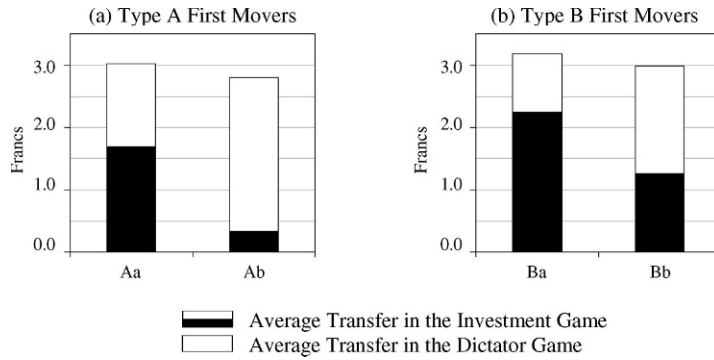


Figure 2. In-Group versus Out-Group Trust: Part I (Inequality)

Notice from Figure 2a that transfers from Type A (rich) first movers to in-group members have substantial trust elements, whereas transfers to out-group members appear to be mostly driven by other-regarding preferences. In other words, even though these two transfers are statistically the same in terms of their overall levels, the compositions of these two transfers differ dramatically. Such in-group favoritism, on the other hand, does not exist in the case of the poor first movers as indicated by Figure 2b.

In the following, we conduct a more rigorous investigation of the data by first comparing the initial decisions of first movers in the investment game with those in the dictator game. These results are summarized in Result 1. In Result 2, we examine the behavioral difference between the investment game and the dictator game once first movers became experienced.

RESULT 1. The inexperienced rich first movers trust the rich significantly more than the poor. The inexperienced poor first movers, however, do not distinguish between the two.

SUPPORT FOR RESULT 1. Let  $Aa$  and  $Ab$  denote the transfers from rich, Type A first movers to rich and poor second movers, respectively. The mean difference ( $Aa - Ab$ ) in the first round is  $-0.03$  in the investment game and  $-0.82$  in the dictator game. Treating each first mover's decision as a relevant observation, a Mann-Whitney rank-sum test suggests that the difference between ( $Aa - Ab$ ) of the two games is significant at the 5% level ( $p = 0.0262$ ).<sup>9</sup> In other words, the inexperienced rich first movers, on average, trusted the rich significantly more than the poor at the very outset of the experiment. As for the poor, Type B first movers, the mean difference ( $Ba - Bb$ ) is  $-0.59$  in the investment game and  $-0.79$  in the dictator game. Based on a Mann-Whitney rank-sum test, the difference between ( $Ba - Bb$ ) of the two games is not statistically significant ( $p = 0.4237$ ). QED.

RESULT 2. As subjects gain experience, first movers, regardless of the income level, trust the rich significantly more than the poor.

SUPPORT FOR RESULT 2. The mean difference ( $Aa - Ab$ ) from round 2 to round 10 is  $0.25$  in the investment game and  $-1.18$  in the dictator game. The mean difference ( $Ba - Bb$ ) for the same nine rounds is  $0.29$  in the investment game and  $-0.78$  in the dictator game. Taking each session as an observation, a Mann-Whitney rank-sum test suggests that the difference between ( $Aa - Ab$ ) in the investment game and that in the dictator game is significant at the 1% level ( $p$

<sup>9</sup> Since no interaction had occurred before first movers made their transfer decisions in round 1, we take each decision maker rather than a whole session as a relevant observation when investigating the inexperienced subjects' behavior.

**Table 5.** Data Summary of Proportion Returned in the Investment Game

	Part I (Inequality) All		Part II (No Inequality) High Condition		Part II (No Inequality) Low Condition	
	To Type A	To Type B	To Type A	To Type B	To Type A	To Type B
Type a Second Movers	17.84 (21.30) [217]	24.50 (25.68) [217]	13.46 (19.24) [61]	12.10 (19.09) [61]	22.57 (26.75) [76]	22.76 (26.96) [76]
Type b Second Movers	15.62 (19.67) [211]	22.50 (24.61) [211]	15.78 (20.41) [64]	15.69 (20.42) [64]	20.01 (26.49) [94]	19.74 (26.50) [94]

Proportions returned are reported as percentages. Standard deviations are in parentheses. The number of observations appears in brackets.

= 0.0027) for rich first movers. The difference between (Ba – Bb) of the two games is significant at the 5% level ( $p = 0.0460$ ) for poor first movers. *QED*.

*Behavior of Second Movers*

As reported above, first movers regardless of their income level chose to trust the rich more than the poor. Was such in-group (among the rich) and out-group (from the poor toward the rich) trust a strategic move that was based on an expectation that poor second movers, out of fairness or equity concerns, would keep more and return less than rich second movers?<sup>10</sup>

Table 5 reports the mean proportion returned, defined as the amount the second mover wished to return divided by three times the amount the first mover sent, across all 10 rounds and eight sessions in the investment game. Type a (rich) second movers returned, on average, 17.84% to the rich and 24.50% to the poor. Type b (poor) second movers, on the other hand, returned an average of 15.62% to the rich and 22.50% to the poor. Wilcoxon matched-pairs signed-rank tests, taking each session as an independent observation, confirm that second movers, regardless of their income levels, returned more to the poor than to the rich ( $p = 0.0357$  for rich second movers and 0.0117 for poor second movers). Since a Mann-Whitney rank-sum test suggests that the amounts sent to a given type of second movers by A and B are not statistically different in the investment game, we believe that returning relatively more to poor first movers is mostly driven by other-regarding preferences.

Although second movers had a tendency to discriminate against the rich, we do not find that poor second movers, compared to those rich ones, held stronger discrimination against or for a specific type of first movers. Specifically, when we compare the proportion returned by Type a versus the proportion returned by Type b, a Mann-Whitney rank-sum test suggests that the difference is not statistically significant for either type of first movers ( $p = 0.2480$  for Type A [rich] first movers and 0.5992 for Type B [poor] first movers). That being said, the fact that first movers chose to send more to the rich even though it did not pay them significantly more perhaps indicates that their behavior was less likely to be a strategic move.

<sup>10</sup> We thank both referees for pointing out this possible explanation for first movers' behavior.

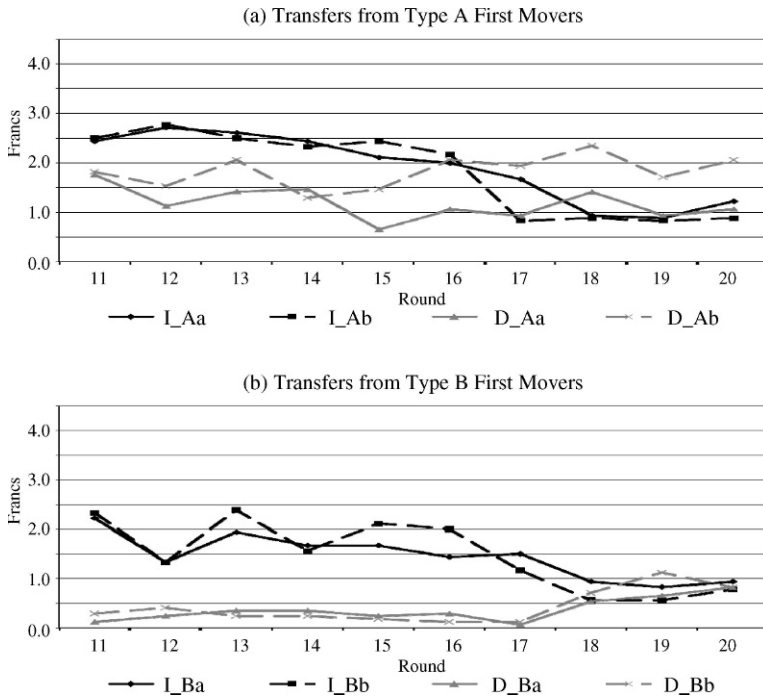


Figure 3. Time Series of Average Transfers: Part II (No Inequality), High Condition

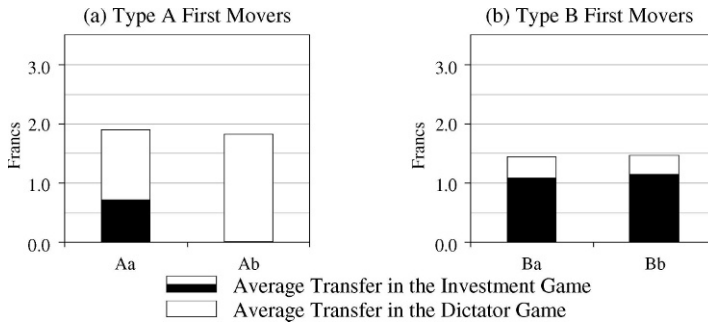
#### 4. Results from Part II

Note that income inequality was removed in Part II of the experiment by either giving all subjects a 10-franc participation fee in each round under the high condition or no participation fee in any round under the low condition. Nevertheless, the group identity remained the same as in Part I. That is, even though there was no difference in participants’ per-round endowments, the minimal group paradigm was in effect in Part II.

##### *Behavior of First Movers*

Figures 3a and 3b present the time series of the average transfers from Type A and Type B first movers under the high condition. The behavior of first movers in the investment game, regardless of being Type A or B, was quite similar to that in Part I in the sense that transfers to in-group members were not significantly different from those to out-group members. This observation is consistent with the mean amounts sent reported in Table 2. Type A (Type B) first movers under the high condition in Part II, on average, sent 1.91 (1.45) to Type a second movers and 1.82 (1.48) to Type b second movers. Wilcoxon signed-rank tests cannot reject the hypothesis that the amount sent to Type a is the same as that to Type b.

In the dictator game, after everyone became equally rich, Type A first movers continued to behave more altruistically toward Type b second movers as in Part I. The mean amount sent, summarized in Table 4, was 1.18 to Type a and 1.83 to Type b. A Wilcoxon signed-rank test rejects the hypothesis that the amounts sent to Types a and b are the same at the 10% level ( $p = 0.0947$ ). Type B first movers, previously treating their own group members more favorably in



**Figure 4.** In-Group versus Out-Group Trust: Part II (No Inequality), High Condition

Part I, no longer differentiated between the two groups in Part II. Therefore, after taking into account other-regarding preferences, those originally rich Type A first movers continued to have more trust toward in-group members than toward out-group members under the high condition. On the contrary, the newly rich Type B first movers became equally trusting toward both in-group and out-group members. The overall inter-group trust attitudes under the high condition can be seen in Figures 4a and 4b.

**RESULT 3.** Eliminating income inequality in a way that makes everyone equally rich does not change the behavior of the originally rich but does make the newly rich first movers behave with equal trust toward both in-group and out-group members.

**SUPPORT FOR RESULT 3.** The mean difference ( $Aa - Ab$ ) from round 11 to round 20 under the high condition is 0.09 in the investment game and  $-0.65$  in the dictator game. If we take each session as a relevant observation to account for the possible within-session correlations, a Mann-Whitney rank-sum test suggests that the difference between ( $Aa - Ab$ ) in the investment game and that in the dictator game is significant at the 5% level ( $p = 0.0433$ ) for the originally rich Type A first movers. The mean difference ( $Ba - Bb$ ) from round 11 to round 20 is  $-0.03$  in the investment game and 0.04 in the dictator game. A Mann-Whitney rank-sum test suggests that the difference between ( $Ba - Bb$ ) of the two games is not significant ( $p = 0.5637$ ) for the newly rich Type B first movers. *QED.*

The time series of the average transfers from Type A and Type B first movers under the low condition are presented in Figures 5a and 5b, respectively. Figure 5a suggests that the amounts of money that Type A first movers wished to transfer to in-group or out-group members were almost indistinguishable after they no longer received a 10-franc participation fee per round. This is true not only in the investment game but also in the dictator game. That is, after becoming equally poor as Type B, Type A first movers stopped discriminating against those originally poor Type B members. Figure 5b offers a similar picture as Figure 5a. The lack of inter-group discrimination in terms of trust attitudes can be seen in Figure 6 as well.

**RESULT 4.** Eliminating income inequality in a way that makes everyone equally poor causes first movers, originally poor as well as newly poor, to behave with equal trust toward both in-group and out-group members.

**SUPPORT FOR RESULT 4.** The mean difference ( $Aa - Ab$ ) from round 11 to round 20 under the low condition is 0.01 in the investment game and 0.18 in the dictator game. If we take each session as an independent observation, a Mann-Whitney rank-sum test shows that the difference between the two games is not significant for the newly poor, Type A first movers ( $p$

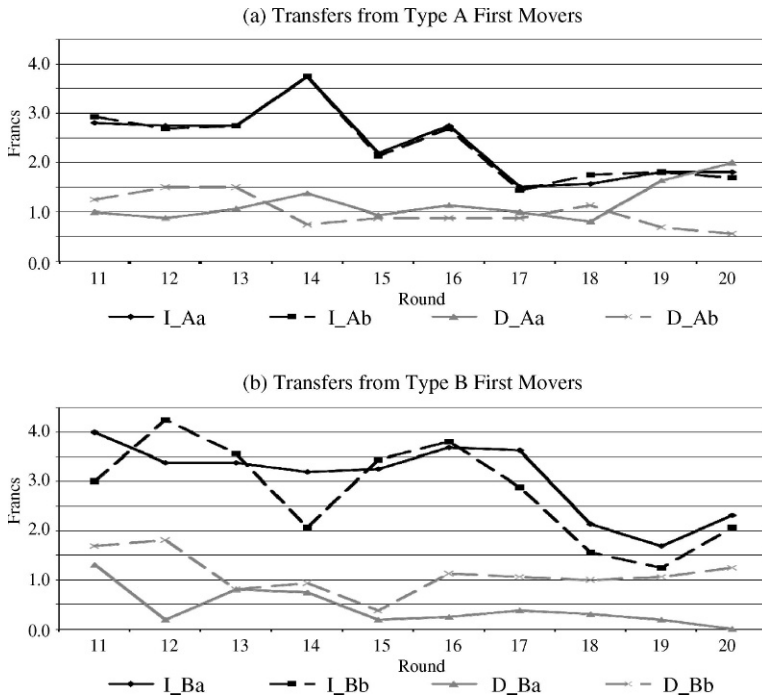


Figure 5. Time Series of Average Transfers: Part II (No Inequality), Low Condition

= 0.1913). The mean difference (Ba – Bb) from round 11 to round 20 is 0.28 in the investment game and –0.68 in the dictator game. A Mann-Whitney rank-sum test cannot reject the hypothesis that (Ba – Bb) in the investment game is the same as that in the dictator game for the originally poor Type B first movers ( $p = 0.1913$ ). QED.

Behavior of Second Movers

Table 5 shows that, under the high condition, Type a second movers returned, on average, 13.46% to Type A and 12.10% to Type B. Type b second movers, on the other hand, returned an average of 15.78% and 15.69% to Type A and B, respectively. Wilcoxon signed-ranked tests indicate that the difference between the proportions returned to A and B is not statistically

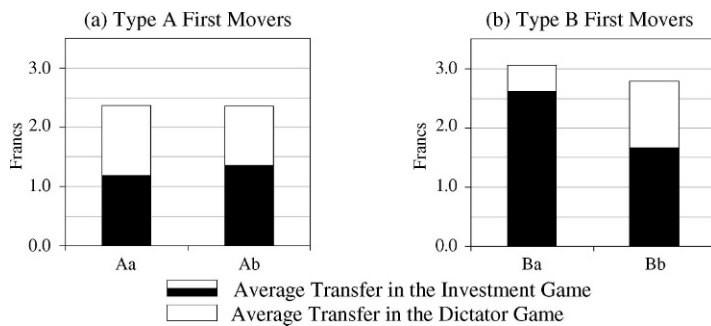


Figure 6. In-Group versus Out-Group Trust: Part II (No Inequality), Low Condition

significant for either type of second movers. The result that second movers did not discriminate between Type A and Type B also holds under the low condition.

## 5. Conclusion

Trust, as noted by Arrow (1974), is an essential lubricant of a society, and income inequality has been shown to consistently undermine it. Some hypotheses have been put forward to explain how income inequality affects trust. As we describe in the introduction, income inequality could reduce trust by allowing social identities to be formed on the basis of income status, thus triggering in-group favoritism.

In this article, we adopt a variant of Berg et al.'s trust game and Cox's dictator game to study if income inequality can indeed activate in-group favoritism and if so, whether or not such a bias is strong enough to survive the removal of inequality. In the first part of the experiment, we find evidence of in-group favoritism on the part of rich first movers. Rich first movers trust their in-group members significantly more in the presence of income inequality not only before but also after they gain experience. Poor first movers, in contrast, do not exhibit in-group bias. They do not discriminate between in-group and out-group at the very outset of the experiment, and once they become experienced, they behave with significantly more trust toward the rich than toward the poor.

The result that income status has a powerful impact on inter-group relations does not appear to result from a norm or an expectation that trusting the poor does not pay as much as trusting the rich. Nevertheless, it is consistent with the social identity theory, which hypothesizes that high-status group members display greater in-group favoritism in order to strive for positive distinctiveness, and that low-status group members could behave more favorably rather than discriminatorily toward high-status out-group members if they perceive the status structure as being legitimate and/or stable (Tajfel and Turner 1979).<sup>11</sup> In our experiment, there are design features that, according to the theory, may activate out-group favoritism on the part of poor first movers. First, we randomly divide subjects into the rich and the poor without any subjective judgments. This may make it easier for subjects to accept the status differential as legitimate. Second, economic status remains fixed throughout the first part of the experiment. This could facilitate the perception of status stability. Of course, the presence of income inequality that is not accompanied by conflicts over scarce resources or even political power could further mitigate out-group hostility in our environment.

In the second part of the experiment, we find that eliminating income inequality makes most first movers, except those originally rich, behave with equal trust toward both the rich and the poor. This result suggests that in-group and out-group favoritism established in the past can be alleviated, but not completely removed, by a more balanced income distribution.

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<sup>11</sup> For laboratory and survey-based evidence that supports social identity theory, see Doise and Sinclair (1973), Commins and Lockwood (1979), Sachdev and Bourhis (1987, 1991), and von Hippel (2006).

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