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Multidimensional Group Identity and Redistributive Allocation: An Experimental Study*

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Abstract

Social identity is embedded in social structures, generated by various social processes, and has multiple dimensions. We report findings from a laboratory experiment eliciting two-dimensional social identities: a horizontal identity determined either randomly or by preferences and a vertical identity defined by income status and determined either by luck or performance. We also vary income gaps between vertical identity groups. Participants make redistributive allocation decisions between two others differing in identity attributes. We find robust evidence of in-group favoritism and that both the identity distance between the allocator and the in-group recipient and income gaps influence the degree of in-group favoritism.

Keywords: Social Identities, Horizontal and Vertical Identity Attributes, In-group Favoritism, Income Inequality

JEL Classification: C91, D03.

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1 Introduction

Social identity is a person's sense of self in her social surrounding derived from her association with groups, e.g. family, clan, social class, sport club, gender, race group and many others (Tajfel and Turner 1979). Social identity makes a person sees herself differently from others belonging to different social groups. It induces her to view the world dichotomously from the perspective of in-group and out-group. Social identity can either have desirable or undesirable impacts. For example, in a workplace setting, working together with people of the same identity can boost morale and induce higher collective effort, making it less necessary for the principal to provide high wages to elicit high effort (Akerlof and Kranton, 2000 and 2005). However, when viewed from the perspective of an identity diverse organization, the presence of strong identity attachment among heterogeneous groups may also reduce the efficiency of the organization, especially when the inter-group conflict arises within the organization (Heap and Zizzo, 2009).

Akerlof and Kranton (2000, 2005) were the first to explore the role of social identity in influencing economic outcomes through the lens of formal economic analysis. Specifically, they proposed a model in which the utility function of an economic agent depends on her social identity and the ideal behavioral norm stipulated by her social identity. This ideal norm could be, for example, an action that a person with her identity is expected to follow. Any deviation from this ideal norm would inflict some disutility.

Their seminal work sparked interests among experimental economists to further explore the role of social identity in influencing a host of behaviors in various economic settings. The main appeal for studying social identity from the view point of experimental economists is the relative ease with which social identity can be induced and manipulated in a controlled laboratory experimental setting. The most common inducement method used is the Minimal Group Paradigm (MGP), a standard method borrowed from the field of social psychology (Turner and Tajfel, 1979). Under this method, experiment subjects were allocated into two groups based on their preferences over seemingly identical abstract paintings by renowned abstract painters, Paul Klee and Wassily Kandinsky. In order to control for the influence of people's normative view on their in-group members and out-group members based on natural identities developed throughout their social life, any meaningful social distinctions between subjects, such as social ties, gender, race, and other social traits, were removed from the experiment. The only remaining factor

that distinguishes people is their group membership. Once assigned to different groups, the experimental subjects were asked to allocate resources between two other individuals from, respectively, their in-group and out-group. Turner and Tajfel (1979) demonstrated that the presence of minimal and somewhat meaningless group classification was sufficient to generate in-group favoritism. They used this evidence to challenge the commonly held view arguing that social differences are the root cause of intergroup conflict.

One of the first experimental economics paper investigating how group identity attribute influences people' decision is done by Charness et. al (2007). However, rather than grouping subjects based on their painting preferences as is commonly done under the MGP, they grouped subjects arbitrarily based on color labeling, e.g. red and blue groups. They found that labeling influences subjects' propensity to cooperate and coordinate with others in the battle of sexes game and the prisoner's dilemma game. Chen and Li (2009) followed closely the MGP procedure proposed by Tajfel and Turner (1979) and grouped subjects on the basis of their choices over paintings by Paul Klee and Wassily Kandinsky. Their main objective was to evaluate the effect of minimal group categorization on subjects' social preferences through investigating the subjects' allocation of resources. They showed that individuals tend to be more generous towards an in-group member than an out-group member.

Other notable works that investigate the role of social identity in various social interaction settings ranging from competition, coalition formation, to cooperation in social dilemma settings include Akerlof and Kranton (2008), Benjamin et al (2010), Tremewan (2010), Guala et al (2013), and Charness et al (2014). These papers generally established that social identity promotes cooperation within in-group and intensifies inter-group competition. Last but not least, Chen and Chen (2011) and Chen, et. al (2014) showed the important role of social identity as a focal coordination device for players to synchronize their action towards a particular equilibrium in a strategic setting involving multiple equilibria. They showed that similarity in group-identity helps people mitigate coordination failure.

It should be noted, however, studies on the link between group identity and social preferences typically only consider a single dimension of group identity. That is, in the context of the MGP experiment, the dimension that distinguishes people is the group membership based on painting preferences. In reality, however, people differ from each

other by more than one identity attribute. For example, two individuals who are members of the same hobby club may come from different racial backgrounds or social classes. Our paper departs from one dimensional group-identity setting to a multi-dimensional group identity setting. It seeks to shed some lights on the interplay between the multi-dimensional group-identity and social preferences.

Specifically, in this paper, we focus our attention on two group-identity attributes that we coin as, respectively, the *horizontal* and *vertical* identity. We define the former as the group identity that does not carry any hierarchical social distinction. Some examples of this in real life are: racial identity and the membership to a club or to a political party, or a religion. To elicit the horizontal identity attribute, we group subjects using Klee's and Kandinsky's paintings in line with the standard MGP procedure. We argue that the MGP procedure is useful to induce group identity that does not carry any social stratification.

The vertical identity, on the other hand, embodies an explicit social stratification. Although examples of social stratification abound including the caste system in India and the old apartheid system in South Africa, the income-based social status is the vertical identity we focus in this paper. To induce the vertical group identity, we group subjects into the *high* and *low* income group. The presence of the vertical group identity, essentially, embeds hierarchical social distinction into otherwise identical subjects sharing the same horizontal identity attribute. It also allows us to evaluate how social structure interacts with the in-group favoritism that is typically shown to exist in studies using the MGP procedure. To sum-up, we have a setting where social class structure exists even among people who are members of the same group. A real life example that depicts this setting would be people who come from the same racial background or the same political affiliation but differ in their economic status.

Several interesting points emerge when we depart from the single-dimensional group-identity setting to the two-dimensional group-identity setting like the one we focus in this paper. *First*, the definition of in-group becomes more nuanced. In the former, an in-group member is defined as someone who belongs to the same group affiliation. In contrast, in the latter, the definition of an in-group member is based on the relative similarity. We define a person's in-group member as someone who has relatively closer identity attributes to him (her) than someone else. The definition thus embodies the

notion of '*identity distance*', and gives rise to an interesting question as to how the degree of in-group favoritism would vary with the identity distance.

Second, because in our setup we have two dimensions of identity, e.g. the horizontal and vertical dimensions, the strength of in-group favoritism when the in-group notion is based on the horizontal dimension (meaning that a person's in-group member shares the same horizontal identity with her) may be different from the strength of in-group favoritism when the in-group notion is based on the vertical dimension. The horizontal dimension, which is elicited using the MGP procedure, represents the standard in-group favoritism found in the literature. The vertical dimension, on the other hand, represents the social-stratification based in-group favoritism. Thus, in our two-dimensional identity setup, the robustness of the in-group favoritism result obtained in the existing studies employing the MGP procedure can be further evaluated.

Third, our setup also allows us to evaluate the manner with which identity is acquired. In reality, social identity can either emerge naturally or through conscious effort or deliberate choice. The horizontal identity can be obtained either through *nature* or through *choice*. Racial background is an example of the horizontal identity obtained through nature beyond one's control, while membership to a hobby club is an example of the horizontal identity obtained through choice. The vertical identity can be obtained either through *luck* or through *effort*. That is, someone can become rich either because of inheritance or hard work. The way income (social) status is detemined, that is either by luck or through effort, has been shown to influence individuals's demand for and supply of redistribution (Piketty 1995, Fong 2001, Alesina and La Ferrara 2005, and Deffains, Espinosa and Thoni 2016). The former refers to individuals' redistributive preferences when the individuals' well-being is directly affected by the redistribution, and the latter refers to their preferences for redistribution when their well-being is not directly influenced by the redistribution.[1]

In a nutshell our experimental design and procedure can be explained as follows. The horizontal identity that is acquired by choice was elicited using the standard MGP procedure whereby subjects must indicate their painting preferences. The one that is acquired by nature was randomly assigned to participants in the following manner. These

[1] See Deffains, Espinosa and Thoni (2016) for the definition of the demand for redistribution and the supply for redistribution. In our paper, we focus our analysis on the supply of redistribution rather than the demand for redistribution.

participants were also shown the abstract paintings by Klee and Kandinsky; however instead of being asked to express their choice over those paintings, they were simply randomly assigned to either Klee or Kandinsky group. The vertical identity that is acquired by performance was elicited through a real effort task involving summing a series of single digit numbers. Subjects were grouped into the high and low income groups based on their performance on the task. The vertical identity that is acquired by chance was simply generated by a random allocation of subjects into the high and low income groups. We also varied the level of income gap between the rich and the poor, and by doing so we would be able to investigate the *fourth* point on how the degree of in-group favoritism varies with the income inequality between the rich and poor groups.

After the above identity elicitation procedure is completed, each subject will be endowed with a two-dimensional identity. To make the horizontal identity more salient, in some treatments, after the identity elicitation procedure was completed, we required participants who had already been grouped into either the Klee or the Kandinsky group to engage in a group task requiring the group to solve a series of mazes collectively. This was done to enhance their sense of horizontal identity. In other treatments, we enhance the vertical identity in a similar fashion.

Subsequently, we moved on to the main part of the experiment where we asked subjects to engage in a series of allocation decisions to two other individuals from, respectively, their in-group and out-group. Because the allocation decisions made were never between oneself and another person, we removed the self-interest consideration and this allowed us to focus on the in-group favoritism. According to the taxonomy of Deffains et al (2016), the allocation decisions the subjects made reflect their preference over the supply of redistribution. In reality, government officials decide on transfer payments made to people from various social groups. One natural question to emerge is whether or not government officials would make impartial transfer decisions regardless of the social background of the beneficiaries. Our experiment's framework can be interpreted as a setting whereby subjects assume the role of a social planner who has to make a redistributive transfer to two groups with differing identity attributes[2].

Several interesting results emerge from our analysis. *First*, in general the evidence

[2]It is perhaps worth noting that Deffains, Espinosa and Thoni (2016) only investigates the supply of redistribution to two beneficiaries with differing income status; a wealthy individual and a poor. Unlike our paper, they do not investigate the role of social identities and in-group favoritism.

of favoritism shown by subjects to their in group fellows existed regardless whether the in-group association is defined over exact/ absolute or relative identity similarity with the allocator, and regardless of whether the two recipients differ in the horizontal or vertical identity dimension. This result shows the robustness of the standard in-group favoritism result in one dimensional identity setting to our more realistic multi-dimensional identity setting. *Second*, we found that the degree of in-group favoritism shown by subjects when the in-group categorization was defined on the basis of the absolute similarity in both identity attributes was stronger than that when the in-group categorization was defined on the basis of relative similarity in identity attributes. Thus, the degree of in-group favoritism was negatively correlated to the identity distance. *Third*, the degree of in-group favoritism seems to be stable and robust to the way by which the group differences including the income inequality were generated. *Fourth,* despite being favorable towards the in-groups, the allocators exhibit certain degree of fairness concern when making allocation decisions between two recipients with distinct income levels. Moreover, the poor allocators responded to the worsening income gap by giving more to their poor in-groups while the rich allocators are unresponsive to it. *Finally*, the inequalities along the vertical dimension have a spill-over effect on the horizontal identity. In particular, the in-group bonds seem to be stronger within the horizontal groups when income gaps between the vertical groups are worsening.

A couple of recent papers investigate multi-dimensional identity too. Chen et al. (2014) prime two dimensions of existing identities in a laboratory setting, which are a common (school) identity and a fragmenting (ethnic) identity. They find that priming a common identity leads to a choice of maximizing total welfare in the Prisoners' Dilemma, while priming an ethnic identity reduces coordination in the minimum-effort games. Kranton et al. (2016) also conducted experiments with two types of identities, i.e. political group identities and the artificial group identities based on preferences on paintings. They find social-welfare destructing behavior toward the out-group subjects, especially for Democrats and Republicans compared to Independents. Both papers prime existing social identities that are associated with idiosyncratic norms or cultures, which might confound identifications on the effect of social categorization. Moreover, none of the multi-dimensional identities studied in Chen et al (2014) and Kranton et al (2013) entails hierarchical meanings, while we consider both horizontal group identities as well as verti-

cal group identities in our experiment. Relatedly, Klor and Shayo (2010) combine existing social identities with differentiated income levels generated in the laboratory and study redistributive preferences. They find that a significant subset of the subjects choose the tax rates that benefit their in-group members. While in their study the subject's choice on redistributive policies affects own income, we focus on other-other allocations to single out other regarding preferences and in-group favoritism from self-interested concerns. They do not investigate alternative ways of generating group differences either.

The paper is organized as follows. Section 2 outlines our experimental design and procedures. Sections 3 presents the experimental results. Section 4 concludes the paper.

2 Experimental Design and Procedure

Our experiment consists of 3 stages: 1) *Identity Inducement*, 2) *Identity Enhancement* and 3) *Token Allocation*, respectively. In the first stage, we induce horizontal and vertical identity attributes for each subject. The horizontal identity attribute is determined either by subjects' preferences over abstract paintings in line with the procedure adopted by Chen and Li (2009) or by chance. The vertical identity attribute is either determined by subjects' performance in a simple real-effort task or assigned randomly. There are two vertical identity attributes associated with high and low endowment tokens respectively. In the second stage, subjects sharing either the same horizontal identity attribute or the same vertical identity attribute play a team task. This task is intended to enhance the bond among members of the same team. We do not provide any monetary incentives in this group task in order not to invoke any reciprocal motive that could influence giving behavior in the token allocation stage. We will explain later why it is important for us to turn off reciprocal incentive in the token allocation stage. Only one dimension of identity (either the horizontal or the vertical identity) is enhanced under this team-building mechanism. In the last stage, which is the main stage of our experiment, each subject makes allocations to two other subjects.

We have 6 treatments, which differ from each other in the first two stages; 1) Random_Random_KK, 2) Random_Random_XY, 3) Choice_Random_KK, 4) Choice_Random_XY, 5) Random_Performance_KK, and 6) Random_Performance_XY. The first word ("Random" or "Choice") of the treatment-name string indicates whether the horizontal identity attribute is determined by *chance* or by the subject's *choice* of preferred paintings;

the second word ("Random" or "Performance") in the treatment-name string indicates whether the vertical identity attribute is determined by *luck* or by *performance* in the real-effort task; "KK" or "XY" in the end indicates whether the horizontal or vertical group identity is enhanced in the second stage. In the next sub-sections we explain in details the three stages. In the meantime, the first two stages for each of the six treatments are summarized in the following table. A sample of experimental instructions (for Treatment Random_Performance_KK) is presented in the appendix.

	Identity Assignment		
Treatment	Horizontal Identity	Vertical Identity	Identity Enhanced
Random_Random_KK	Randomly	Randomly	Horizontal
Random_Random_XY	Randomly	Randomly	Vertical
Choice_Random_KK	By Choice	Randomly	Horizontal
Choice_Random_XY	By Choice	Randomly	Vertical
Random_Performance_KK	Randomly	By Performance	Horizontal
Random_Performance_XY	Randomly	By Performance	Vertical

Table 1: Summary of Treatments

2.1 Stage 1: Identity Inducement

There are two steps in this stage, through which we elicit subjects' horizontal and vertical group identity attributes respectively.

2.1.1 Inducement of Horizontal Identity Attributes

In the first step, we elicited subjects' horizontal identity attributes in line with the MGP procedure done in Chen and Li (2009). Subjects reviewed seven pairs of abstract paintings successively, with one painted by Paul Klee and the other by Wassily Kandinsky in each pair. The first two pairs were shown with the information about the artists, years of completion and names of the paintings. For the last five pairs, without being told the above mentioned information, each subject in treatments Choice_Random_KK and Choice_Random_XY was asked to choose which painting in each pair she preferred. After the subjects made their choices, half of the subjects who preferred relatively more paintings of Paul Klee were grouped to "Team Klee" and the rest who preferred relatively

more paintings of Wassily Kandinsky were grouped to "Team Kandinsky".[3] In case of a tie, the team membership was determined randomly to ensure that each team had the same number of members.[4]

In the other 4 treatments, the team membership was determined randomly. Specifically, in these treatments, subjects reviewed the same seven pairs of paintings as in treatments Choice_Random_KK and Choice_Random_XY, with the relevant information on the artists etc. provided in the first two pairs but not in the other pairs. The only difference is that subjects were not asked to indicate their preferences and after all the pairs of paintings were shown to them, half of the subjects were randomly assigned to Team Klee and the others to Team Kandinsky.

2.1.2 Inducement of Vertical Identity Attributes

In the second step of Stage 1, subjects in treatments Random_Performance_KK and Random_Performance_XY were asked to participate in a real effort task individually. This contains questions requiring subjects to sum up a sequence of numbers, such as "$4+3+5+7+7$". The subject could not proceed to the next question until she answered the current question correctly. Each subject was given 90 seconds to complete as many questions as she can.[5] After the alloted time ended, one half of subjects with better performances were grouped into Group X and the other half into Group Y. In case of a tie, the group membership was assigned randomly in such a way that the two groups always had the same size. In the other 4 treatments, one half of subjects were randomly assigned to Group X while the other half to Group Y.

The membership in Group X or Y indicates the vertical identity attribute with higher or lower income status respectively. As shown in Table 2, we vary the income gaps $(X-Y)$ into 4 possible scenarios, each occurring with equal probability. The first row shows in each scenario the income of a Group X member while the second row indicates the income of a Group Y member.[6] Group X members ("the rich") always have higher income than

[3]For the grouping based on the horizontal dimension we use "team" rather than "group" to label different identity attributes. We will use "group" rather than "team" in labelling vertical identity attributes to avoid confusion.

[4]Note that the grouping is based on relative preferences. A member in Team Klee might prefer more paintings from Kandinsky than from Klee. She is assigned to Team Klee because she prefers relatively more Klee's paintings than those in the Team Kandinsky.

[5]On average a subject completed 13.55 questions within the 90 seconds. The best subject completed 23 questions correctly.

[6]Throughout our experiment, income is expressed in terms of experimental tokens. At the conclusion

Group Y members ("the poor"), no matter which scenario of income gap they are in. While the average income is always equal to 150 tokens across the four scenarios, as we move from the first scenario to the latter, the inequality increases. Thus, we preserve the mean income but let the standard deviation of income varies. One of these scenarios will be randomly selected as the binding scenario to determine subjects' earning from the experiment at the end of the experiment.

Group	Scenario 1	Scenario 2	Scenario 3	Scenario 4
X	175	200	225	250
Y	125	100	75	50

Table 2: Four Possible Income Gap Scenarios

At the end of Stage 1, subjects were informed of their own pair of the horizontal team identity and vertical group identity individually, without knowing others' group identity attributes or preferences over the paintings or performances in the real-effort task. Because there are 2 identity attributes (horizontal and vertical), each of the subjects thus belongs to one of the following 4 combinations:

1. [Team Klee & Group X]
2. [Team Klee & Group Y]
3. [Team Kandinsky & Group X]
4. [Team Kandinsky & Group Y].

For each subject, the identity attributes remained the same throughout this experiment. Overall, for the identity inducement stage, we employ a combination of within-subject and between-subject design. The within-subject design is done through exposing all the four possible income gap scenarios to the subjects under each of which they will be asked to make allocation decisions. The between-subject design is done through the assignments of the horizontal and vertical identity attributes. Treatments with names starting with "Random_Random" are baseline treatments where both identity attributes are elicited in a random way.

of the experiment, the total experimental tokens earned are coverted into the Sigapore Dollars equivalent based on our conversion rate.

By comparing treatments with names starting with "Choice_Random" with "Random_Random", we would be able to examine, holding all else equal, whether the horizontal identity assignment method influences the subjects' decisions in the allocation stage. Likewise, by comparing treatments with names starting with "Random_Performance" with "Random_Random", we would be able to examine, holding all else equal, whether the vertical identity assignment method influences the subjects' decisions.

2.2 Stage 2: Identity Enhancement

Eckel and Grossman (2005) and Chen and Li (2009) argue for the importance of team building in identity experimental design. They recommended to adopt a group task of achieving a common goal among group members, to enhance group identifications. In view of this argument, we incorporated a stage of identity enhancement in which subjects played a team-building group task, after the identity inducement stage. To investigate the potential effect of identity enhancement, we vary the dimension of identity attributes to be enhanced. In stage 2 of our experiment, in treatments with names ending with "KK" (i.e. Random_Random_KK, Choice_Random_KK, and Random_Performance_KK), subjects sharing the same horizontal identity attribute worked together on a task; that is, members in Team Klee worked together on this group task, with members in Team Kandinsky also working on the same task within their Team Kandinsky. Similarly, in the other 3 treatments with names ending with "XY", subjects worked with their group (either Group X or Y) members on the task. We thus have the 3×2 between-subject design as shown in Table 1.

Specifically, in the group task, subjects belonging to the same team (group) must work collectively to solve a sequence of four spot-the-differences puzzles. For each of these puzzles, teams (groups) were given two very similar pictures and asked to spot the differences between the two pictures within a time limit. Subjects were also allowed to chat with their team (group) mates via an online chat box. The chats were only visible to their own team (group) members. A screenshot of such a puzzle is shown in Figure 1. For each of these puzzles, a team (group) member was randomly selected as the team (group) representative to submit the team's (group's) answer on behalf of the entire team (group). After completing each puzzle, subjects would be able to verify whether their team's (group's) answer was correct.

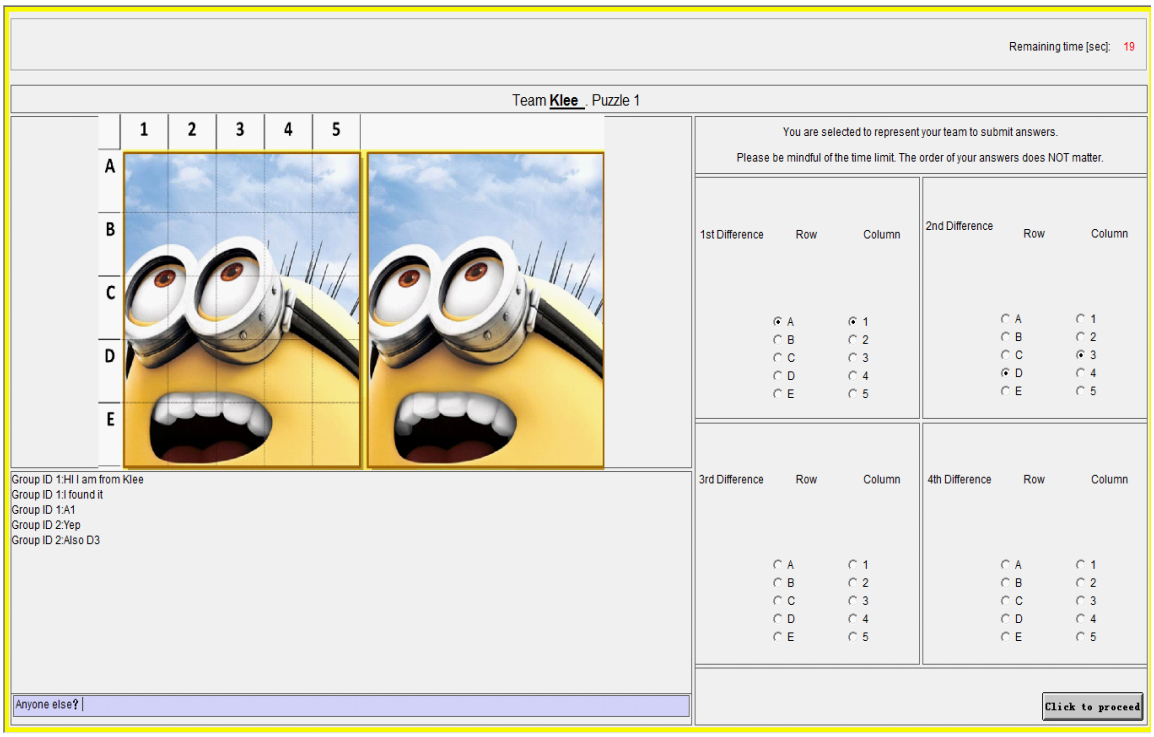

Figure 1: Screenshot of a "Spot-the-Differences" Puzzle

We opted not to incentivize this identity enhancement stage in order to eliminate any reciprocity motive from the allocation decisions that subjects would make in the subsequent stage. If we would have given them a group incentive so that team (group) members worked together and helped each other to earn money in solving the puzzles, the subjects might reciprocate their (team) group members in the subsequent allocation stage therefore biasing our results. The reciprocity motive could potentially be a confounding factor that would prevent us from having a clean investigation on how token allocations would be affected by group identities.

2.3 Stage 3: Allocation of Tokens

The third stage, which is common in all treatments, is the main stage of our experiment. In this stage, we seek to identify the effects of group identity attributes on subjects' other-regarding preferences. We employ the strategy method to elicit subjects' preferences under those four scenarios of income gaps summarized in Table 2. Under each scenario, subjects were asked to make four allocation decisions to two other (anonymous) subjects with various identity configurations. For each allocation decision, the subjects were asked to allocate 100 extra tokens, on top of their tokens determined by their vertical identity

attribute, between the two beneficiaries. This redistributive allocation decision, thus, would not have any affect on the allocator's earnings. The allocation should be made in integer numbers. We focus on the subjects' allocation decisions to two other subjects with the followings identity configurations (see Table 3).

The Beneficiaries of the redistributive allocation Decisions		
Decision No.	Beneficiary 1	Beneficiary 2
1.	(Klee & Group X)	(Klee & Group Y)
2.	(Klee & Group X)	(Kandinsky & Group X)
3.	(Klee & Group Y)	(Kandinsky & Group Y)
4.	(Kandinsky & Group X)	(Kandinsky & Group Y)

Table 3: The Beneficiaries of the Allocation Decisions

Some explanations are in order. In each of the four redistributive allocation decisions, the two beneficiaries are only different in one dimension of identity attributes (either the horizontal or the vertical one). The summary presented in Table 3 shows that the first and fourth allocations involve two beneficiaries differing only in the vertical identity (X and Y), and the second and third allocations involve two beneficiaries differing only in the horizontal identity (Klee and Kandinsky). Given any particular identity configuration of the allocator, one of the two beneficiaries will thus be always closer to the allocator in terms of identity configuration than the other. For instance, suppose that the allocator's identity configuration is (Klee & Group X). In this case, Beneficiary 1 is always closer to the allocator than Beneficiary 2. For example, in allocation decision 1, Beneficiary 1 has exactly the same set of identities as the allocator, while Beneficiary 2 differs from the allocator in the vertical identity. In allocation decision 4, Beneficiary 1 differs from the allocator in the horizontal identity, while Beneficiary 2 differs from the allocator in both identity attributes. We coin the extent of identity similarity between the allocator and beneficiary 1 as the degree of *identity distance*. Further explanation on our notion of identity distance can be found later in our subsequent section. All in all, subjects must therefore make 16 redistributive allocation decisions, because there are 4 redistributive allocation decisions that they must make under each of the 4 income-gap ($X-Y$) scenarios depicted in Table 2.

After all allocation decisions were made, one of the four income-gap scenarios was randomly selected to be the binding income-gap scenario to determine subjects' earning from the experiment. In particular, a subject's earning was set equal to the sum of her

income, which was equal to the value of the endowment, that is either X or Y in the binding scenario, and the average amount of tokens allocated by other subjects in the *relevant allocation decisions*.

To illustrate the meaning of the relevant allocation decisions, consider the following example of a subject with (Klee & Group X) identity configuration. The relevant allocation decisions for this subject would be the allocation decisions made by all of the other subjects to someone with (Klee & Group X) identity configuration. If we examine Table 3, the relevant decisions for this subject would be allocation decisions 1 and 2, i.e. two out of the four available allocation decisions. We have N subjects, and all of them would have to make allocation decisions 1 and 2 for the binding income-gap scenario.

Formally, the final income of subject i who has (W, Z) identity configuration, with $W \in \{\text{Klee, Kandinsky}\}$ and $Z \in \{X, Y\}$, can be expressed as

$$\Pi_i\left(W, Z\right) = Z_i + \frac{\sum_{j \neq i} \sum_1^2 \text{Allocation to } (W \ \& \ Z)}{2(N-1)}, \tag{1}$$

where $\sum_{j \neq i} \sum_1^2$Allocation to $(W \ \& \ Z)$ is the sum of other subjects' allocation to a person with the same $(W \ \& \ Z)$ identity configuration as subject i in the two relevant decisions under the binding income gap scenario. Subjects were informed about the payment scheme before making their redistributive allocation decisions.

2.4 Experimental Procedure

The experiment was conducted at Nanyang Technological University in September 2014. Subjects were undergraduate students with Economics and Business, Engineering, Science, Social Science, and Humanities majors. Overall we had 128 subjects randomly assigned to 6 experimental sessions; one session for each treatment. Table 4 below presents the breakdown of subjects across all treatments.[7] Each subject was only allowed to participate once. The experiment lasted for about one hour. Each subject made 16 redistributive allocation decisions, involving 4 allocation decisions (see Table 3) for each of

[7] In most of the treatments, the ratio of male subjects is close or equal to $\frac{1}{2}$. One exception is Treatment Choice_Random_XY, where we have more female subjects (17) than male (7). However, our estimation of any treatment variable will not depend on any single treatment. For instance, to investigate the effect of identity enhancement at the horizontal dimension versus that done at the vertical dimension, we can compare Treatment Choice_Random_KK with Choice_Random_XY, Treatment Random_Performance_KK with Random_Performance_XY, or Treatment Random_Random_KK with Treatment Random_Random_XY. Thus, the high ratio of female subjects in Treatment Choice_Random_XY is unlikely to confound our estimation of treatment effects.

the 4 income-gap scenarios (see Table 2). Thus, we had $128 \times 16 = 2048$ observations of allocation decisions. The experiment was programmed and conducted using z-Tree (Fischbacher 2007).

Once subjects were seated in the lab, they were given experimental materials that include experimental instructions, a participant information sheet and a consent form. We then read the instruction aloud. Before the experiment began, we gave the participants an opportunity to ask questions if there were parts of the instructions that were not clear to them. We attended to these questions in private.

The tokens the subjects earned were converted to Singapore Dollars with the conversion rate of 12 tokens = S$1. In addition to the earning they obtained from the experiment, subjects also received S$3 show-up fee. On average, subjects earned S$19.46, which was roughly equivalent to US$ 14.20 at the time of the experiment. They were paid in private at the end of the experiment.

	Treatment	N	% Female
1.	Choice_Random_KK	24	42%
2.	Choice_Random_XY	24	70.8%
3.	Random_Performance_KK	18	50%
4.	Random_Performance_XY	20	40%
5.	Random_Random_KK	22	45.5%
6.	Random_Random_XY	20	50%
	Overall	128	50%

Table 4: Distribution of Subjects accross Treatments

3 Experimental Results

In this section, we focus our analysis on how allocators allocated the 100 extra tokens to two recipients (Beneficiary 1 and Beneficiary 2).

3.1 The Definition of In-Group and Out-Group Member

Recall that in any allocation decision, one of the two recipients would be closer in terms of identity similarity to the allocator than the other. We thus call the recipient with identity attributes closer to the allocator an *in-group member* of the allocator, and the other recipient an *out-group member*, throughout this paper.

The following example clarifies our definition. Suppose that the allocator is a rich (X) member of Team Klee, i.e. (Klee & Group X), and the allocation decision made is allocation Decision 1 shown in Table 3. The two recipients (Beneficiary 1 and Beneficiary 2) are, respectively, a rich (X) member of Team Klee (Klee & Group X) and a poor (Y) member of Team Klee (Klee & Group Y). By our definition, Beneficiary 1 is classified as an (absolute) in-group member of the allocator, while Beneficiary 2 is classified as an out-group member of the allocator, even though she has the same horizontal identity (Team Klee) as the allocator. We thus say the allocation decision is made over the vertical dimension between a rich and a poor individual who are both members of Team Klee. Next, in allocation Decision 3 shown in Table 3, the two recipients (Beneficiary 1 and Beneficiary 2) are, respectively, a poor member of Team Klee (Klee & Group Y) and a poor member of Team Kandinsky (Kandinsky & Group Y). By our definition, Beneficiary 1 is classified as the allocator's (relative) in-group member. She shares the same horizontal identity (Team Klee) with the allocator. Beneficiary 2 is classified as the allocator's out-group member as she bears no identity resemblance to the allocator. We thus say the allocation decision is made over the horizontal dimension between a member of Team Klee and a member of Team Kandinsky who are both poor.

3.2 The In-Group Favoritism in General

It should be noted that more tokens allocated to an in-group implies less tokens available for an out-group because the sum of tokens is always equal to 100 points. The tokens received by the in-group thus measure the allocator's *degree of in-group favoritism*. In a setting with one dimensional identity attribute elicited using the MGP procedure, Chen and Li (2009) demonstrated that there exists an in-group favoritism, by which subjects make more favorable decisions towards those sharing the same identity attribute as themselves. In our setting, we have two identity attributes, the horizontal and vertical identity, and we have defined in-group members in the above manner. According to this definition, an in-group recipient may not have exactly the same identity attributes as the allocator, but is closer to the allocator than the other recipient in one dimension of the identity attributes. This raises a question as to whether or not the in-group favoritism as shown in Chen and Li (2009) is robust to our definition of in-group members and the dimension of the identity attribute used to define in-group, in our multi-dimensional

identity setting.

To answer this question, we first looked at the aggregated data on allocation of tokens to an in-group member. We found that around 70.36% of all allocation decisions favored the in-group recipients by giving the in-group more tokens than the out-group. Around 9.28% of all allocation decisions involve giving the entire 100 tokens to in-group recipients. Overall, about 65% of the tokens were allocated to the in-group recipients while only around 35% of the available tokens went to out-group recipients. We then conducted the following non-parametric test. We calculated the average allocated tokens to the in-group for each subject, and then ran the Wilcoxon signed-rank test on the subject-averaged allocation for each session. Throughout our analysis, other non-parametric tests will be conducted in a similar way. We found that in all the treatments, in-group allocations are significantly higher than 50, the fair allocation of the 100 tokens (p-value$<$ 0.1 for Treatment Random_Random_XY; p-values$<$ 0.01 for all the other treatments).

3.3 The Allocation Decisions over the Vertical and the Horizontal Identity

Next, we looked into allocations over the vertical identity and allocations over the horizontal identity respectively. The first type of allocations prevails when the two recipients share the same vertical identity (either rich or poor) but differ only in their horizontal dimension. The second type prevails when the two recipients share the same horizontal identity (either Klee or Kandinsky) but differ only in their vertical dimension. The left bar in Figure 2 shows that allocators gave on average 64.9 tokens to in-group recipients when the allocation is over the horizontal identity, while the right bar shows that when the allocation is done over the vertical identity instead, allocators gave on average 65.9 tokens to in-group recipients. The Wilcoxon signed-rank test shows that the individual-averaged in-group allocations over the horizontal identity are significantly higher than 50 in all the treatments (p-values$<$ 0.01) except Treatment Random_Random_XY, where the individual-averaged in-group allocations over the horizontal identity are insignificantly higher than 50 (p-value$=$ 0.19). Meanwhile, in all of the six treatments, the individual-averaged in-group allocations over the vertical identity are significantly higher than 50 (p-values$<$ 0.01). All in all, these results suggest the existence of in-group favoritism under the multi-dimensional identity setting with our in-group definition. Interestingly,

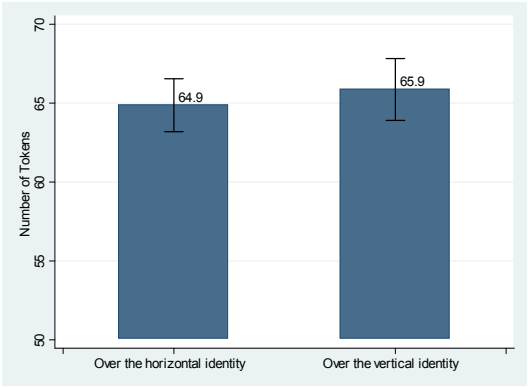

Figure 2: Allocation of Tokens to In-group Members

the strength of in-group favoritism was remarkably similar in the two dimensions. The Wilcoxon Signed-Rank test indicates that for all the treatments, there is no statistically significant difference between the individual-averaged tokens allocated to in-group recipients over the horizontal identity and those made over the vertical identity (p-values> 0.1).

The following result summarizes the findings.

Result 1 (In-group Favoritism) *In all of the treatments, individual-averaged in-group allocations are significantly higher than* 50*, the fair allocation of the* 100 *tokens. In all the treatments except Treatment Random_Random_XY, in-group allocations over the horizontal identity are significantly higher than the fair allocation of the* 100 *tokens. In all of the treatments, in-group allocations over the vertical identity are significantly higher than the fair allocation of the* 100 *tokens. For all the treatments, there is no significant difference between in-group allocations made over the horizontal dimension and those made over the vertical dimension.*

This result confirms the existence of in-group favoritism in our setting with multiple dimensions of identity, and suggests that in general the degree of in-group favoritism is robust to the variation of whether the group identity involves a hierarchical meaning.

3.4 The Degree of Identity Distance

Recall that our definition of in-group is based on the relative identity distance between the two recipients and the allocator. The two recipients always differ in one identity attribute from each other, which could either be the horizontal or the vertical identity. An in-group member is a recipient who is relatively closer to the allocator and there are two types of in-group recipients. The first one is an *absolute in-group* recipient who has

exactly the same set of identity attributes as the allocator, and the second one is a *relative in-group* recipient who only shares one identity attribute with the allocator.

In Figure 3, we break down Figure 2 according to whether or not the in-group recipient's identity attributes are exactly the same as the allocator. The left panel is for the token allocation over the horizontal dimension, while the right panel is for the token allocation over the vertical dimension. Within the same panel, the left and right bar show, respectively, the token allocation to an absolute in-group recipient and to a relative in-group recipient. The figure shows that the average number of tokens transferred to an absolute in-group recipient in the allocation over the horizontal and the vertical dimension are, respectively, 70.3 tokens and 70.1 tokens. The average number of tokens given to a relative in-group member in the allocation over the horizontal and the vertical dimension are, respectively, 59.5 and 61.6 tokens.

The Wilcoxon signed rank test reveals that for all the treatments, the individual-averaged allocations made to an absolute in-group recipient are significantly higher than 50, the fair allocation (p-value< 0.1 for Treatment Random_Random_XY; p-values< 0.01 for all the other treatments), and that for all the treatments except Treatment Random_Random_XY, the individual-averaged allocations made to a relative in-group recipient are significantly higher than 50 (p-values< 0.1). We also found that on average an absolute in-group recipient would attract 10 to 11 tokens more than a relative in-group recipient, and the differences in individual-averaged allocations are statistically significant by the Wilcoxon signed-rank tests, for all the treatments (p-values< 0.1).

The results are summarized as follows.

Result 2 (Identity Distance) *In all of the treatments, individual-averaged in-group allocations to absolute in-group recipients are significantly higher than the fair allocation of the* 100 *tokens. In all the treatments except Treatment Random_Random_XY, individual-averaged in-group allocations to relative in-group recipients are significantly higher than the fair allocation of the* 100 *tokens. In all of the treatments, the individual-averaged allocations to absolute in-group recipients are significantly higher than those made to relative in-group recipients.*

Result 2 confirms the existence of in-group favoritism for both absolute and relative in-group recipients. In-group favoritism is present regardless of the identity distance

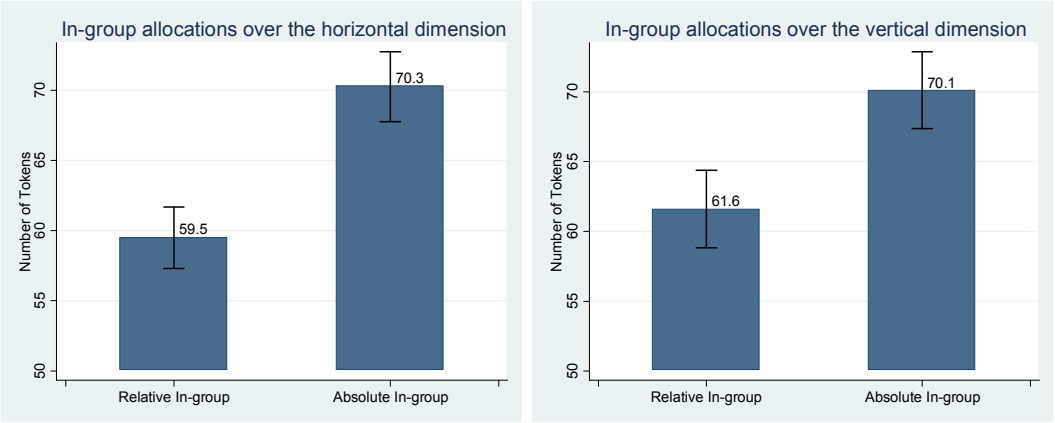

Figure 3: Identity Distance and In-group Allocations

between the allocator and the in-group recipient. This result implies that in reality where identity is naturally multidimensional, people tend to favor those having similar identity attributes, who do not necessarily share exactly the same identity attributes with themselves. Result 2 also shows that, however, being closer in terms of the identity distance to the allocator would attract higher amount of tokens from the allocator. The existing studies on in-group favoritism is generally based on a setting where the allocator and the recipients only differ in one identity attribute. By extending this standard setting into a setting where each subject's identity can be defined on the basis of the horizontal identity attribute and the vertical identity attribute, we were able to show that the degree of favoritism towards an in group recipient is increasing in the identity closeness between the allocator and the in-group recipient. Finally, Figure 3 shows that conditional on the degree of identity distance, the average amount of tokens allocated to the in-group over the horizontal and the vertical dimension appears to be very close.

3.5 Do the Method of Acquiring Identity Attributes and the Identity Enhancement Matter?

Recall that in the identity inducement stage, we varied the ways subjects acquired their identity attributes (see Table 1). The horizontal identity was determined either by choice or randomly, while the vertical identity was acquired either by performance or randomly. In this subsection we first investigate whether or not the method of acquiring identity attributes influences the degree of in-group favoritism.

Figure 4 breaks down Figure 2 based on the identity acquisition methods. The left and the right panel depict the in-group token allocation over, respectively, the horizontal dimension and the vertical dimension. In the left (right) panel, the two bars show, respectively, the token allocations to the in-group recipient when the horizontal (vertical) identity is determined randomly and by choice (performance). We find that when the allocation is made over the horizontal dimension, the average amount of tokens allocated to the in-group is slightly higher (by 1.6 tokens) if the horizontal identity is determined by choice than randomly; when allocation is made over the vertical dimension, the average amount of tokens allocated to the in-group is higher (by 3.9 tokens) if the vertical identity is determined by performance than randomly. Our experimental design allows us to run non-parametric tests on these comparisons. Nevertheless, the Wilcoxon-Mann-Whitney test shows that there is no statistically significant difference in the individual-averaged in-group allocations over the horizontal identity between Treatment Choice_Random_KK and Random_Random_KK, or between Treatment Choice_Random_XY and Random_Random_XY (p-values$>$0.1); moreover, there is no statistically significant difference in the individual-averaged in-group allocations over the vertical identity between Treatment Random_Performance_KK and Random_Random_KK (p-value$>$0.1), while the individual-averaged in-group allocations over the vertical identity in Treatment Random_Performance_XY are marginally significantly higher than those under Treatment Random_Random_XY (p-value=0.072).

We next examine the effect of identity enhancement in the second stage of the experiment. Overall, the average in-group allocation is 66.4 tokens when the identity dimension over which the allocation is made is enhanced and 64.4 tokens when not. In Figure 5, the left panel shows the average in-group allocations over the horizontal dimension when the horizontal identity is enhanced and when it is not, while the right panel shows the average in-group allocations over the vertical dimension when the vertical identity is enhanced and when it is not. We find that if allocation is made over the horizontal (vertical) dimension, on average subjects allocate slightly more tokens to their in-groups when the corresponding identity dimension is enhanced than not. However, the differences are not statistically significant. The Wilcoxon-Mann-Whitney test shows that there is no significant difference in terms of individual-averaged in-group allocations over the horizontal or vertical identity between Treatment Choice_Random_KK and Choice_Random_XY,

or between Treatment Random_Performance_KK and Random_Performance_XY, or between Treatment Random_Random_KK and Random_Random_XY (p-values>0.1).

The following result summarizes our findings about the effects of the methods of identity acquisition and identity enhancement.

Result 3 (Identity Acquisition Method and Identity Enhancement) *In general, the way by which the identity attributes are acquired does not have significant effects on subjects' allocation decisions, while there is weak evidence that when the vertical identity is determined by performance rather than randomly, subjects' in-group allocations over the vertical dimension tend to be higher. There is no significant effect of the second stage identity enhancement on subjects' allocations.*

Therefore, the effects of the identity acquisition methods and the team-building group task on in-group favoritism, if any, are weak. This is in line with Chen and Li's (2009) finding that a random assignment could be as effective as categorization based on painting preferences for identity inducement. The findings in Result 1 show that even for treatments with random assignment of horizontal (vertical) identity attributes, the in-group allocations over the horizontal (vertical) identity are higher than 50, the fair allocation of the 100 tokens. The Wilcoxon signed rank tests further show that for all the treatments, the individual-averaged in-group allocations over the dimension that was not enhanced in the second stage of the experiment are significantly higher than 50, the fair allocation of the 100 tokens (p-values<0.01). Altogether these results suggest, in a methodological sense, that in an experimental setting, in-group favoritism could emerge even with random assignment of identity attributes and without team building tasks among group members.

Appendix A further shows that the performance in the group task in Stage 2 does not seem to affect in-group allocations either.

3.6 Income Gaps

We now look at how in-group allocations vary with the income gap between Group X and Group Y. Recall that we have four (4) possible scenarios of income gap, $X - Y$, which are 50, 100, 150, and 200 respectively as in Table 2. Figure 6 shows the average

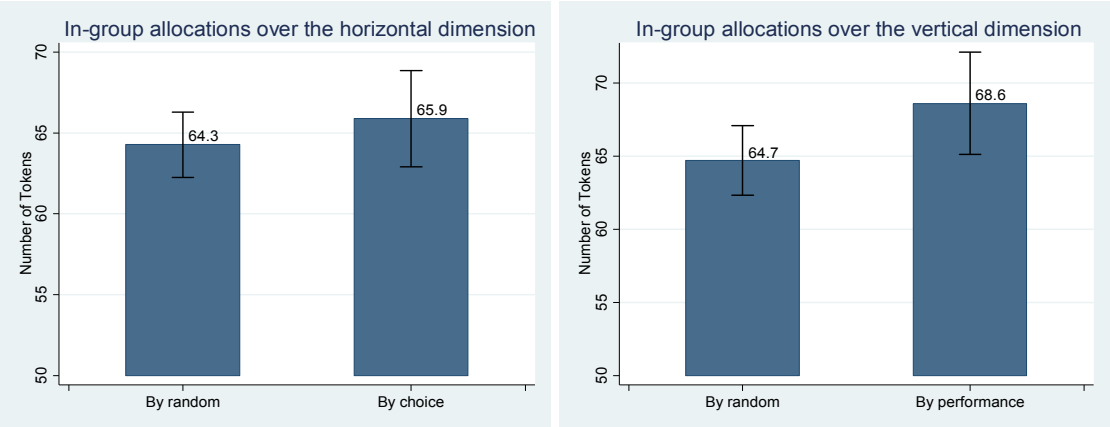

Figure 4: Identity Aquisition Method and In-group Allocations

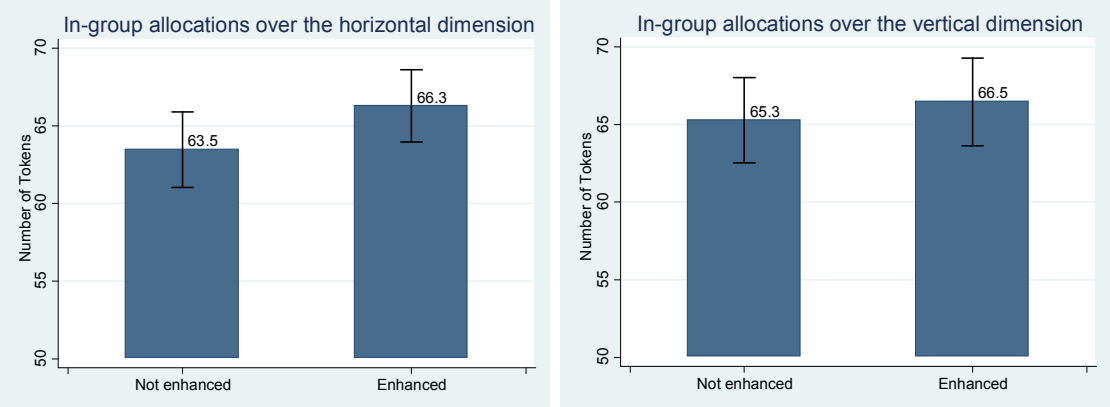

Figure 5: Identity Enhancement and In-group Allocations

allocations to the in-group under the four income-gap scenarios, suggesting an increasing trend of in-group allocations as the income gap worsens. The Kendall rank correlation test shows that in-group allocations are significantly correlated with the income gap (p-value< 0.01). Given the exogeneity of the income gap, this test result suggests a causal effect from the income gap to in-group allocations.

We then have a deeper look into the effect of income gaps. In Figure 7, the left and the right graphs show the average in-group allocations based on the horizontal and vertical dimension respectively. The left graph shows that when allocation is made over the horizontal dimension, the magnitude of in-group allocations increases when the income gap worsens. We ran the Kendall rank correlation test and found that the increase in the in-group allocations across scenarios is statistically significant (p-value< 0.01). This result suggests that when the two recipients have the same income status and only differ in the horizontal identity attribute, a larger income gap between the rich group and the poor group would induce the allocator to increase in-group allocation.

This finding suggests that there seems to be a causal relationship between the increase in income inequality and the in-group bias. The more unequal "the society" is, the more in-group favoritism will be bred. If we think that the in-group bias can potentially lead to inter-group conflict, our result, thus, points to the role of income inequality as a cause of inter-group conflict. This is consistent with the argument put forward by Collier (2000) and Cramer (2003) who argued that income inequality is not an outcome of inter-group conflict, but rather a potential cause of it. In the empirical literature, using cross-country data, some studies, such as Alesina and Perotti (1996) and Nafziger and Auvinen (2002), demonstrated that income inequality correlates with inter-group (social) conflict. However, these studies only established correlation but not causality. In fact, there seems to be no consensus in the literature on the direction of causality between income inequality and inter-group (social) conflict (see Cramer 2003, 2005). Our laboratory experimental study, which varies the income gap exogenously, can be seen as an attempt to establish the causal relationship from income inequality to biased attitude towards in-group members.

The right panel of Figure 7 depicts in-group allocations along the vertical identity. The curve in the middle depicts the average in-group allocation for all the allocators, while the upper and lower curves decompose the middle curve for poor and rich allocators re-

spectively. We find a couple of interesting results. *First*, there is a gap between the poor's and the rich's in-group allocation: The rich make much lower in-group allocations over the vertical identity than the poor. On average the rich give 57.6 tokens while the poor give 73.9 tokens to the in-group along the vertical dimension, and the Wilcoxon-Mann-Whitney test shows that the differences in the individual-averaged in-group allocations over the vertical identity are statistically significant (p-values$\leq$ 0.07) in 4 out of the 6 treatments (Random_Random_KK, Random_Random_XY, Choice_Random_KK, and Random_Performance_KK). By contrast, the differences in the individual-averaged in-group allocations over the horizontal identity between the rich and the poor allocators are statistically insignificant in 5 treatments and in only one treatment (Choice_Random_XY) the difference is marginally statistically significant at the 10% significance level, where the rich appeared to give slightly more than the poor.

The finding that the rich give similar amount of tokens to the in-group as the poor over the horizontal identity, but give less to the in-group over the vertical dimension than the poor could be potentially explained by the *aversion to inequality* between the two recipients and also the in-group favoritism. Note that when allocation is made over the horizontal identity, the two recipients have the same income status; however, over the vertical identity, the rich's in-group are also rich while the poor's in-group are also poor. If the allocators are concerned about the fairness between the two recipients to some extent, when making allocations over the vertical identity, the inequality aversion may induce the rich to give less to the in-group, and induce the poor to give more to their in-group. It is worth mentioning that our allocation setup is similar to Engelmann and Strobel (2004). In their setup, participants were also asked to make an allocation decision towards two recipients; one of them is a rich individual and the other one is a poor individual. They found that there is a tendency for allocators to choose a relatively fair allocation because of the desire to improve the minimal payoffs and to reduce the income gap between the two recipients. Our finding here implies that although allocators exhibited in-group favoritism when making other-other allocations, their allocation decisions also exhibited some degree of fairness concern such that the allocation is not too much biased toward their in-group. In order to disentangle the role of inequality aversion and in-group favoritism, we present a reduced form regression analysis in the later part of this paper.

A second interesting finding of the right panel of Figure 7 is that when allocation is

made over the vertical dimension, poor allocators tend to increase allocations to the in-group poor as the income gap worsens. When the income gap is at the highest level (200 points), the poor allocator would on average allocate around 80% of the extra tokens to the in-group recipient. The increase in allocation is statistically significant (the p-value of the Kendall rank correlation test is less than 1%). In contrast, the rich allocator's allocation to the rich in-group recipient is more or less constant, hovering around $55-60$ tokens when the income gap gets bigger; the p-value of the Kendall rank correlation test was 0.69 indicating that the allocation is invariant to the degree of the income gap.

Overall, the right panel of Figure 7 implies that the allocators exhibit certain fairness concern by allocating more to poor in-group recipients and less to rich in-group recipients when there is income inequality between the two recipients; moreover, this tendency is strengthened for the poor allocators as income inequality worsens, while the rich do not seem to be responsive to the enlarged income gap. The following result summarizes our findings regarding income gaps.

Result 4 (Income Gaps) *The degree of in-group favoritism over the horizontal identity increases as income inequality worsens. Over the vertical identity, the poor tend to make more in-group allocations than the rich; moreover, the poor increase in-group allocations as income inequality worsens while the rich's in-group allocations are insensitive to the enlarged income gap. Two factors are potentially at work here when the allocation is over the vertical dimension. The first one is the aversion to inequality, which works in reducing the rich's in-group allocations and increasing the poor's in group allocations over the vertical dimension. The second one is the in-group favoritism, which works in increasing both the poor's and the rich's in-group allocations.*

3.7 The Regression Analysis

All in all, our statistical analysis has thus far demonstrated the general level of affinity that one has on an in-group recipient in the presence of multi-dimensional identity, and looked into several important factors that may influence the magnitude of one's token allocation decision to an in-group recipient relative to an out-group recipient. Among these factors, the relative degree of identity distance appears to be the most important

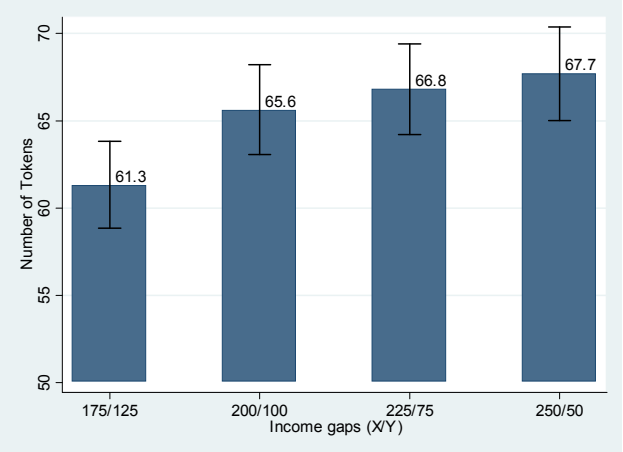

Figure 6: Income Gaps and In-group Allocations

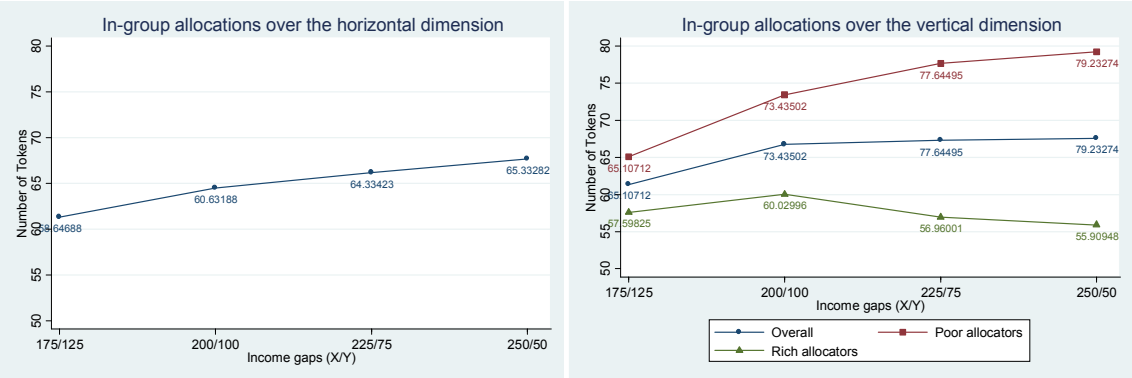

Figure 7: Tokens Allocated to In-group Members across Income Gaps

factor that affects the degree of in-group favoritism. The gap between groups along the vertical dimension also affects in-group allocations, while the effect seems to depend on the dimension for which allocation is made and the vertical identity attribute of the allocator. As we argued earlier, there seems to be two factors at work here, namely the aversion to inequality and the in-group favoritism. When the in-group favoritism exercebated the income inequality, individuals would tend to reduce their in-group allocations. With various variables affecting the allocation decisions of interest, we then conducted a reduced form regression analysis to further look into the determinants of subjects' allocations to in-group members vis-a-vis out-group members.

Table 5 reports our regression results. In all the regressions, we regressed tokens allocated to the in-group recipient on various variables that might affect subjects' allocation decisions, controlling for the session fixed effects and clustering standard errors at the individual level. In Column (1), we regressed in-group allocations on *absolute*, a dummy variable equal to 1 if the in-group has exactly the same identity attributes with the allocator and 0 otherwise, $performance$, a dummy variable equal to 1 if the vertical identity attribute is acquired by performance in the real-effort task and 0 otherwise, *choice*, a dummy variable equal to 1 if the horizontal identity attribute is acquired by preferences on the abstract paintings and 0 otherwise, *enhanced*, a dummy variable equal to 1 if the dimension over which the allocation is made is enhanced in the second stage of the experiment and 0 otherwise, $overkk$, a dummy variable equal to 1 if the allocation is made over the horizontal identity and 0 otherwise, and *scenario*, a variable equal to 1, 2, 3 or 4 corresponding to the Scenarios 1-4 in Table 2 respectively. Thus, the regression analysis presented in Column (1) only include variables that focus on the in-group favoritism in general. We find that, consistent to our findings from non-parametric statistical tests, the coefficient of *absolute* is statistically significant at the 1% significance level, implying that on average an absolute in-group recipient attracts nearly 10 more tokens than a relative in-group recipient; the coefficient of *scenario* is also statistically significant at the 1% significance level, implying that on average 2 more tokens are given to the in-group as the income gap between the rich and poor increases by every 50 tokens; the coefficients of the variables on identity acquisition methods *performance* and *choice*, identity enhancement *enhanced*, and the dimension over which allocation is made $overkk$, however, are statistically insignificant.

Column (2) replaces $overkk$ by two dummy variables, $D_{ingroup>outgroup}$ and $D_{ingroup>outgroup}$. $D_{ingroup>outgroup}$ ($D_{ingroup<outgroup}$) indicates that the in-group's income is higher (lower) than the out-group, implying that the allocation is made over the vertical dimension given our experimental design. In particular, $D_{ingroup>outgroup}$ equals 1 if the allocation is made by a rich allocator over the vertical identity and 0 otherwise, and $D_{ingroup<outgroup}$ equals 1 if the allocation is made by a poor allocator over the vertical identity and 0 otherwise. This regression thus looks into the interaction between the allocation dimension and the allocator's economic status in more details. The coefficient of $D_{ingroup>outgroup}$ is negative while that of $D_{ingroup<outgroup}$ is positive, both of which are statistically significant at the 1% level, implying that compared to the average in-group allocations over the horizontal identity, the rich (poor) on average made 7 less (9 more) tokens to the in-group in allocations over the vertical identity. In particular, the coefficient of $D_{ingroup<outgroup}$ and that of $D_{ingroup>outgroup}$ are significantly different from each other (p-value< 0.001), implying that the poor gave more to the in-group than the rich when allocating over the vertical identity, which could be explained by the aversion to inequality between the two recipients as discussed in the last subsection. These results are consistent with our previous findings from Figure 7.

Column (3) further includes four interaction terms, namely; 1) $D_{ingroup>outgroup} \times performance$, 2) $D_{ingroup>outgroup} \times choice$, 3) $D_{ingroup<outgroup} \times performance$, and 4) $D_{ingroup<outgroup} \times choice$, to dig into the potential interaction effects between the income disparity between the two recipients and the way the group differences were generated. However, none of the coefficients of these interaction terms are statistically significant, nor do the coefficients of $performance$ and $choice$. This confirms that the identity acquisition methods, at most, have negligible effects on subjects' allocation decisions.

Recall that in Column (1) the dummy variable $overkk$ captures the impact of the difference in the horizontal identity attribute between the in-group and out-group recipients regardless of whether or not the allocator's income is higher or lower than both the in-group and out-group recipients' income. In Column (4), we further decompose $overkk$ into the cases where the allocator's income is higher or lower than both the in-group and out-group recipients' income.[8] We do this by adding two interaction terms, $overkk \times D_{self>recipients}$ and $overkk \times D_{self<recipients}$, in which $D_{self>recipients}$

[8]Note that in our experiment, when allocation is made over the horizontal dimension, the two recipients have the same income status, which may or may not differ from the allocator's.

($D_{self<recipients}$) indicates that the allocator's income is higher (lower) than both the in-group and out-group recipients' income. If allocators are also averse towards income inequality between themselves and both the in-group and out-group recipients when these two have the same income then we should expect that the coefficients of the these two interaction terms would be negative and statistically significant. Our regression result shows that the coefficient of $overkk \times D_{self>recipients}$ is positive but insignificant. However, the coefficient of $overkk \times D_{self<recipients}$ is negative and significant at the 5% significance level. This result implies that when poor allocators make allocations to two rich recipients who differ in the horizontal identity, the poor allocator gives less to the in-group (who shares the same horizontal identity as herself but is richer), compared to the case where the allocator and both recipients have the same income status and the allocation is also made along the horizontal identity. This result may be because the aversion to the disadvantageous inequality in the sense of Fehr and Schmidt (1999) between the allocator herself and the recipient sharing the same horizontal identity is stronger than that, if any, between the allocator and the out-group. In other words, the social comparison between the allocator and the recipient seems to be stronger when the recipient is an in-group. As a result, the poor allocator reduces her allocation to her in-group by 6 tokens, giving more to the out-group, compared to the case where the allocator and the recipients have the same income status. This thus shows that the degree of in-group favoritism towards someone sharing the same horizontal identity attribute would be eroded when allocators are poorer than their in-group recipient.

Column (5) further investigates the effect of income gaps by decomposing *scenario* in column (1) to interaction terms $scenario \times overkk$, $scenario \times D_{ingroup>outgroup}$ and $scenario \times D_{ingroup<outgroup}$. We find that $scenario \times overkk$ is positive and statistically significant, implying that the degree of in-group favoritism over the horizontal identity increases as income gap increases, consistent with the left panel of Figure 7. Meanwhile, the coefficient of $scenario \times D_{ingroup<outgroup}$ is positive and statistically significant, while that of $scenario \times D_{ingroup>outgroup}$ is statistically insignificant, suggesting that the poor give more to their in-group poor along the vertical identity as income gap increases, while the rich is not responsive to the change of income gaps when making allocations over the vertical dimension. These results confirm the findings from the right panel of Figure 7.

Overall, our regression analysis lends support to Results 2-4.[9]

4 Concluding Remarks

In this paper, we report findings from a laboratory experiment on social identity *a la* Chen and Li (2009) in a two dimensional identity setting. Although Chen and Li (2009) find that, in a one-dimensional identity setting, the simple Minimal Group Paradigm is sufficient to induce in-group favoritism in economic decisions, people's identity attributes are, by nature, multi-dimensional in reality and are embedded in different kinds of social structures. Our experiment elicits horizontal identity attributes in line with Chen and Li (2009) as well as vertical identity attributes with a hierarchical structure. Vertical identity attributes are materialized as income status in our experiment. This two-dimensional setting also creates an interesting measure that captures the identity distance between any two people. This measure is meaningful as in reality no two people have exactly the same identity attributes as in the one dimensional setting adopted in most of the existing experimental literature. We also manipulate the way the subjects obtain these identity attributes and the dimension of social identities to be enhanced by a team-building group task in a between-subject design, as well as vary the income gap between different vertical identity groups in a within-subject design.

Subjects then played the role of a social planner who have to make a redistributive allocation to two beneficiaries differing in identities attributes. The allocations are like transfer payments made to different social groups by the government in reality. We find that in-group favoritism is robust in our two-dimensional setting, not only for the horizontal group identity as shown in Chen and Li (2009) but also for the vertical group identity, in the sense that subjects make more favorable allocation decisions to the recipient who is closer in terms of identity attributes to themselves in our experiment. Moreover, identity distance influences the degree of in-group favoritism. The closer in terms of identity attributes between the allocator and the recipient, the more favorable decisions will be made to the recipient.

[9] In all of our regressions, adding a demographical variable indicating the gender of the allocator does not change the regression results qualitatively. Moreover, the coefficient of this variable is never statistically significant at the conventional levels.

Table 5: Regression Results of In-group Allocations

	(1)	(2)	(3)	(4)	(5)
$absolute$	9.629***	9.629***	9.629***	8.503***	9.629***
	(1.896)	(1.897)	(1.899)	(2.265)	(1.897)
$performance$	2.991	3.399	2.477	2.325	3.388
	(5.298)	(5.548)	(5.189)	(5.060)	(5.534)
$choice$	-0.478	-0.0805	-0.340	-0.490	-0.0914
	(4.282)	(4.144)	(4.493)	(4.471)	(4.137)
$enhanced$	2.002	2.130	2.120	2.151	2.127
	(2.053)	(1.831)	(1.821)	(1.809)	(1.834)
$scenario$	2.022***	2.022***	2.022***	2.022***	
	(0.640)	(0.640)	(0.641)	(0.641)	
$overkk$	-0.991				
	(2.053)				
$D_{ingroup>outgroup}$		-7.329***	-9.534*	-10.71*	
		(2.784)	(5.595)	(5.729)	
$D_{ingroup<outgroup}$		9.056***	9.530**	8.327**	
		(2.492)	(4.002)	(4.082)	
$D_{ingroup>outgroup} \times performance$			9.261	9.338	
			(7.185)	(7.136)	
$D_{ingroup<outgroup} \times performance$			-5.255	-5.142	
			(6.273)	(6.226)	
$D_{ingroup>outgroup} \times choice$			-1.563	-1.469	
			(6.956)	(6.941)	
$D_{ingroup<outgroup} \times choice$			2.895	2.995	
			(5.726)	(5.721)	
$overkk \times D_{self>recipients}$				1.971	
				(2.668)	
$overkk \times D_{self<recipients}$				-6.344**	
				(2.961)	
$scenario \times overkk$					1.866***
					(0.671)
$scenario \times D_{ingroup>outgroup}$					-1.059
					(1.030)
$scenario \times D_{ingroup<outgroup}$					5.314***
					(0.962)
Observations	2,048	2,048	2,048	2,048	2,048
Adjusted R-squared	0.040	0.077	0.084	0.088	0.082

Session fixed effects are controlled for. Robust standard errors clustered at the individual level are in parentheses. *** for p<0.01, ** for p<0.05, and * for p<0.1

However, the way that differences between people were generated does not substantially influence subjects' allocation decisions in our experiment. No matter whether the horizontal identity was generated randomly or by common preferences on artistic paintings, or whether the vertical identity was determined by luck or in a seemingly more fair way by performance in a real-effort task, the degree of in-group favoritism is robust and stable. A team-building group task is not necessary either for the emergence of in-group favoritism. These results seem to suggest that in-group favoritism might be a deeply embedded human tendency. Independent of the grouping processes, as long as there are divisions among people, people tend to favor the in-groups against the out-groups and the degree of this tendency is stable. This is in line with the insights in Chen and Li (2009) and other studies in identity and economics that a minimal way of grouping people would be sufficient to create in-group favoritism.

The gap between different groups along the vertical dimension also makes a difference. On the one hand, despite the prevalent in-group favoritism, the subject allocators in our experiment also exhibit certain degree of fairness concern in making allocations when there is an income difference between the two recipients. On the other hand, the bigger the gap between different groups along the vertical dimension is, the more favorable decisions allocators would make to the in-group in seemingly irrelevant decisions (i.e. allocation decisions over the horizontal identity where there is no income difference between recipients). This result suggests that social inequality may deepen the tendency of in-group favoritism. As the hierarchical distinctions become more prominent, the in-group bonding is stronger. Inequality thus strengthens the tendency of clustering group members together.

A Appendix

A.1 The Participants' Performance in Stage 2 Group-task

The following figure shows the average in-group redistributive allocations under different performance levels in the stage 2 group task. The stage 2 group task consists of four spot-the-differences puzzles which contain 20 differences in total. Group's scores, measured by the numbers of differences the group spotted, varied from 12 to 20.

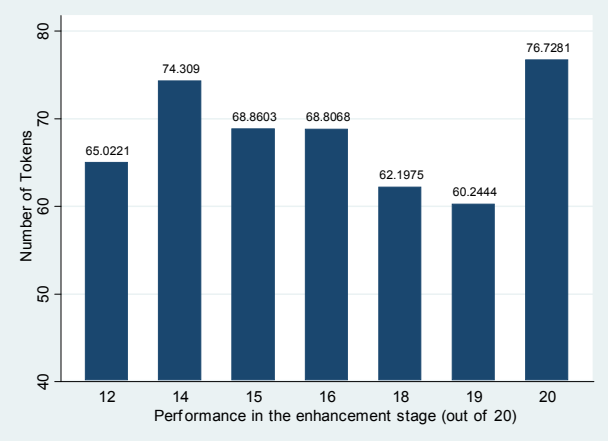

Figure 8: In-group Allocations under Various Performances in the Group Task

The graph suggests that there is no a clear pattern between the stage-2 performance in the group task and the stage-3 redistributive allocation decisions. The Kendall rank correlation test shows that the redistributive allocations over both dimensions of identities are not associated with group performance in the stage of identity enhancement (p-values$>$ 0.225).

A.2 A Sample of Experimental Instruction: the Treatment Random_Performance_KK

General Information

You are now taking part in an interactive study on decision making. **Please pay attention to the information provided here and make your decisions carefully. If at any time you have questions to ask, please raise your hand and we will attend to you in private.**

Please note that unauthorized communication is prohibited. Failure to adhere to this rule would force us to stop the experiment and you may be held liable for the cost incurred in this experiment. You have the right to withdraw from the experiment at any point in time, and if you decide to do so your payments earned during this study will be forfeited and you will only receive your show up fee.

By participating in this study, you will be able to earn a considerable amount of money. The amount depends on the decisions you and others make.

At the end of this session, this money will be paid to you privately and in cash. It would be contained in an envelope (indicated only with your unique user ID). Please exchange the claim card given to you with this envelope.

General Instructions

After the experiment start, each of you will be given a unique numerical user ID randomly generated by the computer terminal. Your **anonymity will be preserved** for the study. You will **never be aware of** the personal identities of other participants **during or after** the study. Similarly, other participants will also **never be aware** of your personal identities **during or after** the study. You will only be identified by your user ID in our data collection. All information collected will **strictly be kept confidential** for the sole purpose of this study.

Specific Instructions

This experiment will consist of three (3) stages. Below we describe the details of these three stages.

Stage 1

There are two steps in this stage: Step A and Step B.

Step A

You will first be shown two pairs of paintings, each of which contains one painting by Paul Klee and one painting by Wassily Kandinsky. You will be told which one is painted by Paul Klee and which one is painted by Wassily Kandinsky. They are popular abstract artists in the last century.

Subsequently, you will be shown five pairs of paintings sequentially, each of which contains one painting by Klee and one painting by Kandinsky, but you will not be told which one is which. Once all the paintings have been shown to you, **half of you will be grouped to Team Klee and the rest of you will be grouped to Team Kandinsky. The group assignment is random.**

Step B

Subsequently, you will be asked to participate in simple quantitative tasks individually. It contains 30 questions requiring you to sum up a sequence of numbers shown to you. You are given 90 seconds to complete as many questions as you can. You are not able to proceed to the next question until you answer the current question correctly. After the time ends, you will be randomly allocated into two groups, i.e. Group X and Group Y, according to your relative performances in the add-up tasks.

Specifically, the computer will count the numbers of questions you have correctly answered.

Half of you with **better** performances will be allocated into Group X and the other half will go to Group Y. In case of a tie, you will be assigned randomly to either Group X or Group Y in such a way that the two groups have the same size.

You will receive a certain amount of endowment tokens according to which group you belong to. **The sum of endowment tokens received by a member of Group X and a member of Group Y is fixed at 300, but the member from Group X will always receive at least 50 tokens more than the member from Group Y.**

The table below shows the four possible scenarios of endowment token allocations. At the end of this experiment, one of the scenarios will be randomly selected to be the binding scenario for all of you. Each scenario will have equal chance of being selected.

Table 1

	Scenario 1	**Scenario 2**	**Scenario 3**	**Scenario 4**
Group X	175	200	225	250
Group Y	125	100	75	50
(X-Y)	50	100	150	200

At the end of Stage 1, each of you will belong to one of the following combinations: (Team Klee & Group X); (Team Klee & Group Y); Team Kandinsky & Group X; and (Team Kandinsky & Group Y) . Your combination will remain the same throughout this experiment. That is, if you belong to (Team Klee & Group X), you will remain as (Team Klee & Group X) throughout this experiment.

Stage 2

In the second stage, you will be asked to participate in a series of team tasks. You will work with other members who belong to the same team as you (either **Team Klee or Team Kandinsky**) on some joint tasks involving spotting-differences puzzles. For each task, one member of your team will be randomly selected as the team representative whose task is to submit the final answer on behalf of the team.

You will be given opportunities to chat with your team members through a chat box which will be later shown on your computer screen. You are encouraged to actively participate in this chatting session by contributing your suggested answers and helping your team to solve these puzzles. After the team representative submits your team answer, you are able to proceed. After completing each puzzle, your team answer and the correct answers will be shown to each of you.

The followings are the details of the 'Spot the Difference' puzzles you will face. There are in total four (4) puzzles; the number of differences and the time limit allotted to you increase as you proceed to later puzzles.

Table 2

	Puzzle 1	Puzzle 2	Puzzle 3	Puzzle 4
No. of Differences	4	5	5	6
Time Limit (Minutes)	4	5	5	6

The time limit is also shown on the **right-hand-side top** corner. Please pay attention to that.

If you are selected as your team representative, when you submit your answer, you will **need to pin point the positions of the differences in the grid lines shown on each picture**. You will have to submit your answer before the time limit ends; otherwise your team will not have any answer recorded.

Stage 3

This is the main stage of this experiment. **You will make some economic decisions which will have an effect on the earnings of other participants, but not on your own earning**.

In this stage, for each decision you will have to make, you will be given **100 extra tokens.** You have **to allocate these 100 tokens to two other participants**. There are four (4) possible scenarios of endowment you will face. These scenarios are those which we

have presented earlier in **Table 1** (please inspect Table 1 once again to familiarize yourself with these scenarios)

In **each scenario**, you will be asked to decide how to allocate tokens between another two participants under the following **four** cases.

	Table 3		
1	A member from **{Team Kandinsky & Group X }**	vs.	A member from**{Team Kandinsky & Group Y}**
2	A member from **{Team Klee & Group X}**	vs.	A member from **{Team Klee & Group Y}**
3	A member from **{Team Klee & Group X }**	vs.	A member from **{Team Kandinsky & Group X}**
4	A member from **{ Team Klee & Group Y}**	vs.	A member from **{Team Kandinsky & Group Y}**

Thus, you will have to make 4 x 4 = 16 allocations in total. The first four (4) indicates the four allocation decisions in Table 3 and the second four (4) indicates the four possible scenarios of endowment tokens shown to you in Table 1. Once you have completed your token allocations in all of the four (4) decisions under each of the four (4) endowment token scenarios, the system will randomly select the binding scenario of endowment tokens for all of you. Under this scenario, you will receive your earning, which will be your endowment tokens under the binding scenario plus the average amount of the tokens allocated to you by the other participants in the relevant decisions of Stage 3. An example here illustrates the details.

For example, you are in {Team Klee & Group X}. Then any other participant's allocation decisions in Stage 3 to a member from {Team Klee & Group X} will affect your earning. You will receive your endowment as well as the average amount of the tokens allocated by each of the others in the decisions highlighted in the table below.

	Table 4		
1	A member from {Team Kandinsky & Group X }	vs.	A member from{Team Kandinsky & Group Y}
2	**A member from {Team Klee & Group X}**	vs.	A member from {Team Klee & Group Y}
3	**A member from {Team Klee & Group X }**	vs.	A member from {Team Kandinsky & Group X}
4	A member from {Team Klee & Group Y}	vs.	A member from {Team Kandinsky & Group Y}

The following formula summarizes how your earning is determined:

$$Your\ Earning = Your\ endowment\ tokens\ allocated\ under\ the\ binding\ scenario + \frac{\sum_{other\ participants} \sum_{the\ 2\ decisions\ relevant\ to\ you\ made\ by\ other\ participants}}{2 * (number\ of\ particiants - 1)}$$

Hence your earning is ONLY dependent on your endowment and others' decisions in Stage 3. Your decisions in Stage 3 will not affect your personal earnings.

Your earning will be exchanged to Singapore dollars (SGD) with the exchange rate of 12 Experimental Tokens = 1 SGD. In addition, you will receive 3 SGD as show-up fee. At the end of the experiment, your total income will be shown on the computer screen. Please write down your ID and your total income on the claim card before you click the button to finish the experiment. Then please wait for your ID to be called for payment.

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