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Beyond Collapse: The Continuation Effect of Group Identities

by

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Abstract

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This paper experimentally examines the effects of Physical Integration, Competition, and Group Identity on integrated groups. We consider a two public good games, played by two groups, first separately then together. We assume that naturally people will be less willing to contribute to the integrated group after playing first game with only their assigned groups. We subject groups to a combination of Physical Integration, Competition, and Identity Manipulation in attempt to increase contribution rates in integrated public good games. The evidence demonstrates that while either Physical Integration or Competition is successful in maintaining contribution rates, a combination of the two is required in order to increase contribution between games.

Acknowledgements

I would like to first and foremost thank my thesis advisor Jiabin Wu, through your continued belief, in-depth insights, and constant support, this project has been the highlight of my undergraduate career. I would like to thank Micheal Urbancic for the use of his equipment, his counsel, and contributions to our recruiting. I would also like to thank Caroline Weber for introducing me to, and advising me in the majority of the statical methods used in this project, and Monica Singha for her suggestions regarding group identity. Lastly, I would like acknowledge the contributions made by my friends Adrienne Chainey, Patrick McClellan, and Marco Curci. As well as the generosity of all of those who lent us equipment or assisted in our recruiting.

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Abbreviations

Base :	**Base**line
NI:	**N**on-Competitive **I**ntegrated
NIB:	**N**on-Competitive **I**ntegrated **B**lue
CN:	**C**ompetitive **N**on-Integrated
CW:	**C**ompetitive **W**inners' Room
CL:	**C**ompetitive **L**osers' Room
PSNE:	**P**ure **S**trategy **N**ash **E**quilibrium
OEO:	**O**ptimal **E**conomic **O**utcome
IG:	**I**n **G**roup
OG:	**O**ute **G**roup
CG:	**C**ross **G**roup

Chapter 1

Introduction

Among the most basic of animal instincts, the natural inclination to belong to a group and find identity within it is paramount; for decades social scientists have studied the social conventions associated with in-group and out-group behaviors. The concept of group identity, as considered by organizational economists, has been rigorously studied since the publication of Akerlof and Kranton (2000). This paper formally analyzes the effects of group identity on economic outcomes, which provide a critical starting point for the analysis done in this thesis as well as the other papers referenced throughout. The main interests of economists in studying group identity have been, up to this point, examining how to establish various degrees of identity and how members of groups with varying identities interact with others both inside and outside of these groups. However, little study has been done on how to maximize efficient economic outcomes when integrating people with diverse identities. To our limited knowledge, this paper is the first attempt at answering this question using a laboratory experiment.

1.1 Literature Review

We began with the seminal theoretical contribution proposed by Akerlof and Kranton (2000) that group identity favors in-group **(IG)**, but not out-group **(OG)** economic outcomes. Our considerations were expanded by similar experiments, which exposed group identity effects to be enhanced by an audience effect (Charness, et al. 2007), as well as experiments performed by Chen and Li (2009) who use **(IG)** tasks and communication to enhance group identity. When considering our specific goal regarding integrating groups with different identities, Goette, et al. (2012) offered the theory that incentivized competition between groups leads to inter-group punishment, and Cason, et al. (2015) found that allowing groups to play an **(IG)** coordination game prior lead to higher levels of cooperation in the prisoners dilemma that follows.

1.2 Motivation

We live in a world where group integration is not only common, but actively pursued. In 2015 there was an estimated 5 trillion USD in deal value created from US mergers and acquisitions (Cancialosi, 2016). In his 2015 contribution to Forbes, Cancialosi states, "But as anyone who has experienced the reality of a transaction knows, the road to living up to financial expectations of a merger or acquisition can be fraught with any number of land mines. And one of the more overlooked derailing factors to consider is organizational culture" (Cancialosi, 2016). This thesis aims to provide managerial bodies from diverse industries information to address some of the organizational cultures optimal for successful group integration. The groups in this experiment are designed to reflect a work place setting with an open floor plan. All subjects can physically observe those around them, but are unable to observe other's specific actions. When information on the actions performed by others is provided, it is done so with the same level of anonymity and vagueness typical of routine progress reports. The social phenomena of group integration can be observed in situations ranging from million dollar cooperate acquisitions, to joint departmental research in a university.

1.3 Theoretical Solution to Public Good Games

The interactions in our experiment model a traditional public good game. Subjects are assigned to two groups and play one public good game within their own group, and one with subjects from both groups. Each game consists of ten rounds in which subjects can choose to either contribute allocated points to a shared multiplying pot, or keep them for themselves. Economic theory finds that the Pure Strategy Nash Equilibrium **(PSNE)** would be to never contribute to the shared pot in either game in order to maximize personal earnings. The Optimal Economic Outcome **(OEO)** [1] does not occur at this equilibrium, but when each subject chooses to contribute every round. Economic theory also suggests that **IG** contribution rates will be higher than cross-group **CG** contribution rates, as found in Akerlof and Kranton (2000), subjects favor **IG** interactions over **CG** interactions. This experiment examines treatments designed to bring subjects closer to the **OEO** in the **CG** public goods game without communication.

[1] **Optimal Economic Outcome:** The point at which total group payoff is maximized.

1.4 Question

Our experiment, which will be described in detail in the next section, consists of five treatments and one control. Formally stated our question of interest is: How does **CG** identity, competition, and integration affect the economic outcome and willingness to play a dominated strategy[2] when integrating groups with distinct identities. To answer this question we use near minimal randomly assigned groups that resemble a real workplace setting. Inspired by the works referenced, we then subjected groups to various forms of integration. Our key finding was that non-incentivized competition, in combination with physical integration, can not only sustain, but increase contributions made by members of two distinct groups upon integrating. We believe that our finding has potential applicability as a management practice to temporary integrate social, professional, or academic groups.

[2]**Dominated strategy:** A strategy that always yields a lower payoff regardless of the actions of others.

Chapter 2

Experimental Design

In this section we will first outline our overarching experiment and summarize the six treatments involved, in subsequent sections we provide the specific methodologies, the design of Phaseii and Phaseiii, and how these differ between treatments. All decisions made by subejcets are submitted anonymously using iClickers[1] an electronic polling system that University of Oregon undergraduates are required to use for various courses. Recruiting was done by use of class management website Canvas, in-class announcements, and posted flyers. All students directly contacted were University of Oregon undergraduates and were recruited from Mathematics, Economics, Business classes. However, flyers were posted in buildings containing many additional disciplines. The minimum amount a

[1] https://www1.iclicker.com

subject could earn was 5 USD [2] while the maximum was 17 USD. The entire experiment was preformed on the University of Oregon campus and each treatment took approximently 30 minutes.

2.1 Overview

As stated above, our experiment consisted of a baseline and 5 additional treatments, each treatment consisted of three phases. These treatments were designed to isolate environmental effects on contributions. In the first phase of our experiment, hereafter referred to as Phasei [3], subjects reported in a common room and were asked to randomly draw index cards from a well shuffled deck marked with colored dots. This deck contained 5 cards marked in green, five cards marked in red, and any additional cards in the deck were marked in black. All cards were revealed simultaneously and publicly, subjects with black cards were paid 5 USD and asked to leave. The remaining subjects were assigned to the 'Green Group' and the 'Red Group' [4]. Those assigned to the Green Group were escorted to a second room by an experimenter while those in the Red Group remained in the original room[5]. Once subjects were in separate rooms they were read

[2] United States Dollars.
[3] Subsequently the second and third phases will be referred to as Phaseii and Phaseiii.
[4] Subjects remained in possession of these cards for the entire experiment.
[5] See Appendix A for statistical test showing no significant difference in actions by the two groups.

the same set of instructions. These instructions varied across treatments. In all treatments subjects were informed that they would be participating in two public good games consisting of ten rounds. They were informed in the first public good game (Phaseii), subjects would interact with their assigned groups and in the second (Phaseiii) they would interact with both groups. In certain treatments experimenters prompted competitive interactions, but in no treatments were subjects made aware of pending physical integrations or modifications to their assigned group identities.

2.2 Treatments

TABLE 2.1: Distinct Treatments

Treatments				
Phaseiii Room(s) :	Different	Random	Winner's	Loser's
Phaseii No Competition	**Base**	**NI/NIB**	**-**	**-**
Phaseii Competition	**CN**	**-**	**CW**	**CL**

Subjects participating in the baseline treatment **Base** of this experiment were not subjected to any form of integration, competition, or adaptations to their originally assigned identities. In treatments **NI** and **CN** subjects were subjected to either a competitive prompt in Phaseii or integrated into a random room in Phaseiii. In treatments **CL** and **CW** subjects were subjected to both a competitive prompt in Phaseii and a physical integration contingent on their response to the competitive prompt in Phaseiii. Lastly, subjects participating in **NIB** were subjected to a random physical integration and a reassigned a common group identity in Phaseiii[6].

2.3 Phaseii

Phaseii consisted of 10 rounds of a public good provision game, and then two questions eliciting the subjects' believes regarding the decisions of others. At the beginning of each round all subjects were allocated 10 points with the value of 0.01 USD each, they could then choose from two options: Option A: Keep my 10 points. (or) Option B: Contribute my 10 points, multiply them 3 and spilt them evenly among my group so that each member receives 6 points. The matrix below shows the payoffs considered by each row player:

[6]This treatment was added to the experiment to show that formally assigning new identities was not a contributing factor in changing contributions when integrating groups.

Table 2.2: Each Row Player's Game Matrix Phaseii

Number Of Other Group Members That Contribute:					
	0	1	2	3	4
Contribute	6	12	18	24	30
Keep	10	16	22	28	34

One can plainly see that the strategy 'Contribute' is strictly dominated by 'Keep'. Let **p**= points earned per round, **c**= 1 if a player chooses to contribute and 0 otherwise, and **g**=total number of group members contributing where $0 \leq \mathbf{g} \leq 4$. A subject's Phaseii round payoff function is defined as:

$$\mathbf{p(c, g) = -4c + 6g + 10}.$$

Since our contribution coefficient is negative we can see that that in oder to maximize payoffs, a rational subject should not contribute.

In the Non-Competitive treatments outlined above, subjects are told that both rooms are playing the same game separately in Phaseii and that they will play together in the Phaseiii, but that all decisions made in Phaseii will only impact the payoffs of the members in their assigned groups. Phaseii differs in Competitive treatments by telling the subjects that team that contributes more points[7] in Phaseii will be the 'Winners' [8]. At the end of Phaseii subjects are asked to enter numeric responses to the following two questions: How many times do you believe your group chose B over the last 10 rounds [0,50]? (and) How many times to be you believe the other group chose B over the last 10 rounds [0, 50]? If a subject answers either question within a range of ±5, 1 additional USD was added to their final payoff. After subjects have answered these questions, subjects in Competitive treatments are informed of the 'Winner' group[9], the other group is assigned the title 'Loser' group.

2.4 Phaseiii

Phaseiii consisted of 10 rounds of a Public Good Game similar to Phaseii. In Phaseiii, subjects from both the Green Group and the Red Group played together. Each round all subjects were allocated 10 points with the value of 0.01 USD each, they could then choose from two options: Option A: Keep my 10 points. (or) Option B: Contribute my 10 points, multiply them 6 and spilt them evenly

[7] It is clearly expressed that higher contribution rates lead to higher Economic outcomes.
[8] It is clearly expressed that 'Winning' has no impact on monetary payoffs.
[9] The 'Winner' group is the group with a higher Phaseii amount of B's.

among both group so that all subjects receive 6 points[10]. The matrix below shows the payoff considered by each row player:

TABLE 2.3: Each Row Player's Game Matrix Phaseii

Total Number Of Other Subjects That Contribute:										
	0	1	2	3	4	5	6	7	8	9
Contribute	6	12	18	24	30	36	42	48	54	60
Keep	10	16	22	28	34	40	46	52	58	64

Just as in Phaseii, the strategy 'Contribute' is strictly dominated by 'Keep'. Let **q**= points earned per round, **d**= 1 if a player chooses to contribute and 0 otherwise, and **s**=total number of other subjects contributing where $0 \leq \mathbf{s} \leq 9$. A subject's Phaseiii payoff function is defined as:

$$\mathbf{q}(\mathbf{d}, \mathbf{s}) = \mathbf{-4q + 6s + 10}$$

Since our contribution coefficient is negative we can see that that in oder to maximize payoffs, a rational subject should not contribute. At the end of Phaseiii subjects are once again asked to enter numeric responses to two questions: How many times do you believe your group chose B over the last 10 rounds [0,50]? (and) How many times

[10]The multiplier was changed to 6 keep payoffs constant when doubling the amount of payers.

to be you believe the other group chose B over the last 10 rounds [0, 50]? If a subject answered either question within a range of ±5, 1 additional USD was added to their final payoff.

In the baseline and Non-Integrated[11] treatments for Phaseiii subjects submitted their choices from the same rooms they were in during Phaseii. In treatments that were integrated, the subjects played Phaseii in a single room for the entirely of Phaseiii. In competitive treatments **CW** and **CL** subjects were integrated into the room of the either the 'Winner' or 'Loser' group respectively. In the Non-Competitive treatments **NI** and **NIB** subjects were integrated into a random room. In the treatment **NIB** subjects were all reassigned a single group identity upon integrating into a random room. First, their original index cards were taken back, then new index cards all marked in blue where randomly drawn from a deck. Subjects were told that they now all belonged to the 'Blue Group'.

2.5 Final Payoffs and Desired Outcome

Since a subject gains no additional monetary payoff [12] from contributing to any other subject **IG** or **CG**. This subject would have the final payoff function π:

[11] Non-integrated treatments: Base, CN
[12] Outside of 6 points.

$$\pi(\mathbf{c_i}, \mathbf{d_i}, \mathbf{g_i}, \mathbf{s_i}) = \mathbf{-4} \cdot \sum_{\mathbf{i}}^{\mathbf{10}} \mathbf{c_i} + \mathbf{6} \cdot \sum_{\mathbf{i}}^{\mathbf{10}} \mathbf{d_i} - \mathbf{4} \cdot \sum_{\mathbf{i}}^{\mathbf{10}} \mathbf{g_i} + \mathbf{6} \cdot \sum_{\mathbf{i}}^{\mathbf{10}} \mathbf{s_i} + \mathbf{200}$$

This payoff is maximized when $\sum_{\mathbf{i}}^{\mathbf{10}} \mathbf{c_i} = \sum_{\mathbf{i}}^{\mathbf{10}} \mathbf{d_i} = \mathbf{0}$. The following section will examine our results in attempting to increase contributions from Phaseii to Phaseiii. Our goal is to use different forms of integration, competition, and identity manipulation to move from our observed baseline model of $\sum_{\mathbf{i=1}}^{\mathbf{10}} \sum_{\mathbf{j=1}}^{\mathbf{10}} \mathbf{c_{ij}} < \sum_{\mathbf{j=1}}^{\mathbf{10}} \sum_{\mathbf{i=1}}^{\mathbf{10}} \mathbf{d_{ij}}$ to a desired increase in cooperation modeled by $\sum_{\mathbf{i=1}}^{\mathbf{10}} \sum_{\mathbf{j=1}}^{\mathbf{10}} \mathbf{c_{ij}} > \sum_{\mathbf{i=1}}^{\mathbf{10}} \sum_{\mathbf{j=1}}^{\mathbf{10}} \mathbf{d_{ij}}$[13].

[13] i indicates rounds in Phases i and ii while j indicates a distinct subject.

Chapter 3

Theoretical Outcome and Hypotheses

As with many experimental papers, we are interested how environmental aspects impact subjects' behavior. We will first explain the results economic theory predicts, then we will state our formal hypotheses, and explain the intuition behind our predictions.

3.1 Theoretical Outcome

As discussed in earlier sections, a subject should choose the **PSNE** 'Keep' every round in order to maximize their personal payoff. Also, as established in the literature, subjects are less likely to contribute in **CG** compared to **IG** interactions, so should we should expect to see decreased coordination in Phaseiii compared to Phaseii.

3.2 Hypotheses

The hypotheses are given as follows:

H1: In the baseline treatment, the proportion of contributed points will decrease from Phaseii to Phaseiii.

H2: In competitive treatments, the proportion of contributed points in Phaseii can be maintained in Phaseiii due to the effects of competitive prompts.

H3: In integrated treatments, the proportion of contributed points in Phaseii can be maintained in Phaseiii due to the effects of physical integration.

H4: In treatments subjected to both integration and competition, the proportion of contributed points will increase from Phaseii to Phaseiii due to the combined effect of competitive prompts and physical integration.

H5: Reassigning a common group identity to an integrated group has a significant effect on subjects' decision to contribute in Phaseiii.

Our belief is that naturally groups of people will be less likely to contribute to **CG** interactions than to **IG** interactions. However, we hypothesis that by exposing subjects to competitive environments and physical integration, subjects will choose to contribute more often in **CG** interactions. This could be due to subjects perceiving contributions as more valuable only after a group is labeled as 'Winners' for favoring contributions, the audience effect examined in our literature review, various other motives, or most likely some combination of the above.

Chapter 4

Results

We now report the summary statistics of the experiment, first in the aggregate, then by treatment. We will continue with a statistical report and analysis of the results.

4.1 Summary Statistics

4.1.1 Aggregate

Figure 1 displays the proportion of contributions made in Phases ii and iii across all 6 treatments and 180 subjects.

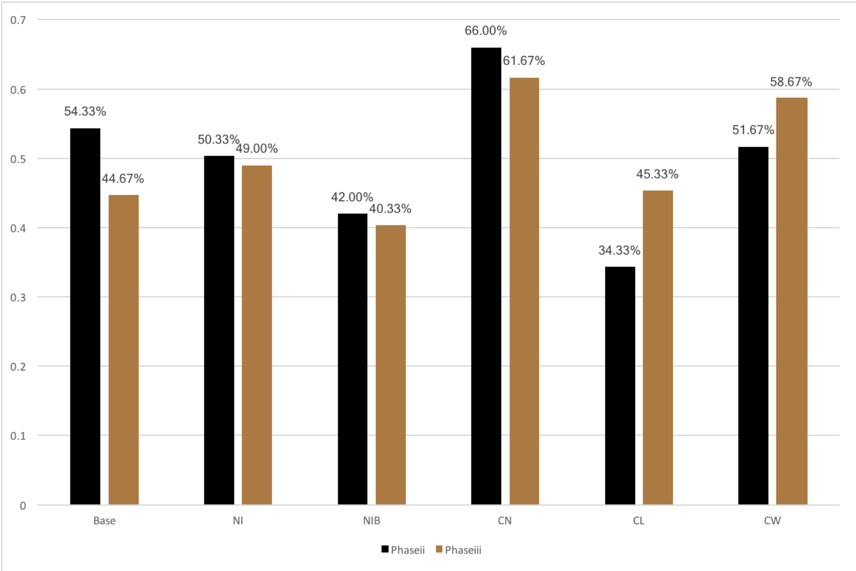


Figure 1. Proportion Of Contributions Made Across All Treatments

In the baseline treatment **(Base)** contributions rates are 54.33 % in Phaseii and 44.67 % in Phaseiii. In the Non-Competitive Integrated treatments subjects contributed 50.33% in Phaseii and 49.00% in Phaseiii in **NI**, and contributed 42.00% in Phaseii and 40.33% in Phaseiii for the treatment **NIB**. In competitive treatments, treatment **CN** had 66.00% contribution in Phaseii and 61.67% contribution in Phaseiii. In **CL** Phaseii contribution rates were 34.33% while Phaseiii contribution rates were 45.33%, finally **CW** saw contribution rates of 51.67% in Phaseii and 58.67% in Phaseiii. As one can see in the baseline treatment we fail to reject **H1** as we do see a decrease in contribution from Phaseii to Phaseiii. In treatments that involve either a competitive prompt or a physical integration [1] we see that

[1]NI, NIB, CN

while there is a decrease in the portion of cooperation from Phaseii to Phaseiii, the magnitude of this decrease has lessened. Therefore build reason to expect the failure to reject **H2** and **H3**. We can also see that in treatments subjected to both a competitive prompt and physically integration we observe an increase in contributions from Phaseii to Phaseiii, thus building evidence for our failure to reject **H4**. It is difficult to make a formal inference about **H5** by comparing **NI** and **NIB** so we will discuss this hypothesis in greater detail in the next section.

4.1.2 Baseline

Figure 2 shows the time series trend for the average number of contributions each round of the **Base** treatment.

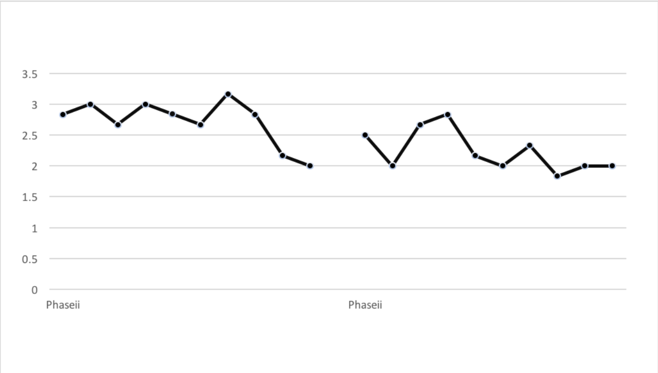


Figure 2. Average Number Of Contributions Per Round

As one can observe in Figure 2, subjects' contribution rates decrease over both Phaseii and Phaseiii. Average contribution rates start at a lower intercept in Phaseiii but finish at the same level of contributions as Phaseii.

4.1.3 Non-Competitive Integration (NI)

Figure 3 shows the time series trend for the average number of contributions each round of the **NI** treatment.

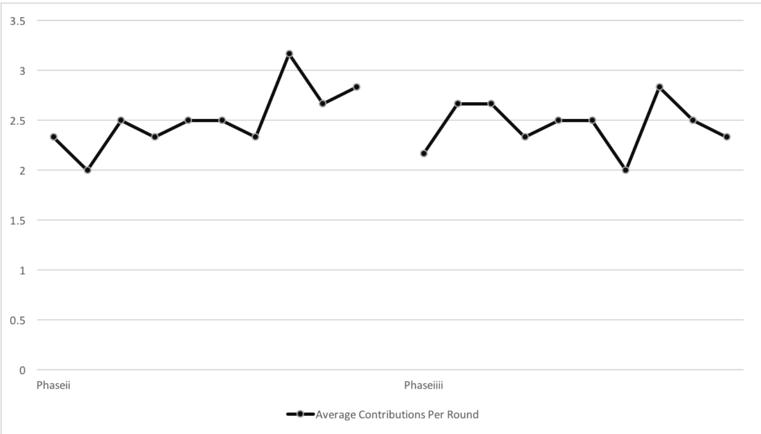


Figure 3. Average Number Of Contributions Per Round **NI**

In this treatment, average contribution rates rise over Phaseii and then drop to flatter rates in Phaseiii.

4.1.4 Non-Competitive Integration Blue (NIB)

Figure 4 shows the time series trend for the average number of contributions each round of the **NIB** treatment.

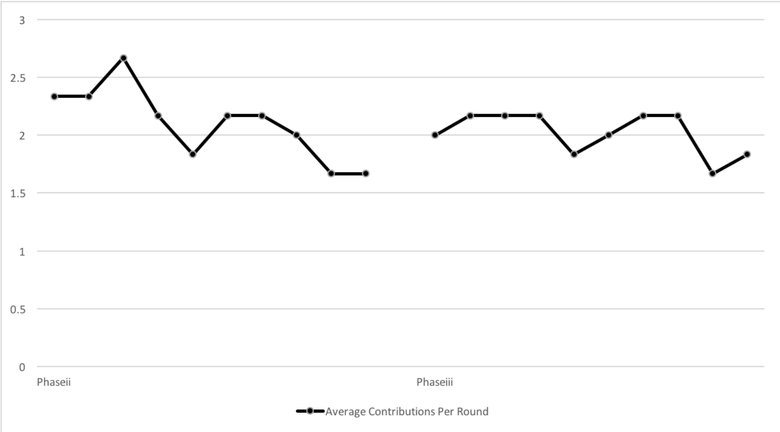


Figure 4. Average Number Of Contributions Per Round **NIB**

In this treatment with reassigned Phaseiii group identities we see a decrease in average contribution over Phaseii rounds, followed by farily stable average contributions over Phaseiii.

4.1.5 Competitive Non-Integration (CN)

Figure 5 shows the time series trend for the average number of contributions each round of the **CN** treatment with 'Winner' groups averaged in blue and 'Loser' groups averaged in Orange. While figure

6 shows the proportions of contributions made by ‘Winner’ groups against ‘Loser’ groups in Phases ii and iii.

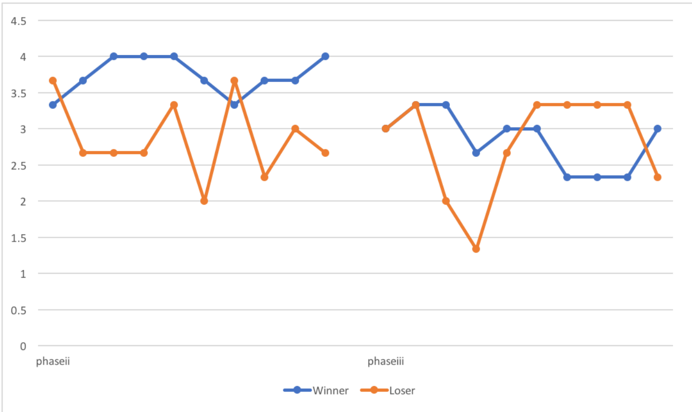


Figure 5. Average Number Of Contributions Per Round **CN**

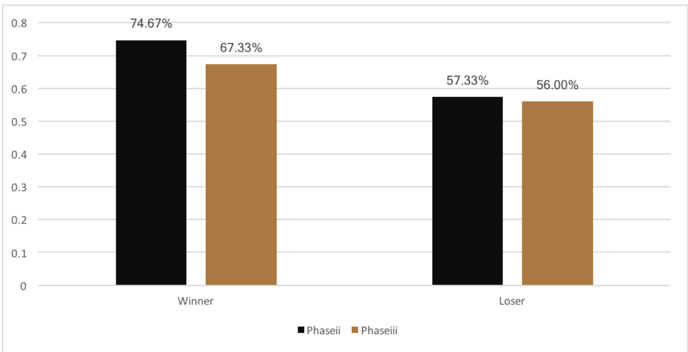


Figure 6. Proportions Of Contributions Made in Phaseii and Phaseiii **CN**

Figure 5 and Figure 6 explore the contribution rates in a Competitive Phaseii and a Non-Integrated Phaseiii, we note that ‘Winner’ Groups have higher overall contributions rates in both Phaseii and Phaseiii but decrease their average contributions upon integration. ‘Loser’

Groups have lower average contribution rates, but have a lessened decrease in coordination from Phaseii to Phaseiii.

4.1.6 Competitive Winners' Room Integration (CW)

Figure 7 shows the time series trend for the average number of contributions each round of the **CW** treatment with 'Winner' groups averaged in blue and 'Loser' groups averaged in Orange. While figure 8 shows the proportions of contributions made by 'Winner' groups against 'Loser' groups in Phases ii and iii.

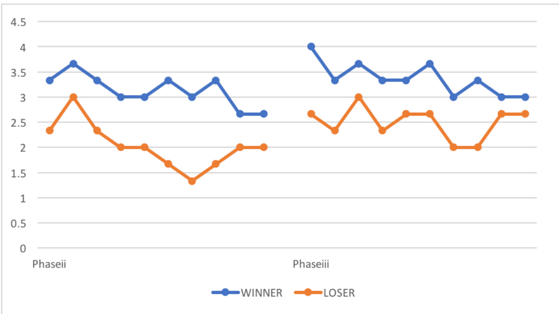


Figure 7. Average Number Of Contributions Per Round **CW**

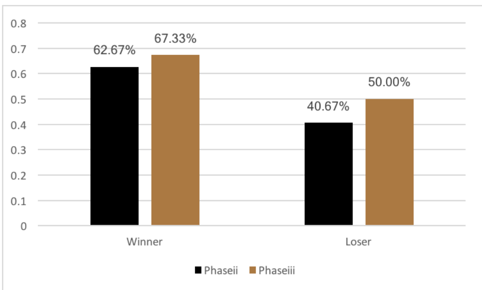


Figure 8. Proportions Of Contributions Made in Phaseii and Phaseiii **CW**

In Figures 7 and Figure 8 we observe higher overall contribution rates from 'Winner' Groups in Phaseiii [2] ,but see an increased portion of contributions from both the 'Winners' and the 'Losers' moving from Phaseii to Phaseiii.

4.1.7 Competitive Losers' Room Integration (CL)

Figure 9 shows the time series trend for the average number of contributions each round of the **CL** treatment with 'Winner' groups averaged in blue and 'Loser' groups averaged in Orange. While figure 10 shows the proportions of contributions made by 'Winner' groups against 'Loser' groups in Phases ii and iii.

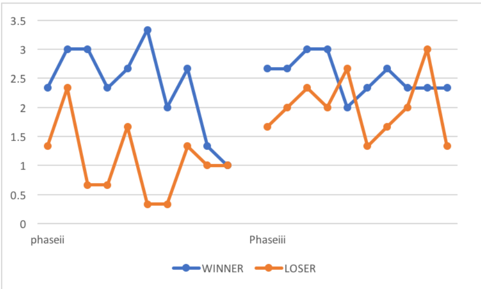


Figure 9. Average Number Of Contributions Per Round **CL**

[2] Higher contribution rates in Phaseii were what assigned them as 'Winners'.

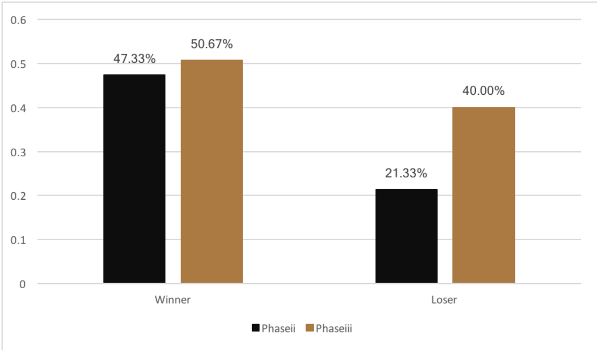


Figure 10. Proportions Of Contributions Made in Phaseii and Phaseiii **CL**

In Figure 9 and Figure 10 we observe higher overall contribution rates from 'Winner' Groups in Phaseiii, but note an increased portion of contributions from both the 'Winners' and the 'Losers' moving from Phaseii to Phaseiii.

4.1.8 Averaged Non-Competitive and Competitive Treatments

Figure 11 shows the time series trend for the average number of contributions pre round in Phaseii across all Non-Competitive treatments. Figure 12 shows the time series trend for the average number of contributions pre round in Phaseii across all Competitive treatments with 'Winner' groups averaged in blue and 'Loser' groups averaged in Orange.

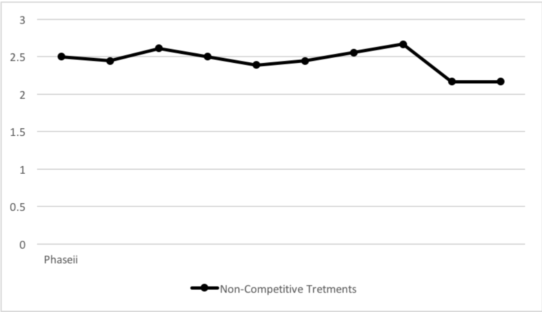


Figure 11. Average Number of Contributions Per Round In Phaseii

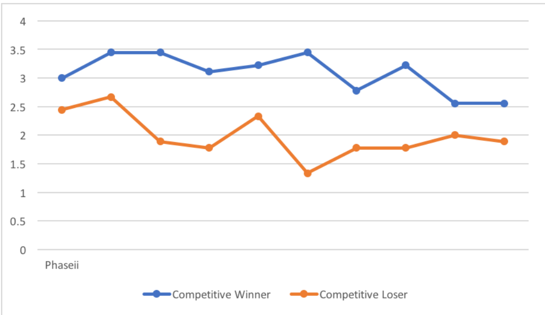


Figure 12. Average Number of Contributions Per Round in Phaseii

The above figures show that on average, in Phaseii, both Competitive and Non-Competitive groups slightly decrease their cooperation throughout the phase.

4.2 Summaries Of Statistical Analysis

The following section summarizes the regression analysis[3] and statistical tests [4] done in attempt to better understand the data displayed in the charts above and isolate the effects of the explanatory variables: Competition, Integration, Identity Reassignment, and the competitive identifier of 'Winners'.

4.2.1 Competition and Integration

In this section we will address hypotheses **H2** and **H3** through use of statistical tests and regression analysis on both the aggregate data and as treatments compared to the the Baseline.

First we consider the effects of Competition, Table 4.1 summarizes the results of the following linear model: [5]

$$P_{iii} = \beta_0 + \beta_2 Pii + \beta_c Comp + \epsilon$$

TABLE 4.1: Linear Model 1

Linear Model 1					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
P_{ii}	.769	.051	15.13	0.000	.669, .870
Comp	.919	.367	2.50	0.013	.194, 1.643
cons	.705	.277	2.55	0.012	.159, 1.251

[3] All linear models use robust standard errors.

[4] All statistical tests were done using the statistical analysis program Stata with results rounded to 2 decimal places.

[5] See Appendix for complete description of variables and their abbreviations.

By conditioning on Phaseii we can see that $\beta c = 0.919$ and is significant with 5% confidence. This shows that given a Competitive Phaseii, subjects are likely to contribute approximately .919 more times in Phaseiii.

Now we consider the effects of Integration[6], Table 4.2 summarizes the results of the following linear model:

$$P_{iii} = \beta_0 + \beta_2 Pii + \beta_{ai} Int + \epsilon$$

TABLE 4.2: Linear Model 2

Linear Model 2					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
P_{ii}	.791	.051	15.50	0.000	.690, .892
AnyInt	.749	.399	1.88	0.062	-.039 1.538
cons	.557	.417	1.34	0.183	-.266, 1.38

By conditioning on Phaseii we can see that $\beta ai = .749$ and is significant with 10% confidence. This means that given an Integrated Phaseiii subjects are likely to choose to contribute approximately

[6] All forms of integration.

.749 more times in Phaseiii than observed in Non-Intagrated treatments.

The next linear model considers the model containing both a Competitive Phaseii and an Integrated Phaseiii. Table 4.3 summarizes the results of the individual effects of each explanatory variable in the model below:

$$P_{iii} = \beta_0 + \beta_2 Pii + \beta_c Comp + \beta_{ai} Int + \epsilon$$

Table 4.3: Linear Model 3

Linear Model 3					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
P_{ii}	.788	.051	15.60	0.000	.688, .888
Comp	.915	.365	2.51	0.013	.195, 1.636
AnyInt	.745	.393	1.89	0.060	-.031, 1.520
cons	.118	.374	0.31	0.753	-.621, .856

While our estimated coefficients and P-value has changed slightly from the Linear Models 1 and 2, we observe positive estimated coefficients for these variables with significant P-values. Therefore, we can conclude that both Integration and Competition have significant effects on contributions in Phaseiii. Through these regressions, and the evidence presented figures 1-6, we can conclude that contributions do not significantly decrease from Phaseii to Phaseiii in treatments **NI**, **NIB**, and **CN**. Thus, we fail to reject hypotheses **H2** and **H3**

The following regression considers the linear model with the interacting explanatory variable Competition*Integration[7]. Thus, we are able to observe the interactive effect of these two variables on Phaseiii contributions conditioning on Phaseii. Table 4.4 summarizes the estimated results of the following linear model:

$$P_{iii} = \beta_0 + \beta_2 Pii + \beta_1 Comp * Int + \epsilon$$

Table 4.4: Linear Model 4

Linear Model 4					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
P_{ii}	.790	.0499	15.84	0.000	.692, .889
CI	1.112	.390	2.85	0.005	.343, 1.881
cons	.689	.288	2.39	0.018	.121, 1.258

We can see that the interaction variable CI has an estimated coefficient of 1.112 conditioning on Phaseii and is significant at the 5%

[7] Competition*Integration is named CI in regression.

level. Thus, we fail to reject **H4** and conclude that through the combination of an Integrated Phaseiii and Competitive Phaseii we can increase the level of contributions between the two.

In the following analysis we will operate under the assumption that both Phaseii Competition and Phaseiii Integration have a significant effect on Phaseiii. To investigate future, we regress the effect of each treatment on Phaseiii contributions, conditioning Phaseii contributions. What we find with only 30 baseline observations and 30 observations from each other treatment, is that only one treatment has statistically significant effects on Phaseiii contributions. This treatment is **CL**, in which subjects experience a competitive Phaseii then integrate into the 'Loser' groups' room. These results can be compared to Figures 1, 10, and 11 from the pervious section. The results from the following linear model are summarized in Table 4.5:

$$P_{iii} = \beta_0 + \beta_2 Pii + \beta_{cl} CL + \epsilon$$

TABLE 4.5: Linear Model 5

Linear Model 5					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
P_{ii}	.825	.082	10.11	0.000	.662, .989
CL	1.717	.516	3.33	0.002	.683, 2.75
cons	. -.017	.367	-0.05	0.962	-.753, .718

We can see in Table 4.5 that the estimated coefficient on the **CL** is 1.717 and is significant at the 5% level. Therefore, compared to the baseline treatment, subjects are observed to contribute over 1.7 more rounds in Phaseiii conditioned on Phaseii. We feel confident asserting that this treatment was the most effective at increasing relative contributions from Phaseii to Phaseiii.

4.2.2 Identity Reassignment

The following linear model consists of treatments **NI** and **NIB**, in this regression we examine the impact of reassigning a common 'Blue Group' identity to subjects in Non-Competitive Integrated treatments. Table 4.6 summarizes the estimated the effect of this common identity on the Phaseiii contribution rates:

$$P_{iii} = \beta_0 + \beta_2 Pii + \beta_b BLUE + \epsilon$$

Table 4.6: Linear Model 6

Linear Model 6					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
P_{ii}	.889	.068	13.03	0.000	.752, 1.025
Blue	-.126	.519	-0.24	0.809	-1.166, .9138
cons	.427	.452	0.94	0.349	-.478, 1.331

We can plainly see in that in the above model the estimated coefficient on Blue is not statistically significant. Thus, we reject **H5** that reassigning a common group identity has a significant effect on Phaseiii contribution rates [8].

4.2.3 Competitive 'Winner'

The following section will consider what effect being a 'Winner' has on the change in subjects' behavior between Phaseii and Phaseiii. The variable 'Change'[9] used in the following statistical tests considers the difference between subjects' behavior in Phaseiii and Phaseii. If a subjects' coordination rates increased, this variable is positive and if coordination decreased, the variable is negative.

We ran numerous two sample t-tests[10] in attempt to find a variable or treatment where being a 'Winner' group had a significant effect on 'Change'. The t-test on all combined Competitive treatments resulted in no significant difference in the means of 'Change'. The only two sample t-test that detected a statistically significant difference

[8]Due to our small sample this test likely has very low power, however since we reject this hypothesis for NI treatments we are not compelled to add this reassignment to all other treatments.

[9]Variable 'Change'= Phaseiii-Phaseii

[10]T-tests were run to test that two sample 'Change' means were equal between 'Winner' groups and 'Loser' groups.

in the mean 'Change' was the test run on the **CL** treatments. The results of this t-test are summarized in table 4.7.

TABLE 4.7: Two Sample T-test With Equal Variances 1

Two Sample T-test With Equal Variances 1					
Group	Obs	Mean	Std. Err.	*Std.Dev*	95% conf int
Loser	.15	1.867	.584	2.264	.613, 3.120
Winner	.333	.592	-0.24	2.289	-.934, 1.601
combined	30	1.1	.432		-.169, 3.236

The above t-test tests the null hypothesis that mean(Loser)-mean(Winner)[11]=0 and can be rejected at the 10% level as it has a P-value of 0.076. We can therefore conclude, that in treatments with a competitive Phaseii and a Phaseiii that integrates into the 'Loser' groups' room we observe a difference in behavior based on whether subjects are a 'Winner' or 'Loser'. In our experiment the observed 'Change' was greater in 'Loser' groups than 'Winner' groups [12].

4.2.4 Beliefs

In this section we will briefly discuss how the beliefs elicited from subjects vary across our treatments.[13] In our initial statistical tests

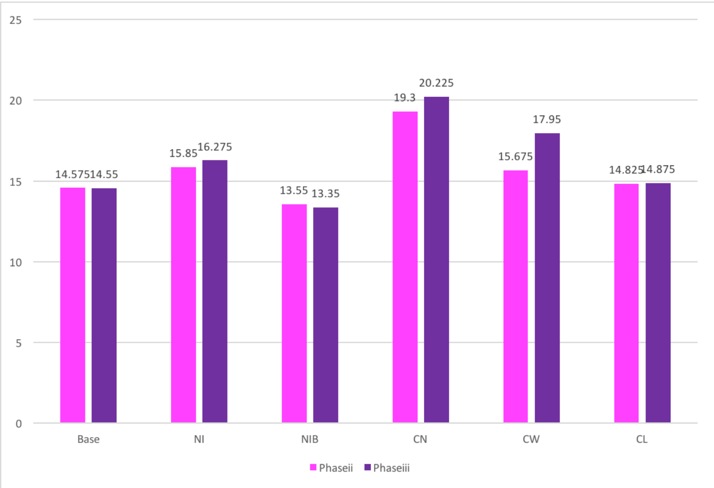
[11] mean(loser)=mean of 'Change' for 'Loser' groups.
[12] See Figure 11.
[13] We will not run a complete statistical analysis on these results as they are not the focus of this paper.

we did not find that the average believed contribution rate of group members had a statistically significant effect on Phaseii contributions. However, we did observe that for each additional time subjects believed all others contributed in Phaseiii, they chose to contributed .5 more times themselves.[14] The results from this model can be found in the Table 4.8 below.

TABLE 4.8: Linear Model 7

Linear Model 7					
P_{iii}	Coef.	Std. Err.	t	$p > \|t\|$	95% conf int
Avg. Contrib	.5001	.122	4.09	0.000	.259, .742
P_{ii}	589	.080	7.41	0.000	.432, .746
cons	-.643	.383	-1.68	0.095	-1.398, .112

The following Figure shows that believed Phaseii and Phaseiii contribution rate from the group subjects belonged to.



[14]Conditioning on Phaseii

Figure 13. Believed Proportion Of **IG** contributions

Figure 14 shows that believed Phaseii and Phaseiii contribution rate from the group subjects did not belonged to.

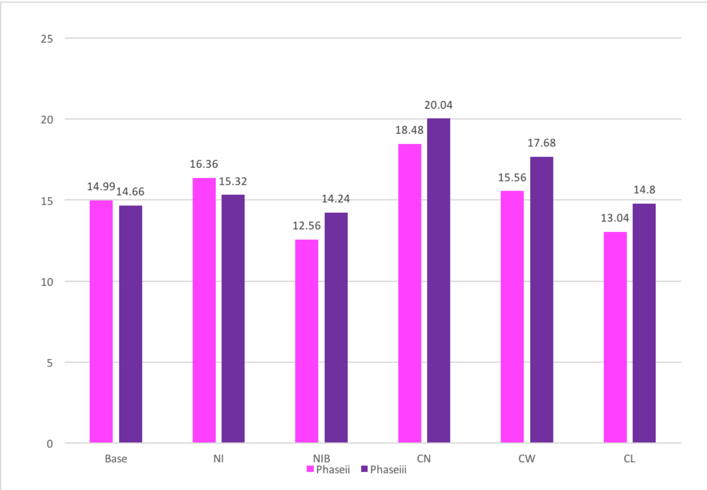


Figure 14. Believed Proportion Of **OG** contributions

We observe that subjects' beliefs are mostly consistent across the two phases. In the case where reported beliefs change between phases, results are likely due in part to subjects updating their beliefs in Competitive treatments upon being informed of a 'Winner' group.

Chapter 5

Conclusion

We experimentally examine the effects of Physical Integration, Competition, and Group Identity on near-minimal groups through two public good games. We hypothesize that while contribution rates are expected to fall when integrating groups, we can use combinations of the three mentioned explanatory variables to sustain or increase contributions after the integration. We use the observed contributions for **IG** and **CG** public good games to estimate the effects. The evidence suggests that while reassigning a common Group Identity may have no significant effect, Competition, and Physical Integration can each alone sustain contributions, while together even increase them. We also find that these effects differ in competitive treatments between the groups assigned the identities 'Loser' and 'Winner'. Specifically, 'Loser' groups are more prone to increase contributions when both groups are physically integrated into their original room.

Practices for sustaining contribution rates over integrations of distinct groups have applications in business, higher education, and beyond. This is especially true in a increasing global world and economy. For instance, consider an executive board of a successful firm that wishes to acquire another business. In order to maintain the efficiency of their employees and those which they are soon to acquire, should they focus their considerations on firms that they are currently competing with, or only firms from other industries? Another question is, if they are going to implement a transition team to acclimate newly acquired employees, should they implement the training in the home office or on site. Our paper offers the perspective that to maintain successful contributions by your employees a firm should chose to acquire a current competitor and if possible integrate current employees into the the acquired office instead of physically relocating the acquisition.

These practices are likely to vary across industry and circumstance however, we believe this paper takes the first step in addressing how to successfully increase the contribution rates of integrated groups.

Appendix A

Variables and Coefficients

Abbreviations

Abbreviation or Coefficient	Definition
P_{ii}	$Phase_{ii}$ Contribution
β_2	$Phaseii_{ii}$ Coefficient
P_{iii}	$Phase_{iii}$ Contribution
Comp	Indicator Variable For Competitive Treatment
β_c	Comp Coefficient
Int	Indicator Variable For Any Integrated Treatment
β_{ai}	Int Coefficient
ϵ	residuals
CL	Indicator Variable For **CL** treatment
β_{cl}	CL Coefficient
Blue	Indicator Variable For **NIB** treatment
β_b	Blue Coefficient

Appendix B

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