Essays on Salience in Coordination Games: Gender, Punishment and Communication

by

Zoë C. Bett

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School of Economics and Centre for Behavioural and Experimental Social Science
University of East Anglia
Norwich NR4 7TJ, UK

ZOE BETT
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Abstract

The issue of coordination is one that has received significant attention in the experimental literature. In this thesis I delve deeper into this by combining and exploring a number of issues from the literature in economics and the social sciences in the context of coordination games. More specifically in all three chapters a common theme of the examination of the efficiency-equality trade off in coordination games prevails. In the first chapter I take inspiration from Holm’s (2000) paper "Gender Based Focal Points" and look further into aspects of both the equity-efficiency trade off in coordination games and gender information. In the second chapter we combine elements of the coordination literature with the literature on the effects of punishment: Most previous investigations of punishment have concentrated on the effects of punishment when free riding is a possibility (for example Fehr & Gächter, 2000, Abbink et al., 2010) and here we are able to report results from an experiment where free riding is not a possibility. In the third chapter we investigate the effects of communication in coordination games. We take our initial inspiration from Cooper et al. (1990) and Farrell (1987) and expand on these papers by examining the effects of rich and free form communication between subjects and also expanding the type of games used in the experiment.

We find a number of interesting results which will be described in more detail with this thesis. In chapter one we find that an inefficient compromise very quickly loses its appeal to subjects as its inefficiency increases. We also find that unisex pairings are more successful in term of expected payoffs from coordination games as compared to mixed gender pairings. In chapter two we find that, whilst gender information and punishment do not tend to affect behaviour in isolation, the two treatment variables combined do lead to observed behavioural changes. We also find gender differences in punishment behaviours with males becoming more aggressive in punishment when playing against a male and males punishing more aggressively than females. In chapter three we find that payoff structure is highly relevant in how the availability of communication affects choices in the game. Through our novel experimental design we show that subjects will use an equitable split of earnings as a focal point for coordination rather than out of an intrinsic preference for an equitable split of earnings.

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Introduction

In day to day life we are often want or need to engage in behaviours which will allow us to coordinate our behaviour with others. In other words we are frequently required to consider the potential actions of others in an interactive situation before deciding on our own actions in order to ensure a successful outcome for ourselves and a another person. Coordination failure can therefore lead to frustrations if expectations are not met and, potentially, a loss of earnings (and more generally welfare) if an interaction proves unsuccessful due to coordination failure. Coordination is thus a very important aspect of economic life. The methods by which we achieve coordination in the real world can take a number of forms. For example, governments may be able to induce people to coordinate their behaviours through political regimes such as dictatorships in which people can be forced to conform to certain behaviours. A market economy can also induce people to coordinate their behaviours in order to gain successful outcomes. Alternatively, in a democratic political regime the government can use laws and sanctions to achieve desirable coordination outcomes (for example, the smoking ban in the UK). As an alternative to these sorts of methods, the concept of achieving desirable outcomes through "nudging" has also recently become popular in the political arena. In this form of behavioural incentivising, positive reinforcement and suggestion (rather than laws or the threat of punishment) are used to gain desired outcomes. For example a recent UK trail found that payment of court fines increased if debtors were sent a text reminder in which they were personally mentioned by name[1].

The study of coordination games in the economics literature has also led to the establishment of a number of key concepts on how we achieve successful coordination outcomes voluntarily without further encouragement, even in the presence of multiple equilibria. For example Schelling (1960) introduced the concept of the inherent salience in certain coordination outcomes. In "Schelling Salience" one equilibria in a coordination game becomes a focal point even in the absence of communication and advice due to its inherent qualities of seeming natural or distinct in some form, thus making a certain equilibria focal. Coordination can therefore be achieved through certain outcomes being focal but also via personal attributes of a co-participant. Stereotypes and assumptions which connect personal traits to certain types of behaviour may also allow people to use this information in order coordinate behaviours.

[1] As reported in the Cabinet Office Behavioural Insights Team report: *Applying behavioural insights to reduce fraud, error and debt.*
(Available at:
www.gov.uk/government/uploads/system/uploads/attachment_data/file/60539/BIT_FraudErrorDebt_accessible.pdf)

In this PhD thesis I contribute to the coordination literature by presenting three essays which are linked by a common thread of experimental investigations into differing elements of the trade-off between equality and efficiency in coordination games. The issue of a trade-off between equity and efficiency is one which I feel deserves further research for a number of reasons: I want to investigate if an equal outcome is focal when subjects attempt to tacitly (and non-tacitly) coordinate behaviour where there are a range of efficient outcomes, and also how focal this option becomes when it loses its property of efficiency as compared to an unequal outcome. In everyday life many strategic situations exhibit a conflict of interest together with different (perhaps inefficient) ways in which these situations can be resolved. In this paper we investigate different elements of games with an efficiency-equality trade-off as well as issues of tacit and non-tacit communication in this context. The issue of tacit coordination (in the absence of communication) is one that has received some attention in the economics literature previously: For example Bardsley et al. (2010), Blume & Gneezy (2010), Crawford et al. (2008), Holm (2000), Isoni et al. (2013), Mehta et al. (1994), and Schelling (1960) and in these papers it is found that subjects are often able to tacitly identify a focal point which will lead to successful coordination. I hope to be able to move beyond these findings in this thesis.

An experimental methodology is employed in all three chapters with each experiment being conducted in labs at the Centre of Experimental and Behavioural Social Science at the University of East Anglia using z-Tree software (Fischbacher, 2007). In each chapter a different, interesting and novel element of the efficiency-equality trade-off is examined. More specifically, all the experiments presented here use the battle of the sexes game framework (and/or adaptations thereof) in order to investigate a varied number of issues and factors relating to the trade-off between equality and efficiency. In general games used in these experiments take one of the following forms: First, the battle of the sexes game where, in order to achieve coordination, subjects must coordinate on an outcome which leaves one subject better off than the other. Second, the battle of the sexes game with the addition of an equitable split of earnings which is efficient (in terms of total monetary earnings available to a pairing) in comparison to coordinating on an unequal split of earnings. Third, a battle of the sexes game with the option of an equitable split of earnings that is inefficient in comparison to coordinating on an unequal split of earnings. Where I use this third type of game in this thesis it took two possible forms: One in which both subjects would receive less compared to what they would have received had they coordinated on an unequal outcome and one in which only one subject received less.

In the first chapter I examine the effects of gender information on behaviour. In this paper I also examine gender effects in interaction with the effects of decreasing the efficiency (in comparison to an unequal split of earnings) of an equitable coordination outcome. In the second chapter (joint with Dr. Subhasish Modak Chowdhury[2]) we present an experiment in which we continue to investigate elements of equality and efficiency in interaction with gender effects whilst further investigating the effects of (the threat of) punishment on behaviour in a repeated coordination game. In the third chapter (joint with Dr. Anders Poulsen[3]) we investigate the effects of communication in the equality-efficiency trade off and also further investigate this in conjunction with a study of how subjects react to both subjects in a pairings gaining from abandoning equality compared to how behaviour is affected when only one subject in the pairing can gain.

A number of common themes dominated the results found in the experiments. The first is that the appeal of an equitable amount can very easy be manipulated. Both efficiency and relative payoffs compared to an inequitable outcome often dramatically affect how subjects view and use equitable outcomes. We also find the counter-intuitive result that subjects are able to achieve higher monetary earnings if the gap between the equitable outcome and the inequitable outcome is higher if the inequitable split is kept constant and, that subjects are also able to achieve higher monetary earnings if the equitable amount is kept constant but the inequitable outcome is not "too" different from the equitable outcome.

In both of the jointly authored papers the majority of the contributions to the papers were made by me. In both I was wholly responsible for programming and running the experiments as well as for the majority of the writing of the papers, the co-authors providing advice and assistance where required.

[2] School of Economics, University of East Anglia, Centre for Behavioural and Experimental Social Sciences and the ESRC Centre for Competition Policy
[3] School of Economics, University of East Anglia and Centre for Behavioural and Experimental Social Sciences

Chapter 1: *Coordination and Gender: An Experiment*

Chapter 1 contains investigations of two main elements: The first is gender effects and the second is the effects of varying the degree of inefficiency in an equitable split of earnings. I therefore run two treatment conditions: The first in which subjects were unaware of their co-participant's gender (or any other information on their co-participant) and the second in which subjects were universally aware of their co-participant's gender. My treatments allow for both mixed gender and single gender subject pairings to be observed in all gender configurations. Both treatments are run using a variety of games which all took the basic form of a battle of the sexes type game (unequal split of earnings) with the addition of an equitable split of earnings. In the first game the equal split was efficient in comparison with the unequal split of earnings. In the remaining games the efficiency of the equal split of earnings was decreased in comparison to the unequal split of earnings. All subjects played all games (without feedback) regardless of the presence of gender information. This experiment thus employed a 2x1 factorial design.

I am able to obtain a number of interesting findings in this experiment: I find that unisex pairings are the most successful in achieving higher expected payoffs in the game with unisex pairings (i.e. males playing a coordination game with a male or females playing a coordination game with a female) achieving higher expected earnings than mixed gender pairings (i.e. pairings containing both a male and a female). I also provide an analysis of how decreases in efficiency act on the trade-off between equality and efficiency for subjects. I find that subjects do make trade-offs between equality and efficiency and, additionally, that even small decreases in efficiency often lead to subjects abandoning an inefficient equitable option.

Chapter 2: *Gender Identity and Punishment in Coordination Games*

In this second chapter the investigation of the trade-off between equality and efficiency continues. However, within this chapter, whilst we also investigate the effects of gender information on subject behaviour and outcomes, we also explore some elements in addition. In this chapter, in contrast to chapter 1 described above, we employ a repeated game design (with feedback) with subjects repeating the same game five times. Subjects exclusively played either a battle of the sexes type game or the adapted battle of the sexes game with the addition of an inefficient equitable split. We also included the ability to punish a co-participant after seeing their strategy choices as a treatment variable. Our experiment is thus a 2x2x2 factorial design with treatment variables on the availability of gender information, the availability of punishment and the form of the repeated game.

Our analysis is presented in two main parts. Due to the repeated nature of the games with feedback, we first provide an analysis of behaviour in the first period of game play only. This was because our period 1 observations provide as with the only truly independent observations in the game and are thus interesting in themselves. We then continue on to provide a dynamic analysis of the games over all five periods.

Again we are able to ascertain a number of interesting results. With regard to punishment we find that knowing a subject is male induces higher punishment rates than knowing a co-participant is female. We also find that knowing a co-participant is of the opposite gender leads to both the threat of punishment and the addition of gender information increases in equitable behaviours but that the presence of gender information is required in order to induce the effects of the availability of punishment and vice versa. We also find that game structure and payoffs are important in how the treatments variables affect behaviour.

Chapter 3: *Pre-Play Communication and the Efficiency-Equality Trade-Off in Coordination Situations: An Experiment*

In chapter 3 we further progress our investigation of the equality-efficiency trade off and concentrate our attention on the effects of cheap talk communication on behaviour is a variety of coordination game payoff structures. The experiment employs a simple 4x2 factorial design consisting of four game types and two communication "types" – free form pre-play communication or no communication. We begin our analysis with a simple battle of the sexes type game. We then continue with the analysis of two games which look at different elements of the equality-efficiency trade off: In our first game of this nature (as in the previous two chapters) we make the equitable split inefficient as compared to the unequal-battle of the sexes type split. Then, in the second game of this type, in order to investigate this trade off further, we reduce payoffs from coordinating on an unequal split of earning in the game in order to make the equal split only "weakly" Pareto dominated. Finally we wished to examine behaviour if we increase the monetary stakes available to subjects and hence the inequality between the payoffs upon coordination.

We present the results of this novel experiment and report some interesting findings: We find that game structure is very important in determining the effects of the availability of cheap talk communication. It is in the games where the unequal split Pareto dominates the equal split that we see the largest changes in behaviour between treatments with and without communication with the equal split proving highly focal in the games without communication and its use dropping off almost entirely when communication is available. In contrast we find that when the equitable split is only weakly Pareto dominated by the unequal split it retains its desirability to subjects both with and without communication. We conclude that subjects are only willing to abandon an equitable split of earnings if both parties could benefit from this. In an additional section of analysis we use coded conversation content from the experiment and analyse how conversations are affected by game structure. We are able to establish interesting differences in conversational and bargaining language and strategies between games.

Chapter 1

Coordination and Gender: An Experiment*

Zoë C. Bett

School of Economics, and Centre for Behavioural and Experimental Social Science,
University of East Anglia, Norwich NR4 7TJ, UK

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1. Introduction and motivations

In this first chapter, using an experimental methodology, I examine the effects of both own gender and a co-participant's gender (and both in combination) on behaviour in a series of coordination type games with differing payoff structures. My experimental design means that I provide insights into how own gender and a co-participant's gender influences behaviour in conflict and compromise situations, and subsequently how this affects outcomes in a coordination game.

With regard to gender, research remains relevant from a broader perspective since issues of gender related behaviour and outcomes are still prominent in everyday life. For example, it is well-documented in the popular news that there still exists a pay gap between males and females and that board membership is still dominated by males. I illustrate this in figures 1.1 and 1.2 below, which show, respectively, both that there was a persistent wage gap in the UK between males and females between 1997 and 2012 and that males are over-represented (proportionally, compared to the gender mix in the population) in directorships:

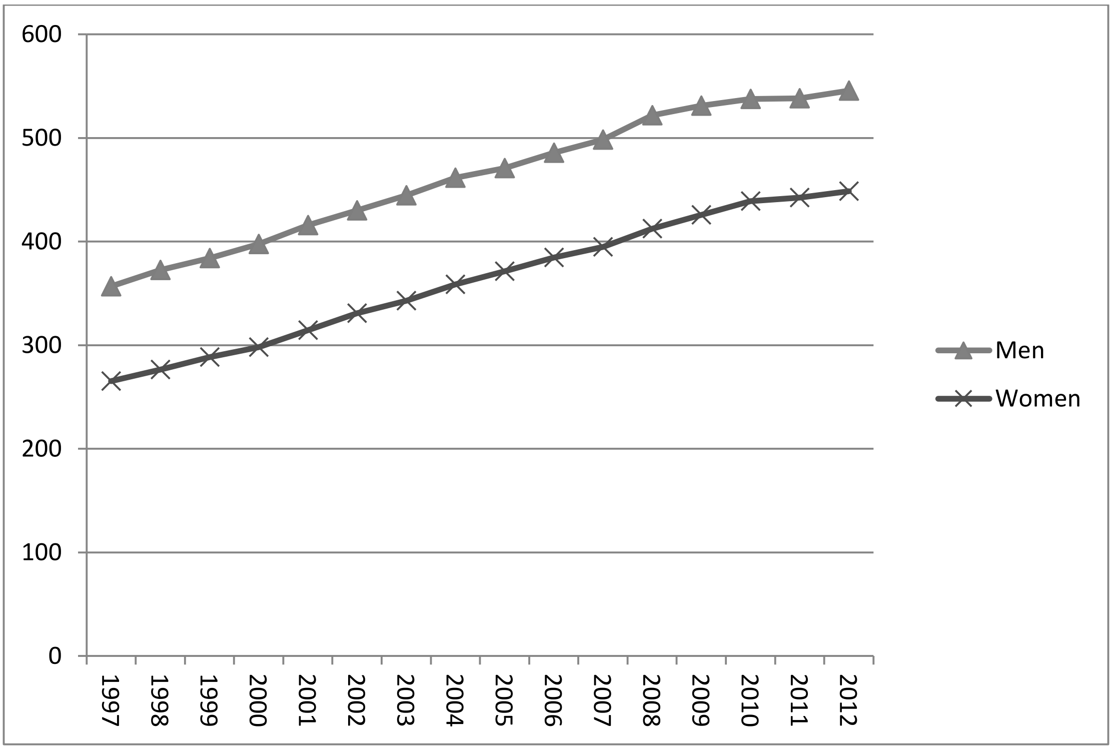

Figure 1.1. Median full-time gross weekly earnings (£) by sex, UK, April 1997 to 2012[4,5]

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[4] In 2004, 2006 and 2011 data collected for discontinuous and thus the measure reported here is an average of 2 measurements taken in each of those years.

[5] Data taken from "Patterns of Pay: Results from the Annual Survey of Hours and Earnings, 1997 to 2012" published by the Office for National Statistics.

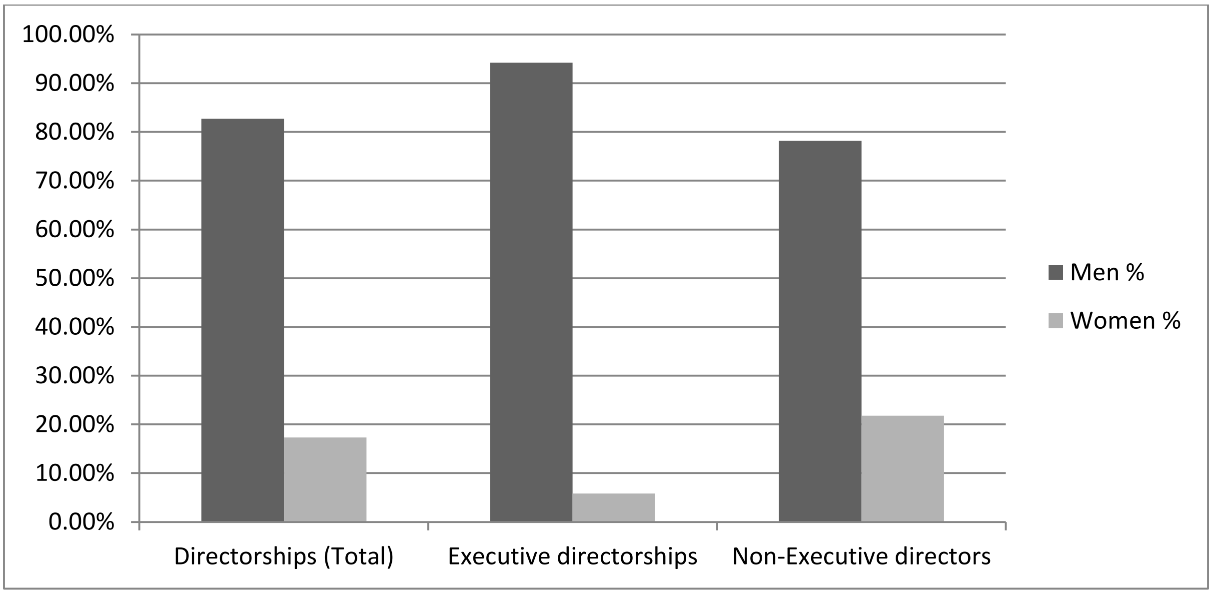

Figure 1.2. Board Membership in FTSE 100 Companies in 2013 by gender[6]

Further to evidence pointing to the importance of gender in society in general, there is also a body of experimental evidence which examines how gender affects behaviour in a lab setting and in particular in coordination games, and it is to this literature which I feel this chapter contributes. Successful coordination of behaviours can be an aim of everyday life and thus the ways in which we can achieve successful coordination are of interest. Schelling's 1960 work - *"The Strategy of Conflict"* - first presented the idea of focal points in coordination games and the concept has spawned a large body of literature on methods of coordination also in the context of gender. For example, in this chapter, Holm (2000) provides the initial framework and inspiration for the experimental methods and coordination games used. Whilst one of the coordination games used in Holm (2000) serves as a baseline treatment in this experiment I advance this game and adapt it so that further aspects of gender related behaviour, not investigated in the original Holm (2000) design, can be studied. Furthermore, whilst Holm ran his experiments in a series of lecture based sessions using a pencil-and-paper method to record and collect decisions, I use a computerised version programmed in z-Tree (Fischbacher, 2007). More specifically, a section of Holm's experiment is a coordination type game in which subjects are faced with a coordination problem (with an anonymous co-participant and without pre-play communication) similar to the standard battle of sexes type game but with the addition of an equitable split of earnings which sum to the same amount as available through coordination on an inequitable split of earning in the battle of the sexes portion of the game. In this experiment I look further into the focality of splitting money equally by reducing the sum of

[6] Data based on the Female FTSE Board Report 2013 (Cranfield University)

money which is available through coordination on an equitable split of money thereby investigating its appeal at different levels of comparative financial gain as compared to coordinating on the inequitable, battle of the sexes, portion of the game. In other words I investigate if the amount of money which can be gained from coordination on an equal outcome can be reduced to total less than the total amount available through coordination on an unequal outcome without altering its appeal to subjects. I will therefore sometimes label equal splits of this nature as inefficient in this paper due to their financial "inefficiency" as compared to coordinating on a battle of sexes portion of the game.

With regard to coordination games, past research offers a number of insights into how coordination behaviour is affected by various influences and payoff structures: In particular with regard to game structures, a good starting point for my exploration of coordination behaviours is the work of van Huyck et al. (1992) since they use some game structures which are similar to one of mine (a battle of the sexes game with an efficient equal split). However van Huycks' et al. line of investigation focuses on the effects of strategy advice from an anonymous arbitrator and if this kind of advice can "over-run" elements of focality (symmetric and efficient outcomes) in coordination games. They find that when subjects are choosing a strategy, they are more concerned with principles of symmetry and payoff dominance as opposed to an anonymous arbitrator's suggestion. Symmetry of payoffs is clearly an important property in subjects' decision making. Furthermore, the existing literature has, aside from a number of exceptions, only researched coordination game with an equal and efficient split of earnings. For example we can consider Nydegger & Owen (1974), Holm (2000), Roth & Malouf (1979), Mehta at al. (1992), Roth and Murnighan (1982), Roth (1995), Schelling (1960) and van Huyck et al. (1995). In this chapter I concentrate further on aspects of game structure (i.e. changes in symmetry and equality with regard to payoffs) in coordination games and therefore hope that this chapter will also contribute to this work. To my knowledge games of this nature have not been studied in depth in the previous literature and I therefore offer a substantial contribution to the literature. I therefore hope that this paper provides insights into the ways in which coordination and conflict situations are resolved and specifically how gender relates to this.

The paper will continue as follows: In section two below I examine the previous literature in the fields to which I feel this paper contributes, in section three I examine theoretical considerations in the experiment, in section four I present my experimental design, in section five I present my hypotheses, in section six I present the results and in section seven I end on a conclusion and final discussion.

2. Literature Review

2.1.Gender Related Behaviour

For the purpose of this literature review I first consider previous findings on the effects of one's own gender on behaviour. The treatment variable in this experiment was whether subjects are aware of the gender of a co-participant (or not) and therefore, where no gender information is given, these are the kinds of effects which are being examined in isolation.

To begin, these initial papers and studies have provided insights in the effects of own gender on behaviour but do not offer evidence of 'pure' gender effects since they are based on observation or case studies, and not on experimental findings where the information that a subject has on the personal attributes of a co-participant can be carefully controlled. Therefore the effects of own gender and another's gender on behaviour cannot be cleanly separated here. However they provide some very interesting and relevant insights. For example, it is striking that many disciplines have found that women are inherently disadvantaged in bargaining or competitive situations. Notably, Babcock & Laschever's (2007) seminal book described case studies in which they illustrate that females are disadvantaged in bargaining and negotiation situations because they are unwilling to express personal wants and similarly Tiger (2005) asserts that due to anthropological differences men are more competitive and consequently more eager to "dominate" than females. Likewise, Valian (1999) also claims that females *interpret equality as greed* (p.1051) since they feel less entitled than males. In addition Darwin (1874) famously proclaimed that there were evolutionary and biological influences on the difference between the genders and that females are more *coy* and less *eager* than their male counterparts (Darwin, 1874, p.194). In addition, Belot et al. (2012) find that gender, and not attractiveness, is important in how subjects share out a sum of money in a prisoner's dilemma type game at the end of a game show with females more likely to choose to split the money equally. Differing attitudes of genders for competition have also proved fruitful in pin pointing behavioural difference between males and females: For example, Gneezy & Rustichini (2004) find that competition is beneficial in terms of performance for school age boys but not for school age females.

I now look further into lab-based economic experiments which look closer, and in a more controlled environment, at how gender affects behaviour and, due to the nature of the methodology are able to offer us clearer insights into 'pure' gender effects. There are a number of different games and set-ups which have been examined in this context and they find mixed evidence with regard to gender differences in behaviour. For example in the dictator game Bolton & Katok (1995) find no gender differences in behaviour with regard to dictator behaviours. However, Eckel & Grossman (1998) find that females give away twice that of males in a dictator game in terms of initial endowment, suggesting that females are more generous than males: however, Andreoni & Vesterlund (2001) find that altruism is conditional based on the costs of doing so and that, consequently, females display more altruism than males when costs of being altruistic are higher but this reverses when the costs are lower. Generosity is clearly conditional! With regards to the examination of coordination games and gender, in a prisoner's dilemma type game Ortmann & Tichy (1999) find that females are significantly more cooperative than males in the first few rounds of a repeated game (as in the Belot et al., 2012 field study described above) but that these gender differences disappear as rounds progress. The same result, with regard to diminishing gender differences, is found by Cadsby & Maynes (1998) who find that, in a public goods game, females contribute more than males early on in the game but that these gender effects disappear as subjects move through repeated periods of the game. Similar to the non-experimental literature described above, with regard to differing competitive preferences between the genders, Niederle & Vesterlund (2007) conclude that there are gender differences with regards to preferences (but not ability) for entering into competitive situations with males being more willing to do so than females. Datta Gupta et al. (2013) also find females are more prone to avoiding competitive situations than males. Finally, Croson & Gneezy (2009) find that gender affects preferences for competition.

There is also a literature which goes beyond the ‘pure’ gender effects described above and additionally looks at how the gender of a co-participant (or whomever a subject is dealing with) affects behaviour. Since, one of the treatment variables in this experiment was to give subjects knowledge of a co-participant’s gender, this literature is of relevance to my investigation. The papers described below could therefore give us insights into how culturally based expectations or stereotypes related to gender are employed (successfully or not) in an economics experiment. The source of such expectations and stereotypes which subjects bring into the lab may be vast and multiple. However daily interactions and experiences within the society we live can help us to form these and learn about those which are already present (whether we use choose to use these in our judgements or not). Whilst not everyone may support or advocate the gender norms which exist with our society, in a lab setting, if they are commonly known to exist in some form then subjects may be able to “use” them to inform their decision making processes. Therefore a certain equilibria or action may become salient in an experiment in a fashion that could be described as “self-fulfilling”. The concept of contextual information about a co-participant creating focal points in a game was one introduced by Schelling (1960). In the context of gender this would imply that a particular outcome in a game becomes salient or focal due to knowledge of the gender of co-participant (in Schelling's work this was common knowledge that everyone in a game was familiar with New York's landmarks in order to coordinate on a meeting place). The presence of these kinds of focal points was also more formally investigated by Mehta et al. (1994) who find that subjects are far more able to coordinate on common answers to a question than would be predicted. That is, they find that, when subjects are asked to attempt coordination of their answers to a question with a co-participant, coordination rates are much higher than if they were asked to pick an answer at random, showing that subjects are capable of using some form of coordination device in order to employ aspects of focality, rather than random picking, in order to coordinate their answers at a higher level than might be expected if focality was not considered.

In this experiment I seek to investigate if similar commonly known information relating to a co-participant (in this case gender) can have an effect akin to this. I aim to see if information about a co-participant's gender will affect behaviour and coordination outcomes and if expectations or stereotypes such as those described above exist in the context of gender and within the framework of this experimental design. For a further discussion of stereotypes, labels and norms see for example Bowles & McGinn, 2002, Cadsby et al., 2007, Pickering, 2001, Moncrieffe & Eyben, 2007.

To return to more specific examples of studies which examine both the effects of own gender and a co-participant's gender, a number of papers have found that subjects in an experimental lab setting do behave differently depending on if their co-participant is known to them. For example, Holm (2000) finds that use of a hawkish (or aggressive) strategy is more common towards females than males in a battle of the sexes type game. Experiments using ultimatum and dictator games also offer interesting insights into distributional preferences dependent on co-participant gender. For example, using a simple ultimatum game, Solnick (2001) find that knowing a co-participant is male increases offers made compared to knowing a co-participant is female. However Slonim & Garbarino (2007) found that subjects prefer to donate to females if given the choice and that females also sent more than males using a adapted version of the dictator game (amounts sent were tripled) and a simple trust game. Similarly Holm (2005) finds that females receive more offers in both ultimatum and dictator games when the gender of a co-participant could be chosen by the subject making the offer. Aguiar et al. (2009) also find that behavioural expectations are different for males and females in a dictator game with females expecting females to be more generous than males whilst males having no such pre-conceived expectations. Also, in a dictator game Cadsby et al. (2010) find that unisex female groupings donate more than half of an endowment significantly more often than unisex male groupings. Dufwenberg & Muren (2006) conclude that the gender composition of groups affects dictator game behaviour and that subjects are more generous towards females than males and, that females are significantly more likely to send nothing than males. Using the ultimatum game Hannagan & Larimer (2010) find that females are more likely than males to suggest an equitable distribution of the endowment. With regards to competition, Ivanova-Stenzel & Kübler (2011) found that all female teams were most successful in competition against all male teams and that males are most successful if females are present in their teams.

3. Theory and Background

In this section I discuss the theoretical underpinnings of this experiment. This section also introduces the games used in the experiment.

3.1. The Battle of the Sexes Game and Focal Points

As all my games contain the following battle of the sexes structure I first examine this structure in isolation and in more extensive detail here. For that reason, and although this game is not used in isolation in this experiment, it will provide context to the games I do use. As is often standard in this type of game a strategy of choosing the higher amount for oneself is labelled as "hawkish" whilst a strategy of choosing the lower amount for oneself is labelled as "dovish". I will continue to use this terminology throughout the paper.

A standard battle of the sexes type game is shown below in Table 3.1.1[7]. As per all standard coordination type games mis-coordination leads to zero earnings in the game:

[7] The battle of the sexes game is also illustrated in, for example, Luce & Raiffa (1957)

Table 3.1.1. The Battle of the Sexes matrix

		Player 2	
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(x, y)
	Strategy 2 (Dovish)	(y, x)	(0, 0)

Where it is assumed that $x>y>0$

This type of game has also been described as a *classic "mixed-motive" game*. (Camerer & Fehr, 2004, p.89) since, whilst coordination on a certain outcome is preferable to not (since mis-coordination leads to zero earnings), coordination is difficult to achieve here since one person must leave the game with - financially speaking - more than the other. The problem is also further exacerbated by the fact that subjects are assumed to have no opportunity to communicate before making decisions. However, the ease with which this type of "mixed-motive" problem is solved (i.e. coordination is achieved) could be affected if there exist commonly held conventions about which strategies (and resulting coordination outcomes) are more acceptable – with regard to gender in the case of this experiment – as was described above. Additionally these types of conventions could potentially lead to economic gains for those in possession of gender information about a co-participant if they aid coordination and thus diminish mis-coordinating behaviours. The coordination problem with which subjects are faced in this study is also particularly interesting since Crawford et al. (2008) have shown that, as the title of their paper proclaims, *"even minute payoff asymmetry may yield large coordination failures"*.

The battle of the sexes game has two pure strategy Nash equilibria (from here on in "PSNE") i.e. at {Strategy 1, Strategy 2} and at {Strategy 2, Strategy 1}. These equilibria can also be described as {Hawkish, Dovish} and {Dovish, Hawkish} respectively as is common practice in the battle of the sexes game. Whilst neither of these equilibria dominates the other as discussed above, the introduction of gender information for both subjects (i.e. making gender common knowledge) may make one of the equilibrium more salient than the other.

Naturally, there is a mixed strategy Nash equilibrium (from here on in "MSNE") for this game. Here I calculate the mixed equilibrium for the values of x and y used in this experiment: In my experiment *x* is equal 30 and *y* is equal to 20[8].

Table 3.1.2. The Battle of the Sexes matrix with payoffs

		Player 2	
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(30, 20)
	Strategy 2 (Dovish)	(20, 30)	(0, 0)

The MSNE is calculated in the appendix where it is shown that each subject chooses a hawkish strategy with probability $\frac{3}{5}$, and a dovish strategy with probability $\frac{2}{5}$ in the MSNE. In this case each subject has expected payoffs of 12. We therefore notice that the payoffs available from playing the MSNE are naturally less than those available through coordination on one of the PSNE. It can therefore logically be conceived that the introduction of gender labels, together with the presence of expectations of behaviour which relate to gender, would lead to higher payoffs for subjects.

3.2. The Games: Equal Split Game and the Compromise Option Games

Having described the battle of the sexes as the basis of all my games I now describe the specific games used in the experiment. The experiment involved four games all of which were identically used in all sessions and treatments and, as previously described, all took the form of a battle of the sexes type game with the addition of an option to coordinate on an equal split of resources.

The first of the games used in this experiment - The Equal Split Game - allowed subjects the option of coordination on an equitable outcome where the financial gains

[8] These point amounts were selected because they equate to the same percentage difference in payoffs between x and y as that in Holm (2000). Whilst payoffs were presented in Swedish Krona (SEK) in Holm (2000) and were 200 and 300 I felt that in my experiment (and since experimental currency as opposed to monetary amounts were presented in the experiment) subjects would be better able to calculate final monetary payoff amounts if points were divided through 10.

available from this outcome summed to an amount equal to the amount available from coordination on the unequal (Battle of the Sexes Type) portion of the game (as illustrated by the condition below that *(x+y) = (z+z)*).

Table 3.2.1. The Equal Split Game

		Player 2		
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)	Strategy 3 (Equal)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(x, y)	(0, 0)
	Strategy 2 (Dovish)	(y, x)	(0, 0)	(0, 0)
	Strategy 3 (Equal)	(0, 0)	(0, 0)	(z, z)

Where $x>z>y>0$ and $x+y = z+z$

That is, in this case the sum (i.e. to both player 1 and player 2 combined) of the payoffs available is the same whether the players coordinate on the battle of the sexes portion of the game - {Strategy 1, Strategy 2} or {Strategy 2, Strategy 1} - or if they coordinate on the equal split. The equal split here can thus be described as efficient. This game is similar to those used by Holm (2000) and van Huyck et al. (1992). More specifically the game took the following form in the experiment with regards to payoffs:

Table 3.2.2. The Equal Split Game with payoffs

		Player 2		
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)	Strategy 3 (Equal)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(30, 20)	(0, 0)
	Strategy 2 (Dovish)	(20, 30)	(0, 0)	(0, 0)
	Strategy 3 (Equal)	(0, 0)	(0, 0)	(25, 25)

Following the same theoretical analysis as conducted above, this game has three PSNE at {Strategy 1, Strategy 2}, {Strategy 2, Strategy 1} and {Strategy 3, Strategy 3}. In this game there is also a MSNE where strategy 1 (Hawkish) is played with probability $\frac{15}{37}$, strategy 2 (Dovish) is played with probability $\frac{10}{37}$, and strategy 3 (Equal) with probability $\frac{12}{37}$. The expected payoff from playing the MSNE is $8\frac{4}{37}$. Finally there exists an MSNE where player 1 mixes between a strategy of choosing hawkish and equal and player 2 mixes between dovish and equal (or vice versa). In this case player 1 plays hawkish with probability $\frac{5}{9}$ and equal with probability $\frac{4}{9}$ and player 2 plays dovish with probability $\frac{5}{11}$ and equal with probability $\frac{6}{11}$. The expected payoff from playing the MSNE is $13\frac{7}{11}$ for player 1 and $11\frac{1}{9}$ for player 2. Full detailed calculations of MSNEs are provided in the appendix.

I now introduce a key element of this research which will be described as the "compromise option" for the remainder of this chapter. This is shown in table 3.2.3 below:

Table 3.2.3. The Compromise Option

		Player 2		
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)	Strategy 3 (Compromise)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(x, y)	(0, 0)
	Strategy 2 (Dovish)	(y, x)	(0, 0)	(0, 0)
	Strategy 3 (Compromise)	(0, 0)	(0, 0)	(z, z)

Where $x>y>z>0$ and thus $(x+y)> (z+z)$

It can easily be seen that the non-shaded section of the game described in table 3.2.3 above is the same as the standard battle of the sexes game described in the previous section. The compromise option can be seen in the shaded area and is described by {Strategy 3, Strategy 3}. This inefficient compromise adds a strategy option to the game which could potentially lead to coordination on an equitable and symmetric outcome but that leads to combined earnings which are less than could potentially have been achieved if coordination had been achieved on an asymmetric "battle of the sexes" outcome (since $(x+y)>(z+z)$). With the addition of this option subjects can now potentially coordinate on an outcome which offers Pareto inferior (as compared to the unequal battle of the sexes type payoffs) but equal payoffs for both subjects. However the inherent potential unattractiveness of the inefficiency in this outcome could be counteracted by the fact that it does lead to an equitable split of earnings: this could greatly increase the desirability of this outcome if inequality is something subjects find intrinsically undesirable. I refer specially to Camerer & Fehr (2004):

> *"People who dislike inequality are willing to take costly actions to reduce inequality, although this may result in a net reduction in their material payoff"* (p.56)

Consequently, in order to further test the ability and willingness of subjects to coordinate on an equitable outcome I also decrease the efficiency of the equitable payoff in comparison to that available in the equal split game described above. That is, using the notation from above, by further increasing the difference between $x+y$ and $z+z$. This is shown more explicitly, with regards to specific payoffs used in the experiment, in the tables which follow below: .

First let us consider the "High Compromise Game". Coordinating on {Strategy 3, Strategy 3} in the High Compromise Game (table 3.2.4) gave payoffs of 15 points per subject in a pairing. Payoffs of 15 points were chosen because, in comparison to the efficient 25 point payoff in the Equal Split Game, I felt that it was high enough that subjects would still consider it as an attractive and viable strategy choice but still sufficiently low that the inherent inefficiency in this outcome would be evident to subjects. Now let use consider the "Medium Compromise Game" where payoffs from the compromise option are reduced to 12 points per subject (table 3.2.5). Finally in the "Low Compromise Game" payoffs from the compromise option are reduced to 5 points per subject (table 3.2.6). As such, coordinating on the high, medium or low compromise options leads to substantial 40%, 52% and 80% reductions in combined total earnings respectively as compared to coordinating on either {Strategy 1, Strategy 2} or {Strategy 2, Strategy 1}.

As can easily be calculated, each of the three games below has three PSNE at {Strategy 1, Strategy 2}, {Strategy 2, Strategy 1} and {Strategy 3, Strategy 3}. I report the MSNE below each game below. Again, these calculations are provided in more detail in the appendix.

Table 3.2.4. The High Compromise Game

		Player 2		
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)	Strategy 3 (Compromise)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(30, 20)	(0, 0)
	Strategy 2 (Dovish)	(20, 30)	(0, 0)	(0, 0)
	Strategy 3 (Compromise)	(0, 0)	(0, 0)	(15,15)

In the High Compromise Game there is a MSNE where strategy 1 (hawkish) is played with probability $\frac{1}{3}$, strategy 2 (dovish) is played with probability $\frac{2}{9}$, and strategy 3 (compromise) with probability $\frac{4}{9}$. The expected payoff from playing the MSNE is $6\frac{2}{3}$. Finally there exists an MSNE where player 1 mixes between a strategy of choosing hawkish and equal and player 2 mixes between dovish and equal (and vice versa). In this case player 1 plays hawkish with probability $\frac{3}{7}$ and equal with probability $\frac{4}{7}$ and player 2 plays dovish with probability $\frac{1}{3}$ and equal with probability $\frac{2}{3}$. The expected payoff from playing the MSNE is 10 for player 1 and $8\frac{12}{21}$ for player 2.

Table 3.2.5. The Medium Compromise Game

		Player 2		
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)	Strategy 3 (Compromise)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(30, 20)	(0, 0)
	Strategy 2 (Dovish)	(20, 30)	(0, 0)	(0, 0)
	Strategy 3 (Compromise)	(0, 0)	(0, 0)	(12,12)

In the Medium Compromise Game there is a MSNE where strategy 1 (hawkish) is played with probability $\frac{3}{10}$, strategy 2 (dovish) is played with probability $\frac{1}{5}$, and strategy 3 (compromise) with probability $\frac{1}{2}$. The expected payoff from playing this MSNE is 6. Finally there exists an MSNE where player 1 mixes between a strategy of choosing hawkish and equal and player 2 mixes between dovish and equal (and vice versa). In this case player 1 plays hawkish with probability $\frac{3}{8}$ and equal with probability $\frac{5}{8}$ and player 2 plays dovish with probability $\frac{6}{21}$ and equal with probability $\frac{15}{21}$. The expected payoff from playing the MSNE is $8\frac{12}{21}$ for player 1 and $7\frac{1}{2}$ for player 2.

Table 3.2.6. The Low Compromise Game

		Player 2		
		Strategy 1 (Hawkish)	Strategy 2 (Dovish)	Strategy 3 (Compromise)
Player 1	Strategy 1 (Hawkish)	(0, 0)	(30, 20)	(0, 0)
	Strategy 2 (Dovish)	(20, 30)	(0, 0)	(0, 0)
	Strategy 3 (Compromise)	(0, 0)	(0, 0)	(5, 5)

In the Low Compromise Game there is a MSNE where strategy 1 (hawkish) is played with probability $\frac{3}{17}$, strategy 2 (dovish) is played with probability $\frac{2}{17}$, and strategy 3 with probability $\frac{12}{17}$. The expected payoff from playing the MSNE is $3\frac{9}{17}$. Finally there exists an MSNE where player 1 mixes between a strategy of choosing hawkish and equal and player 2 mixes between dovish and equal. In this case player 1 plays hawkish with probability $\frac{1}{5}$ and equal with probability $\frac{4}{5}$ and player 2 plays dovish with probability $\frac{1}{7}$ and equal with probability $\frac{6}{7}$. The expected payoff from playing the MSNE is $4\frac{2}{7}$ for player 1 and 4 for player 2.

These values were also chosen to allow the compromise option in the Medium Compromise Game to correspond to the expected payoffs available from playing the MSNE if only the battle of the sexes game without a compromise option was considered (this was calculated in the previous section). Thus, if behaviour is well described by the MSNE we would not expect subjects to try to coordinate anymore often on the asymmetric part of the matrix (as described by Strategies 1 and 2) as on the compromise option part of it (as described by Strategy 3) in the Medium Compromise Game since the expected payoff from both is the same.

4. Experimental Design

The experiment was conducted at the University of East Anglia using facilities provided by the Centre for Behavioural and Experimental Social Science (CBESS)[9]. As has become

[9] http://www.uea.ac.uk/cbess

standard for economic experiments the experiment was computerised using z-Tree (Fischbacher, 2007). I employed an experimental methodology since it allows an effective and simple method to examine the effects of gender in isolation as also described in the review of previous experimental literature above.

4.1. Subjects

Subjects were recruited via the University's ORSEE (Greiner, 2004) system and a total of 176 subjects (all of whom were students at the University) participated in the experiment[10]. Subjects were only told that they would be taking part in a decision-making experiment and were at no point told that the experiment related to gender effects. I did this in order to circumvent any possible experimental demand effects which could influence subject behaviour. Zizzo (2010) provides a more detailed discussion of experimenter demand effects which I do not include here.

Subjects were randomly seated in a partitioned computer lab. They were provided with paper instructions which were read aloud at the beginning of the experiment. Questions were then answered publicly. After this the experiment began on the computer screens. Instructions are loosely based on the original translation from the Swedish provided in Holm (2000). However some changes were made in order to ensure that there was full comprehension of experimental procedures and in order to fit the instructions and games into a computerised setting.

4.2. Treatments

I conducted two treatments: As described above, the first was conducted without providing subjects with information about their co-participant's gender (or any other information on a co-participant) whilst the other was conducted with subjects receiving information on a co-participant’s gender. My experimental design ensured that, in the latter treatment, only information on the gender of a co-participant was available to subjects. Here, the key element of the investigation is gender information and as such I took great care to introduce this information to subjects in isolation from any other information about a co-participant in the

[10] Psychology students were omitted during recruitment (via email) as we suspected that, the kind of gender revelation process used here may have been familiar with students who had studied psychology literature. (See, for example, Friedman & Sunder, 1994, p.39 for a more in-depth discussion)

appropriate treatments so that any gender effects were not "muddied". The methods used for this will be described in more detail in the following section.

In total 82 subjects took part in the treatment without gender labels (NGL) and 94 subjects took part in the treatment with gender labels (GL). This is illustrated in table 4.2.1 below:

Table 4.2.1. Treatment Conditions and Subject Numbers

without gender information	with gender information
NGL (n = 82)	GL (n = 94)

In the GL treatment it was essential that all gender configurations were collected (i.e. males playing against a males, females playing against females, males playing against females and females playing against males) so that data could be gathered on all possible pairing types. As per Holm (2000) these are labelled as MM, FF, MF and FM respectively throughout this chapter. From the perspective of observations, I therefore collect, for each male pair (MM) two males each playing against another male; for each male/female pair (MF/ FM) one female each playing against a male and one male playing against a female, and for each female pair (FF) two females each playing against another female. Consequently from each pair of subjects I glean two observations. Subject pairings were made randomly by the computer and therefore subjects were not given the opportunity to select if they wanted to play a male or female in the game. Subject pairings remained fixed throughout all the games and subjects were aware of this. Subjects played all four games without feedback and in the same order in order to keep observations independent and to aid statistical analysis. Subjects could achieve experimental earnings of up to £7.20 or 120 experimental points with each point being worth 6p in monetary earnings.

4.2.The Gender Revelation Procedure

The gender revelation procedure describes the process by which information about the gender of a co-participant is transmitted to subjects. Similar to Holm (2000) and Datta Gupta et al. (2013)[11] I decided that this information should be conveyed to subjects by way of fictitious names. In line with the original inspiration for this paper, this method was used by Holm (2000). Subjects were made aware that the names were indeed fictitious and did not relate to the subject in any way apart from that female names had to been assigned to

[11] Fershtman & Gneezy (2001) also use names to introduce information about both ethnic origin and gender. However real names were used in their experiment.

female co-participants and male names to male co-participants[12]. As can be seen from the instructions which are presented in the appendix I also informed subjects of this in language that was designed to make the introduction of these “names” appear more as an administrative component of the experiment rather than a crucial and central one. Subjects could also see the “name” of their co-participant throughout the experiment as they were asked to write it on a piece of paper which was in front of them during the whole experiment. This was to ensure that subjects did not forget about this initial piece of information on their co-participant and it remained prevalent in their minds. In addition, it was important that I ensured all subjects understood that everyone in the experiment was privy to the same gender information. As such subjects were informed, both in writing on their paper instructions and through reading the instruction aloud, that everyone had received identical instructions and information.

The following names, shown in table 4.3.1 below, were selected for use in the experiment. The forenames were chosen due to their recognisability as male or female names[13]. I also decided to combine each of these forenames with a surname in order to further “distract” subjects from the focus on gender in the experiment. These surnames are listed below and were selected from the top 5 surnames in England in 2001 (McElduff et al., 2008). Thus, by combining each of the first names with each of the surnames a total of 25 names per gender were available.

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[12] Datta Gupta et al. (2013) run “weak” and “strong” information procedures in which subjects are not told that fictitious name corresponded to actual gender and where they are, respectively, and find that results for males were sensitive to the type of procedure. I felt that ensuring subjects were aware of gender by additionally making clear the direct relationship between fictitious name and gender would therefore create stronger results.

[13] In order to check which names would definitely be recognised as male or female by native and non-native speakers alike, I ran an online questionnaire asking if a selection of the top 100 names for boys and girls were male or female. Only names where 100% of respondents choose the correct gender were used. In order to ensure that a wide variety of British and non-British subjects were polled, subjects were also asked how long they had been resident in the UK.

Table 4.3.1. Anonymised names used[14]

Female	Male	Surnames[15]
Lilly	Daniel	Smith
Eva	William	Jones
Sophie	Thomas	Taylor
Isabelle	Ben	Brown
Ellie	Lewis	Williams

I also felt that this method of gender revelation would be appropriate since various field-based studies have shown that discrimination on the basis of gender, and specifically on the basis of gender specific names, exists. For example Moss-Racusin et al. (2012) illustrate how gender discrimination can take place, even against an anonymous job candidate, in a field experiment in which a job application is sent out for an academic position to various universities with only the (fake) name of the applicant randomly alternated between an easily recognisable male or female name. They find that even this small change in the application form effects people's reactions to the application form: From feedback given by subjects asked to assess the applications it was found that subjects found the female to be less competent and employable and also deserving of a lower starting salary. This piece of research provides simple and effective evidence of gender discrimination in the workplace and is also particularly relevant here since expectations of gender were elicited via fake names and anonymously (i.e. subjects had no distinguishing information about the subject's personal attributes aside from their gender) and this is also the method we use here to communicate gender information to subjects. Similar results with regard to gender discrimination were also found by Steinpreis et al. (1999) in a comparable style of study. Gender discrimination in some form clearly exists.

5. Hypotheses

Since it is the one of the unique contributions of this study, it will be useful to examine some hypotheses relating to the compromise option in isolation first. As such, the Equal Split Game serves as a baseline here since it represents a game in which an equitable

[14] Forenames were selected from the top 100 baby names for boys and girls born in England and Wales in 2009 supplied by the Office of National Statistics (2009)
[15] Surnames were the top 5 must common surnames in England in 2001. Taken from McElduff et al. (2008) and measured by percentage of the population- Smith: 1.26%, Jones: 0.75%, Taylor: 0.59%, Brown: 0.56%, Williams: 0.39%

split of money is efficient in comparison to an inequitable one (See game tables above). Comparing the results I obtain in this game, we can assess how use of an equal split changes as if moves from being efficient to being inefficient and subsequently becomes increasingly inefficient. A strategy which leads to an equal and efficient split of money proved to be highly salient in Holm (2000). I will therefore examine a couple of matters here. It is assumed that the reliance on the compromise option will decrease as its efficiency decreases: naturally, as the gap between potential earnings (i.e. between coordinating on an inequitable outcome and an equitable split) increases, I would expect subjects to attempt coordination on an asymmetric outcome more.

Therefore:

- **H_1: Reliance on the compromise option/ equal split will decrease as its efficiency decreases.**

Moving onto the second hypothesis, as established in Holm (2000), subjects appear to be capable of using gender discrimination to increase payoffs in his experiments. We might therefore expect that the addition of gender labels will decrease reliance on this equitable option (especially amongst mixed gender pairs) since players have information about their co-participant which they could potentially use to discriminate between the two inequitable outcomes more easily. However if gender labels in the experiment are able to introduce a "cost" in that they "force" subjects to make choices against or in line with gender stereotypes (if gender labels are very salient and not used in an unconscious way in the experimental setting) this may make the (Equal, Equal) option more appealing in mixed gender pairs since it opens up an opportunity to make a politically correct decision.

Therefore:

- **H_2: The addition of labels will alter reliance on the compromise option**

I can relate the first two hypotheses to those remaining below in that, as the reliance on the compromise option decreases, we would see greater use of the hawkish and dovish strategy options. In Holm's experiment he found that subjects are significantly more hawkish when playing a coordination game against a female compared to against a male in a battle of the sexes game. He also finds that mixed gender pairings are more successful in achieving higher payoffs when compared to unisex parings as mixed gender pairings are able to use discrimination to coordinate more successfully. If, as in the hypotheses above, we hypothesise that as the efficiency of the equitable split decreases it will become less attractive this might also suggest that as the equitable split becomes an increasingly rejected strategy (due to inefficiency) subjects will turn more to using the battle of the sexes portion of the game and will exhibit behaviours such as those detailed above. Thus I pose the following as hypotheses in the games with an inefficient compromise option (i.e. the High, Medium and Low Compromise Games):

Therefore:

- **H_3: The gender of a co-participant will affect levels of hawkish behaviour**
- **H_4: Mixed gender pairs will be able to use discrimination to achieve higher expected payoffs than unisex pairings.**

Similarly, we might assume that mixed gender pairings would be more successful in using gender labels to achieve higher payoffs compared to their unisex counterparts.

Therefore:

- **H_5: The addition of labels will advantage mixed gender pairings more than unisex pairings.**

Finally, it has been found in the lab that own gender can impact on behaviour but evidence has been hugely mixed as indicated in the literature review above.

Therefore:

- **H_6: Own gender will affect behaviour**

6. Results

6.1. Demographics and subject information

Subjects were required to provide demographic information when they signed up the experiment via ORSEE (Greiner, 2004). Information was collected on gender, age, faculty of study and nationality. 49.43% of subjects were females and 50.57% male, the average age of subjects was 24.58 years, 40.34% were British and 59.66% were non-British, 14.86% were postgraduate research students[16], 38.86% postgraduate taught students[17] and 46.29% undergraduate students[18]. 47.16%, 34.09%, 17.05% and 1.7% of subjects came from the faculties of Science, Social Sciences, Humanities and Medicine & Health Sciences respectively.

Data for the GL treatment and the NGL treatment was collected independently in a between subjects design. The following number of observations, as defined above, were collected in each treatment and pairing subgroup:

Table 6.1.1. Observations

		Treatment	
		GL	**NGL**
Observation	MM	24	18
	FF	26	18
	FM	22	23
	MF	22	23

6.2. Summary of Results

I will now present the results of individual choices made in the games. For this purpose, as well as examining strategy choices in the games by subjects, I will also utilise two additional measures - expected payoffs and expected coordination rates. Both are explained in greater detail here:

Expected payoffs in the game are calculated using the same method as described in Holm (2000). I denote expected payoffs to a subject of gender *a* which is in the set {Male, Female} who has been made aware of their co-participant's gender - *b* - which is in the set {Male, Female}, as $\pi_{ab.}$ Similarly, $p_{ab(30)}$ is the proportion of those of gender *a* who choose to take 30 experimental points for themselves (i.e. use a hawkish strategy) when they aware that their co-participant is of gender *b*, and $p_{ab(COES)}$[19] is the proportion of those of gender *a* who choose the compromise option (High, Medium and Low Compromise Games) or an equal split (in the Equal Split Game), when they are aware that their co-participant is of

[16] Enrolled on PhD, MRes or MPhil programs
[17] Enrolled on MA, MSc or LLM programs
[18] Enrolled on BA, BSc, LLB or MBBS programs
[19] Compromise Option or Equal Spilt i.e. 25 in the Equal Split Game, 15 in the High Compromise Game, 12 in the Medium Compromise Game & 5 in the Low Compromise Game

gender *b*. Using this notation, expected payoffs are therefore calculated in the manner which follows:

$$\pi_{ij} = [p_{ab(30)} *(1- p_{ba(30)} – p_{ba(COES)}) * 30] + [p_{ba(30)}*(1- p_{ab(30)} – p_{ab(COES)}) * 20] + [(p_{ab(COES)} * p_{ab(COES)}) * COES]$$

Expected coordination rates (ECR) are examined using the same notation as in the expected payoff calculations illustrated above. With the ECR I am calculating the product of the proportions of people choosing an individual strategy in each game. The expected coordination rate therefore provides a measure of coordination "success" but does not consider point earnings from the game. It is calculated as follows:

$$ECR_{ij} = [p_{ab(30)} *(1- p_{ba(30)} - p_{ba(COES)})] + [p_{ba(30)} *(1- p_{ab(30)} - p_{ab(COES)})] +[p_{ab(COES)} * p_{ba(COES)}]$$

These two measures (expected coordination rate and expected payoffs) are also interesting in relation to one another: Expected coordination rate provides a measure of successful alignment of expectations without consideration for the resulting payoffs. On the other hand, expected payoffs provide an indication both of successful coordination levels but also the resulting financial implications of that success.

In the tables that follow I will present a summary of the data from the experiment in all games and treatments. Data will be presented for all subjects and also for these subgroups of participants (i.e. different pairing types) in the experiment. I not only report results on the four main subgroups (MM, MF, FM, FF) but also on “higher level” subgroups such as results from subjects who had a female co-participant (i.e. pooled data from MF and FF subjects) or from male participants (i.e. pooled data from MF and MM subjects). It is acknowledged that some significance may occur in some of the subgroup comparisons for purely random reasons.

Table 6.2.1. Code for summary data presentation

(M,F)	Data for all males and all females regardless of partner type
(M_P, F_P)	Data for all subjects with a male partner and all subjects with a female partner regardless of own gender
(MM, FF, MF, FM)	Data for males partnered with males, females partnered with females, males partnered with females and females partnered with males
(Unisex, Mixed)	Data for all unisex pairings (i.e. MM and FF) and for all mixed gender pairings (i.e. FM and MF)
All subjects	Data for all subjects

Table 6.2.2. Labelled Treatment (GL)

	Equal Spilt Game	High Compromise Game	Medium Compromise Game	Low Compromise Game
Males/ Females (M, F)				
a) (M,F) Dovish (%)	2.174, 6.25	17.391, 29.167	21.739, 29.167	30.435, 43.75
b) (M, F) Hawkish (%)	8.696, 8.333	34.783, 18.75	32.609, 27.083	60.87, 39.583
c) (M, F) ES/CO (%)	89.13, 85.4175	47.826, 52.083	45.652, 43.75	8.696, 16.667
d) (M, F) Exp. Payoffs (points)	18.578, 19.731	6.678, 6.853	6.612, 5.996	9.849, 8.932
e) (M, F) ECR (%)	74.291, 78.906	35.066, 38.976	35.681, 35.46	38.847, 38.802
Male/ Female partnered (Mp, Fp)				
a) (Mp, Fp) Dovish (%)	4.348, 4.167	21.739, 25	32.609, 18.75	36.957, 37.5
b) (Mp, Fp) Hawkish (%)	13.043, 4.167	32.609, 20.833	23.913, 35.417	50, 50
c) (Mp, Fp) ES/CO (%)	82.609, 91.667	45.652, 54.167	43.478, 45.833	13.043, 12.5
d) (Mp, Fp) Exp. Payoffs (points)	18.568, 19.722	6.489, 6.992	6.068, 6.521	9.121, 9.635
e) (Mp, Fp) ECR (%)	74.291, 78.906	35.066, 38.976	35.681, 35.46	38.847, 38.802
MM, FF, MF, FM				
a) (MM, FF, MF, FM) Dovish (%)	0, 3.846, 4.545, 9.091	12.5, 26.923, 22.727, 31.818	37.5, 30.769, 4.545, 27.273	29.167, 42.308, 31.818, 45.455
b) (MM, FF, MF, FM) Hawkish (%)	8.333, 0, 9.091, 18.182	41.667, 15.385, 27.273, 22.727	20.833, 26.923, 45.455, 27.273	62.5, 42.308, 59.091, 36.364
c) (MM, FF, MF, FM) ES/CO (%)	91.667, 96.154, 86.364, 72.727	45.833, 57.692, 50, 45.455	41.667, 42.308, 50, 45.455	8.333, 15.385, 9.091, 18.182
d) (MM, FF, MF, FM) Exp. Payoffs (points)	21.007, 23.114, 16.116, 16.116	5.755, 7.064, 7.045, 6.694	5.99, 6.29, 6.694, 5.579	9.149, 9.068, 10.454, 8.926
e) (MM, FF, MF, FM) ECR (%)	84.0278, 92.456, 64.463, 64.463	31.424, 41.568, 36.57, 36.57	32.986, 34.467, 36.364, 36.364	37.153, 38.166, 40.082, 40.082
Unisex, Mixed Gender				
a) (Unisex, Mixed) Dovish (%)	2, 6.818	20, 27.273	34, 15.909	36, 38.636
b) (Unisex, Mixed) Hawkish (%)	4, 13.636	28, 25	24, 36.364	52, 47.727
c) (Unisex, Mixed) ES/CO (%)	94, 79.545	52, 47.727	42, 47.727	12, 13.636
d) (Unisex, Mixed) Exp. Payoffs (points)	22.13, 16.284	6.856, 6.826	6.197, 5.626	9.432, 9.313
e) (Unisex, Mixed) ECR (%)	88.52, 65.134	38.24, 36.415	33.96, 34.349	38.88, 38.74
All Subjects				
a) (All Subjects) Dovish (%)	4.255	23.404	25.532	37.234
b) (All Subjects) Hawkish (%)	8.511	26.596	29.787	50
c) (All Subjects) ES/CO (%)	87.234	50	44.681	12.766
d) (All Subjects) Exp. Payoffs (points)	19.206	6.862	6.198	9.716
e) (All Subjects) ECR (%)	76.822	37.449	35.174	38.864

Table 6.2.3. Un-Labelled Treatment (NGL)

	Equal Spilt Game	High Compromise Game	Medium Compromise Game	Low Compromise Game
Males/ Females (M, F)				
a) (M, F) Dovish (%)	4.878, 7.317	29.268, 19.512	36.585, 41.463	43.902, 51.22
b) (M, F) Hawkish (%)	9.756, 4.878	19.512, 31.707	31.707, 29.268	46.341, 39.024
c) (M, F) ES/CO (%)	85.366, 87.805	51.22, 48.78	31.707, 29.268	9.756, 9.756
d) (M, F) Exp. Payoffs (points)	18.055, 19.952	6.791, 6.936	6.782, 7.341	10.547, 9.768
e) (M, F) ECR (%)	72.1, 79.893	36.764, 38.132	33.135, 33.135	42.534, 40.214
Male/ Female partnered (Mp, Fp)				
a) (Mp, Fp) Dovish (%)	9.756, 2.439	24.39, 24.39	34.146, 43.902	46.341, 48.78
b) (Mp, Fp) Hawkish (%)	7.317, 7.317	24.39, 26.829	29.268, 31.707	46.341, 39.024
c) (Mp, Fp) ES/CO (%)	82.927, 90.244	51.22, 48.78	36.585, 24.39	7.317, 12.195
d) (Mp, Fp) Expected Payoffs (points)	17.995, 19.994	7.029, 6.686	6.77, 7.371	10.434, 9.863
e) (Mp, Fp) ECR (%)	72.1, 79.893	38.132, 36.764	33.135, 33.135	42.534, 40.214
MM, FF, MF, FM				
a) (MM, FF, MF, FM) Dovish (%)	11.111, 5.556, 0, 8.696	33.333, 22.222, 26.087, 17.391	33.333, 50, 39.13, 34.783	44.444, 55.556, 43.478, 47.826
b) (MM, FF, MF, FM) Hawkish (%)	5.556, 0, 13.043, 8.696	11.111, 27.778, 26.087, 34.783	22.222, 22.222, 39.13, 34.783	44.444, 27.778, 47.826, 47.826
c) (MM, FF, MF, FM) ES/CO (%)	83.333, 94.444, 86.957, 82.609	55.556, 50, 47.826, 47.826	44.444, 27.778, 21.739, 30.435	11.111, 16.667, 8.696, 4.348
d) (MM, FF, MF, FM) Expected Payoffs (points)	17.67, 22.299, 18.299, 18.185	6.481, 6.836, 6.607, 7.06	6.074, 6.481, 7.599, 7.599	9.938, 7.855, 11.04, 10.832
e) (MM, FF, MF, FM) ECR (%)	70.679, 89.198, 72.968, 72.968	38.272, 37.346, 36.484, 36.484	34.568, 29.938, 33.837, 33.837	40.741, 33.642, 44.045, 44.045
Unisex, Mixed Gender				
a) (Unisex, Mixed) Dovish (%)	8.333, 4.348	27.778, 21.739	41.667, 36.957	50, 45.652
b) (Unisex, Mixed) Hawkish (%)	2.778, 10.87	19.444, 30.435	22.222, 36.957	36.111, 47.826
c) (Unisex, Mixed) ES/CO (%)	88.889, 84.783	52.778, 47.826	36.111, 26.087	13.889, 6.522
d) (Unisex, Mixed) Expected Payoffs (points)	19.869, 18.207	6.879, 6.739	6.194, 7.646	9.124, 10.938
e) (Unisex, Mixed) ECR (%)	79.475, 72.826	38.657, 36.106	31.559, 34.121	38.04, 44.093
All Subjects				
a) (All Subjects) Dovish (%)	6.098	24.39	39.024	47.561
b) (All Subjects) Hawkish (%)	7.317	25.61	30.488	42.683
c) (All Subjects) ES/CO (%)	86.585	50	30.488	9.756
d) (All Subjects) Expected Payoffs (points)	18.966	6.873	7.064	10.198
e) (All Subjects) ECR (%)	75.863	37.493	33.09	41.553

6.3. Analysis

I predominately use the chi-squared test in this analysis (and the Fisher Exact Test where appropriate i.e. where subject numbers fall below 7 for a given category). The test is appropriate here because I observe nominal values of choices (Hawkish, Dovish, Equal). It is also relevant and appropriate for analysis in all periods since subjects were not given feedback between rounds. I can thus consider all observations in all periods to be truly independent.

Let us first consider the hypotheses relating to the compromise option in more detail:

- **H_1: Reliance on the compromise option/ equal split will decrease as its efficiency decreases**
- **H_2: The addition of labels will alter reliance on the compromise option**

The tables which follow provide some initial indications of how the equitable split of earnings (i.e. the equal split and the compromise options) is used by subjects in all possible pairings configurations.

Table 6.3.1. The rate of use of the Equal Split/ Compromise Option[20]

	Equal Split (GL)	High Compromise (GL)	Medium Compromise (GL)	Low Compromise (GL)	Equal Split (NGL)	High Compromise (NGL)	Medium Compromise (NGL)	Low Compromise (NGL)
All subjects	87.23%	50%	44.68%	12.77%	86.59%	50%	30.49%	9.76%
FF	96.15%	57.69%	42.31%	15.39%	94.44%	50%	27.78%	16.67%
MM	91.67%	45.83%	41.67%	8.33%	83.33%	55.56%	44.44%	11.11%
FM	72.73%	45.46%	45.46%	8.18%	82.61%	47.83%	30.44%	4.35%
MF	86.36%	50%	50%	9.09%	86.96%	47.83%	21.74%	8.7%
Male subjects	89.13%	47.83%	45.65%	8.7%	85.37%	51.22%	31.71%	9.76%
Female subjects	85.42%	52.08%	43.75%	16.67%	87.81%	48.78%	29.27%	9.76%
Unisex pairings	94%	52%	42%	12%	88.89%	52.778%	36.11%	13.89%
Mixed gender pairings	79.55%	47.73%	47.73%	13.64%	84.78%	48.78%	26.09%	6.52%
Subjects with a male partner	82.61%	45.65%	43.48%	13.04%	82.93%	51.22%	36.59%	7.32%
Subjects with a female partner	91.67%	54.17%	45.83%	12.5%	90.24%	48.78%	24.39%	12.2%

[20] GL - Labelled Treatment, NGL - Unlabelled Treatment

Let us first provide some initial observations on the effects of reducing efficiency in the equal split in the experiment. From table 6.3.1 we can observe that, despite the property of equality, a strategy of choosing an equal split decreases in popularity as its efficiency decreases in most subgroups (in both the GL and NGL treatments). Thus subjects are interested in both payoffs and equality, and are making trade-offs as the payoffs from the outcome that offers equal payoffs decreases. Also we notice that when the equitable payoff is efficient (as in the Equal Split Game) the vast majority of subjects choose this strategy option. However the drop in the use of an equitable strategy as soon it becomes inefficient (as in the difference in the use of the equitable strategy between the Equal Split Game and the High Compromise Game) is striking. Even when there is only a very small fall in efficiency in a compromise option type payoffs (as in for example from the High Compromise Game to the Medium Compromise Game) the drop in the use of the compromise option is often large, particularly in the NGL treatment. People move away from this strategy very quickly. I therefore accept hypothesis 1[21].

Let us now consider hypothesis 2. As can also be seen from table 6.3.1 above, female subjects, subjects with a female partner and MF subjects show an increased reliance on the compromise option when labels are added over all games. This could suggest that with the addition of labels makes these groups more cautious about using a hawkish or dovish strategy and moves them towards using the compromise options. The only subgroup that consistently decreases their reliance on the compromise option when labels are added are MM subjects.

However, using a chi-squared test a significant difference between a strategy of choosing the compromise option was found between treatments in the Medium Compromise Game only for the following subgroups: all subjects ($\beta = 3.7420$, $p < 0.1$), those with a female co-participant ($\beta = 4.4153$, $p < 0.05$) and mixed gender pairings ($\beta = 4.5351$, $p < 0.05$) with all these showing a greater use of the compromise option when labels were present. These result appears to be driven by MF subjects (Fisher's Exact Test, $p = 0.065$) who are the only pairing subgroup to use the compromise option significantly more in the treatments with labels. I am thus unable to establish that subjects are less likely to use the inefficient compromise option in the presence of gender labels as predicted by hypothesis 2. It is interesting that it is MF subjects who display some significant differences in compromise type behaviours in the Medium Compromise Game with and without labels as it was these mixed gender pairings who we might have expected to

[21] The hypothesis is accepted purely on observational grounds. We will continue our analysis of choices in more details in the sections which follow.

be able to use playing against a co-participant of a different gender to discriminate between the two higher payoff options (as in Holm, 2000). However I do not observe this. I therefore reject hypothesis 2.

Let us now move on to look at our second set of hypotheses.

- **H_3: The gender of a co-participant will affect levels of hawkish behaviour**

In Holm (2000) it is found that when an unequal split is unavailable in the coordination game, males and females exhibited more hawkish behaviours towards females than males with 67.9% and 47.9% respectively choosing the hawkish option dependent on the gender of a co-participant (Holm, 2000, p.299). In addition Holm (2000) found that females choose the dovish option more often when they were aware their co-participant was a male as compared to a female co-participant.

Tests of hypothesis 3 offer some surprising results. In the High Compromise Game subjects are more hawkish towards males than females. However this pattern reverses in the Medium Compromise Game, and in the Low Compromise Game where 50% of those partnered with both male and female co-participants chose a hawkish strategy. I therefore have partial evidence that supports hypothesis 3 in the Medium Compromise Game.

Table 6.3.2. Hawkish behaviour towards men and women (with gender information)

	High Compromise	Medium Compromise	Low Compromise
With Male Partner	32.609%	23.913%	50%
With Female Partner	20.833%	35.417%	50%
Difference	-11.775%	11.504%	0%

However using a (one-tailed) chi-squared test no significant difference was found between choosing a hawkish strategy between those with a male and female partner. This result is contrary to Holm's finding reported above with regard to differences in hawkish behaviour towards the genders. This is despite the result reported above in which I observe that the use of the compromise option does tend to decrease as its efficiency decreases. Despite increasingly abandoning the equitable strategy as efficiency decreases subjects do not exhibit behaviours as seen in the Holm's battle of the sexes game with regard to use of the hawkish and dovish options.

It could be hypothesised that when the compromise option is available it may influence the ways subjects view the hawkish and dovish strategy options. Those who reject the equitable strategy and are choosing to use the hawkish and dovish options, are not resorting to behaviours that are similar to those seen in Holm's battle of the sexes set-up.

Let us now consider the hypotheses 4 and 5:

- **H_4: Mixed gender pairs will be able to use discrimination to achieve higher expected payoffs than unisex pairings.**
- **H_5: The addition of labels will advantage mixed gender pairings more than unisex pairings.**

Now referring to the expected payoffs in table 6.3.3 we see that unisex pairings consistently get higher expected payoffs and outperform mixed gender parings in the GL treatment. In all four games expected payoffs for unisex and mixed gender were as follows:

Table 6.3.3. Expected Payoffs - Unisex v. Mixed pairings (GL Treatment)

	High Compromise	Medium Compromise	Low Compromise
Mixed Gender Pairings	6.826	5.626	9.313
Unisex Pairings	6.856	6.197	9.432
% difference[22]	0.441%	10.145%	1.278%

From this table we also note the interesting result that expected payoffs from the low compromise game are higher[23] than those in the High Compromise and Medium Compromise games despite payoffs from the compromise option being lower in the Low Compromise Game. If subjects aren't as "distracted" by the compromise option (only 12.766% of subject choose the compromise option in the low compromise game) they appear to be capable on coordinating on

[22] % difference is calculated at (Unisex Pairings Expected Payoffs – Mixed Gender Pairings Expected Payoffs)/ Mixed Gender Pairings Expected Payoffs. A positive % difference thus indicates that unisex pairings achieved higher payoffs.
[23] However these differences are not found to be statistically significant:
Unisex: (High Compromise/ Low Compromise – p = 0.4, Medium Compromise/ Low Compromise – p = 0.29)
Mixed Gender: (High Compromise/ Low Compromise – p = 0.42, Medium Compromise/ Low Compromise – p = 0.23)

the unequal section of the game. We note however that ECRs for all four of the labelled games are fairly similar[24]. This could indicate that although absolute expected levels of coordination are similar, coordination on higher value outcomes in the Low Compromise games leads to higher overall expected payoffs.

Let us now consider elements of individual strategy choice in order examine if this gives us some explanation as to where these differences in payoffs are coming from. Using a two-tailed chi-squared test, I am unable to establish a significant difference in strategy choice (between mixed and unisex pairings) over all strategies (Dovish, Hawkish or Equal/ Compromise). However the game in which the difference between payoffs is most large (The Medium Compromise Game), the p-value is just outside the standard threshold of significance level ($\beta = 4.3729$, $p = 0.112$). I also find a significant difference between the number of subjects choosing a dovish strategy in the Medium Compromise Game between mixed and unisex pairings ($\beta = 4.0287$, $p < 0.05$) with mixed gender pairings choosing this strategy significantly less often than unisex pairings (34% for Unisex and 15.909% for Mixed)

With regard to hawkishness, again the Medium Compromise Game shows p-values just outside the standard threshold of significance level ($\beta = 1.7106$, $p = 0.191$). We have weak evidence that mixed gender couples are being hawkish “too” frequently (24% for unisex and 36.364% for mixed gender in the Medium Compromise Game) to allow coordination with this strategy in these games (combined with not enough subjects being dovish to allow coordination on a hawkish strategy for mixed gender pairings) thus leading to lower expected payoffs. So it seems the largest differences in unisex and mixed gender expected payoffs (as in the Medium Compromise Game) are driven mainly by a difference in the number of subjects choosing a hawkish strategy, with mixed gender parings doing so too often to allow coordination with someone on a dovish strategy. Maybe there is some Schelling salience at work here: Subjects

[24]Using a chi-squared test to test for differences between each of the ECRs in each of the games I find the following p-values which suggest the differences in ECRs between games are (as anticipated) non-significant.

	Pairing Type	
Game Comparison	**Mixed p Value**	**Unisex p Value**
High-Medium	0.971879	0.941452
Medium-Low	0.943774	0.937109
High-Low	0.970219	0.991811

are aware they are different in gender and thus pick a strategy of choosing something that will lead to different outcome in payoffs (i.e. the asymmetric payoffs of (20, 30)). However the salience of labels is failing them.

Now we will look further into why mixed gender pairings are less successful to see if the result is driven by males or females in these pairings:

Table 6.3.4. Difference between MF and FM subjects' expected payoffs (GL treatment)

	High Compromise	Medium Compromise	Low Compromise
Difference % (MF-FM)	5.247%	20%	17.13%

In the High Compromise Game, Medium Compromise Game and Low Compromise Game lower expected payoffs for mixed gender pairings seem to be driven by FM pairings who consistently achieve lower expected payoffs than MF pairings. MF subjects are actually the most successful (of all 4 pairing subgroups MM, FF, FM and MF subjects) in the Medium Compromise Game and Low Compromise Game and 2nd most successful in the High Compromise Game with regard to total coordination. Given this result we will now consider if individual behavioural differences can be used to explain changes in expected payoffs and expected coordination rates amongst MF and FM pairings. From looking at the proportions in table 6.3.5 below it seems the lower expected payoffs for FM subjects might be due to MF subjects being more hawkish and FM subjects being more dovish. Where the differences in payoffs are small (High Compromise Game) it seems that subjects are choosing an equitable outcome. Where FM are scoring much lower than MF subjects it seems it's because FM subjects are using the dovish strategy a lot (4.545% for MF subjects and 27.273% for FM subjects - a 22.727% difference in the Medium Compromise Game and 31.818% for MF subjects and 45.455% for FM subjects - a 13.636% difference in the Low Compromise Game). This difference is only 9.091% in the High Compromise game.

Table 6.3.5. MF and FM strategy choices in labelled treatment

	High Compromise	Medium Compromise	Low Compromise
MF	27.273, 22.727, 50	45.455, 4.545, 50 59.	59.091, 31.818, 9.091
FM	22.727, 31.818, 45.455	27.273, 27.273, 45.455	36.364, 45.455, 18.182

NB: Reported as % of all subjects choosing each strategy - Results are presented as Hawkish(%), Dovish(%), Compromise(%)

Overall there is no significant difference in strategies (Dovish, Hawkish and Compromise) between FM and MF pairings apart from in the Medium Compromise Game ($\beta = 4.6190$, $p = 0.099$). FM subjects are also consistently more dovish over all games as compared to MF subjects. There is found to be a significant difference between a strategy of choosing a dovish strategy and not doing so in the Medium Compromise Game (Fisher's Exact Test, $p = 0.095$) but not in the Low Compromise Game ($\beta = 0.8627$, $p = 0.353$) There is no significant difference in the High Compromise game. Also where FM pairings are achieving much lower expected payoffs than MF pairings it seems all that FM pairings are using the hawkish strategy a lot less (45.455% for MF subjects and 27.273% for FM subjects - a 18.182% difference in the Medium Compromise Game and 59.091% for MF subjects and 36.364% for FM - a 22.727% difference in the Low Compromise Game). This difference is only 4.545% in the High Compromise game. However no significant difference is found between incidences of choosing the hawkish strategy between MF subjects and FM subjects in all games. However in the Low Compromise Game the difference is very close to significant ($\beta = 2.2774$ $p = 0.131$). So in conclusion, where the gaps in mixed and unisex expected payoffs is the largest (The Medium Compromise Game) it is mainly driven by FM subjects being subject to receiving a dovish payoff. In the Low Compromise Game we have weak evidence that FM subjects' payoffs are lower due to not receiving the hawkish payoff.

Following this it is logical to see if mixed and unisex are affected differently by the addition of labels. From above we have shown that unisex pairings are better at using labels than mixed gender pairings (with regard to expected payoffs) and might expect that unisex pairings will see more advantage from the addition of labels than mixed:

Table 6.3.6. The % difference in expected payoffs when gender labels are added

	High Compromise	**Medium Compromise**	**Low Compromise**
Unisex	-0.332%	0.038%	3.373%
Mixed Gender	1.288%	-26.414%	-14.857%

From table 6.3.6 above we can see that it is indeed unisex pairings who are more successful in using labels to increase expected payoffs (although the increase is minimal). Mixed gender pairings lower total expected payoffs in the GL treatment are much more striking as compared to NGL treatments. It seems that people's expectations of each other's behaviour are failing to serve them well in achieving higher payoffs. Perhaps the salience of gender labels when playing against someone of the opposite gender with regard to expected behaviour is failing and behavioural expectations are not aligned. It could also be true that subjects are unwilling and uncomfortable in using any gender stereotyped of norms of behaviour that they are aware of. However big reductions in ECRs (table 6.3.7 below) are only seen in the Low Compromise Game for mixed gender pairs. It may also thus be interesting to examine this difference by looking at differences in individual behaviour between treatments.

Table 6.3.7. The % difference in ECRs when gender labels are added

	High Compromise	**Medium Compromise**	**Low Compromise**
Unisex	-1.08%	7.609%	2.208%
Mixed Gender	0.857%	0.669%	-12.14%

With regard to mixed gender pairings, there is a significant difference in overall strategy choice between treatments (i.e. GL v. NGL) overall ($\beta = 6.6103$, $p < 0.05$) and also in the number of subjects choosing a dovish strategy (GL - 15.909%, NGL – 36.957%, $\beta = 5.0944$, $p < 0.05$) and the number of subjects choosing an equal split (GL – 47.727%, NGL – 26.087% , $\beta = 4.5351$, $p < 0.05$) in the Medium Compromise Game only. No significance difference is found for hawkish behaviour. Since it is in the Medium Compromise Game that the largest fall in expected earnings is observed (26.414%) it may come as no surprise that significance is found here. Within the unisex parings we find no evidence of behavioural differences between treatments.

H_6: Own gender will effect behaviour

Let us now also look at pure gender effects. As discussed above these are the effects that own gender has on behaviour when information about a co-participant's gender is not present. We test if there are differences in the frequency of using all strategies, and if incidences of choosing the dovish, hawkish or equal split/ compromise strategy are different between genders. We find no significant differences in male and female behaviour between genders. We thus conclude that there are no pure gender effects in this game. Results obtained must therefore relate either to people expectations of others with regards to gender related behaviour or a combination of 'pure' gender effects and expectations of 'pure' gender effects.

To complete our analysis we now also consider the MSNEs we calculated above to see if they are able to predict behaviour in our games. We would expect subjects to be more likely to exhibit behaviour similar to that described by the MSNE when no gender information is present compared to when there is, due to subjects potentially having no focal PSNE to focus on in the absence of subject labels. P-values from each chi-squared test used to test for significant differences between each of the MSNEs and the observed behaviour is reported below with p-values greater than 0.05 highlighted in grey, indicating statistically similarity with the MSNE. An abbreviation for each of the MSNE calculated in the theoretical section above is provided at the top of the table with an explanation for each in the footnote below the table. These abbreviations will be used throughout the thesis to describe each of the MSNE.

A number of MSNE seem to predict behaviour. It is interesting to note that the MSNE where subjects mix between all three strategy options appears to describe behaviour in the High Compromise game whether gender information is present or not. However, when gender information is present this MSNE also appears to describe behaviour in the Medium Compromise game. Observing the data between the GL and NGL treatments we note that this result holds because the compromise option remains more popular in the Medium Compromise game when gender information is present compared to when it is not. Without gender labels we note that use of the compromise option drops off much quicker meaning that the “MSNE All” no longer describes behaviour in the game. We also note that, presumably due to the focality and high use of the equal outcome, this MSNE does not describe behaviour in the Equal Split Game in either treatment. This supports previous finding, reported above, that an efficient equal spilt is often chosen by subjects if available. Also interesting is that in the Low Compromise Game, in both the GL and NGL treatments, the MSNE where subjects mix between dovish and hawkish appears to reflect observed behaviour. Therefore we could conjecture that in this game, where use of the compromise is largely abandoned by subjects, subjects who choose the hawkish and dovish options begin to mix between the two options. We can make this interpretation if we interpret an MSNE as a method of behaviour subjects use, in situations where no other information is available to them on which equilibrium is focal on via the methods discussed above.

Table 6.3.8. p-values for comparisons to MSNEs (GL)

Actual (Males)	MSNE All[25]	MSNE DH[26]	MSNE HE P1[27]	MSNE DE P2
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.73	0.00	0.38	0.05
Medium Compromise	0.84	0.01	0.77	0.08
Low Compromise	0.00	0.22	0.00	0.00
Actual (Females)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.09	0.00	0.99	0.41
Medium Compromise	0.28	0.01	0.62	0.08
Low Compromise	0.00	0.17	0.00	0.00
Actual (All Subjects)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.37	0.00	0.19	0.04
Medium Compromise	0.37	0.00	0.73	0.01
Low Compromise	0.00	0.00	0.00	0.00
Actual (Male Partnered)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.99	0.01	0.59	0.09
Medium Compromise	0.10	0.00	0.54	0.07
Low Compromise	0.00	0.65	0.00	0.00
Actual (Female Partnered)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.18	0.00	0.60	0.35
Medium Compromise	0.71	0.01	0.73	0.05
Low Compromise	0.00	0.65	0.00	0.00
Actual (Unisex)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.55	0.00	0.59	0.12
Medium Compromise	0.05	0.00	0.54	0.04
Low Compromise	0.00	0.69	0.00	0.00
Actual (Mixed)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.47	0.00	0.60	0.24
Medium Compromise	0.60	0.01	0.73	0.05
Low Compromise	0.00	0.57	0.00	0.00

[25] MSNE where subjects mix between all three strategy options
[26] MSNE where subjects mix between the dovish and hawkish strategy options
[27] These 2 columns represent the MSNE where one player mixes between hawkish and equal with the expectation that the other player mixes between dovish and equal (and vice versa)

Table 6.3.9. p-values for comparisons to MSNEs (NGL)

Actual (Males)	MSNE All	MSNE DH	MSNE HE P1	MSNE DE P2
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.16	0.00	0.07	0.43
Medium Compromise	0.01	0.06	0.04	0.01
Low Compromise	0.00	0.49	0.00	0.00
Actual (Females)				
Equal Split	0.00	0.00	0.00	0.02
High Compromise	0.84	0.01	0.43	0.12
Medium Compromise	0.00	0.04	0.02	0.00
Low Compromise	0.00	0.12	0.00	0.00
Actual (All Subjects)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.33	0.00	0.04	0.07
Medium Compromise	0.00	0.00	0.00	0.00
Low Compromise	0.00	0.07	0.00	0.00
Actual (Male Partnered)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.47	0.00	0.17	0.29
Medium Compromise	0.06	0.03	0.08	0.02
Low Compromise	0.00	0.43	0.00	0.00
Actual (Female Partnered)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.68	0.01	0.23	0.23
Medium Compromise	0.00	0.06	0.01	0.00
Low Compromise	0.00	0.15	0.00	0.00
Actual (Unisex)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.21	0.00	0.09	0.50
Medium Compromise	0.01	0.01	0.04	0.01
Low Compromise	0.00	0.12	0.00	0.00
Actual (Mixed)				
Equal Split	0.00	0.00	0.00	0.00
High Compromise	0.89	0.01	0.31	0.12
Medium Compromise	0.00	0.12	0.01	0.00
Low Compromise	0.00	0.47	0.00	0.00

7. Conclusion and Discussion

In this paper I have reported an experiment which combined elements of gender information and efficiency. I used several adaptions of the battle of sexes game in order to examine aspects and interactions of gender related behaviour and game structure. I hope that this experiment has provided some interesting insights into the different ways that gender can affect how we interact. As such I am able to find evidence that strategy choice in the games is sometimes affected by the gender of a co-participant. Additionally I find that unisex pairings receive higher expected earnings than pairings where the co-participant is of the opposite gender. It is largely female unisex pairings who are driving the higher expected payoffs in unisex pairings as compared to mixed gender pairings earnings. Similarly only unisex pairings are successful in achieving higher expected payoffs in labelled as opposed to the unlabelled treatments. The fact that unisex groups were able to achieve higher payoffs than mixed gender groups may also suggest that gender composition of groups could be an important factor in other experiments of this nature.

Contrary to Holm (2000) I am not able to establish a consistent pattern of more hawkish behaviour towards a particular gender. We find significant increases in the use of the compromise option between treatments (higher use in the labelled treatment for all subjects, MF subjects, those with a female co-participant and mixed gender pairings in the Medium Compromise Game) when in the treatment with gender labels.

The property of equality does not keep people from increasingly abandoning this strategy as its efficiency decreases. The attractiveness of an equitable over an efficient option is questioned by this result.

These results could be important in the bargaining and negotiation literature since they suggest that group composition could be relevant to outcomes and choice. I hope also that this experiment has provided some interesting insights at the intersection between gender, efficiency and equality and serves as motivation for future work.

Chapter 2

Gender Identity and Punishment in Coordination Games*

Zoë C. Bett[a] and Subhasish M. Chowdhury[b]

[a]School of Economics, and Centre for Behavioural and Experimental Social Science, University of East Anglia, Norwich NR4 7TJ, UK

[b]School of Economics, Centre for Behavioural and Experimental Social Science, and the ESRC Centre for Competition Policy, University of East Anglia, Norwich NR4 7TJ, UK

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"WOMEN HAVE SERVED ALL THESE CENTURIES AS LOOKING GLASSES POSSESSING THE MAGIC AND DELICIOUS POWER OF REFLECTING THE FIGURE OF MAN AT TWICE ITS NATURAL SIZE."

— Virginia Woolf, *A Room of One's Own*

1. Introduction and motivations

The ability to coordinate behaviour is a crucial element of economic life. As such, and inherent in coordination, our behaviour is not only governed by our own desires but also by our beliefs in how others will behave (Geanakoplos et al., 1989)[28]. Our ability to coordinate with, for example, colleagues or employees may be decisive in achieving successful or desirable outcomes and mis-coordination (i.e. our beliefs not being met) may lead us to want to take retalitative action which could have negative economic effects. This will occur if coordination failure (and thus reduced payoffs for both parties) itself is not in itself viewed as sufficient "punishment" leading a person to want to further punish. We therefore combine aspects of coordination including (1) options, (2) gender identity and (3) retaliation in a laboratory experiment in order to examine this further.

In day-to-day life coordination attempts can come at both a reward and cost. With regard to loss, we can experience coordination failure which makes us angry and induces us to punish the person we feel contributed to this coordination failure.

We also see application for our research in the area of peer-reviewed promotion. In this practice the opportunity to "punish" a colleague for not coordinating their actions with yours is high. Negative feedback supplied to a promotion panel could be seen as an opportunity to inflict negative consequences on a colleague who you feel has "wronged" you by not aligning their behaviour with your own. Also in politics and business coordination behaviours, own gender and the gender of others may affect how people behave with regard to punishment behaviours.

We use experimental methods to investigate these issues. The experiment which forms the basis of this paper places itself at the intersection of two substantial areas of literature, yet unexplored by itself. The experiment aims to join the growing experimental and behavioural literature relating to the effects of own gender and the gender of others on behaviour, with the literature on the effects of punishment on behaviour. Combining these two literatures is

[28] Geanakoplos et al., 1989 actually go as far to say that payoffs in the game are actually dependent on beliefs.

interesting and relevant on a number of levels: First, it is interesting to see if punishment can be used as an instrument to induce coordination in a pure coordination game with no cost and free riding incentive (whereas the literature mostly uses public good or group coordination, e.g., contest games[29], here we use a battle of the sexes game). Second, and relating to the gender aspects of this paper as mentioned in the introduction, it is of interest to examine if males or females take the threat of punishment as a 'coordination cue' more seriously with costless coordination and with no free-riding opportunity, i.e., if any social norms that may exist, and may aid coordination, are complied with more strongly by males or females under the threat of punishment. Relating to this point we also wish to examine if males or females are more vindictive or malicious in a pure coordination game with regard to their willingness to punish for certain types of behaviour. Finally, we wish to examine if revealing information about a co-participant's gender has an effect on both coordination and punishment behaviours.

2. Related Literature

We will now examine the previous literature in the areas which relate to this research and the areas which we feel this piece of research contributes to.

2.1. Punishment

> *…[] if a person leaves an exchange in which he was treated unkindly, then his unhappiness at being so treated should be a consideration in evaluating the efficiency of that exchange.*
>
> (Rabin, 1993, p.1283)

Punishment and sanctions are common place in everyday economic life. They are often used in disputes when others are seen to break accepted behavioural or social norms but can also be antisocial in nature (see, for example, Herrmann et al., 2008). Additionally, in everyday life punishment can take a formal form but can also include informal forms such as peer pressure, gossip or social ostracism (Masclet et al., 2003, p.366).

[29] See for example: Fehr & Gächter (2000), Masclet et al. (2003), Sefton et al. (2007), Nikiforakis (2008), Abbink et al. (2010)

Previous experiments looking at the effects of punishment, incorporate a huge body of work of which we will look at a selection here. Whilst punishment has been studied extensively in the literature, the combination of coordination and punishment is one of the novelties of our experiment. Pervious experiments have tended to use games in which free riding was a possibility (for example public good or contest games e.g. Fehr & Gächter, 2000, Abbink et al., 2010), however in our pure coordination games free riding is not possible. The pioneering work in this area of literature is by Fehr & Gächter (2000). They find that, in a public goods game, the addition of the ability to punish leads to contributions to the public goods remaining between 50% and 90% whilst in the treatments without punishment contributions are seen to converge to lower percentages. A similar result is found in related experiments run by Masclet et al. (2003), Sefton et al. (2007) and Nikiforakis (2008). In contrast, in a group contest with public good prizes Abbink et al. (2010) find that allowing subjects to punish leads to a lowering of efficiency due to the expenditures used to punish other subjects lowering overall earnings in the experiment. Ostrom et al. (1992) also find that, in a public good investment type game, financial investment gains (by increasing contribution rates) gained via inflicting punishment are undermined by the costs of punishment. Furthermore, Fehr & Fischbacher (2004) find that a third party, unaffected by the outcome of a game, was prepared to punish norm breaking behaviour at their own cost and thus conclude that norm perceptions play an important role in punishment behaviour. With regard to gender effects, Brañas-Garza & Ottone (2009) find that the threat of punishment makes females increase transfers in a dictator game whilst this threat has the opposite effect on males. The existence and implementation of a punishment technology is clearly a powerful tool in effecting behavioural change. In Eckel & Grossman (1996) they found that the relative price of punishment has different effects on males and females. They find that females punish more when the relative costs of doing so are lower and males are not affected by relative costs. As previously mentioned, the literature looking at punishment in games without a free-riding option is limited. However, one example is the work of Dreber et al. (2008) in which they use a prisoner's dilemma game with the possibility of costly punishment in a repeated game with partner matching. They find that those who receive a higher payoff in the game are not likely to punish a co-participant. They conclude that punishment *is maladaptive in cooperation games* (p. 348).

2.2. Player labels and gender effects

There have been a wide selection of experiments in which some form of information about a co-participant (player labels) is given to a participant. The nature of information provided about a co-participant in the experimental literature has been wide and, as such, the literature on player labels has provided a rich and interesting selection of evidence on the effects of differing types of co-participant labelling in a controlled experimental setting. Labels include social status (De Kwaadsteniet & Van Dijk, 2010, von Essen & Ranehill, 2011, Ball et al., 2001[30]), race (Benjamin et al., 2010), nationality (Bogach & Leibbrandt, 2011[31], Ahmed, 2010[32]), surname (Charness & Gneezy, 2008), ethnicity (Fershtman & Gneezy, 2001, Chen et al., 2014[33]) and gender (Sonsino & Sirota, 2003, Kahn et al., 1971, Holm, 2000, Dufwenberg & Muren, 2006, Rapoport & Chammah, 1965, Mack et al., 1971, Sutter et al., 2009).

As described in the introduction, this study will more specifically look at how gender information and own gender is used in coordination situations and if this information or attribute can be applied to make certain outcomes, actions or equilibria more salient. A review of the literature in this area is also provided in chapter one of this thesis but we will provide a version here too.

The prisoner's dilemma game has been commonly used to investigate the interaction between gender and coordination. Whilst van Huyck & Battalio (2002) and Orbell et al. (1994) observe no gender differences in behaviour in the game, Kahn et al. (1971) find that men are more cooperative. They also find that females were more susceptible to changing their behaviour dependent on the gender of a co-participant. Mack et al. (1971) find that both males and females are more cooperative when faced with a co-participant of the same gender and overall males are more cooperative than females in a prisoner's dilemma game. Charness & Rustichini (2011), in a similar game, observe that, under observation by a third party males are less cooperative and females are more cooperative. In a repeated prisoner's dilemma game, Rapoport & Chammah (1965), find that women are significantly less cooperative than male

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[30] von Essen & Ranehill (2011) use surnames to communicate social status.
[31] Information on age, current degree level, eye colour and hair colour is not observed to effect behaviour.
[32] Ahmed (2010) observes discriminatory behaviour towards people with foreign surnames (as opposed to Swedish where the experiment was run) by subjects with Swedish surnames.
[33] Chen et al. (2014) also prime on a common organisation of subjects (in this case the university which they all attended)

counterparts when playing against a male. However, when males played against females this difference vanished.

A number of other games have also been used to investigate gender effects. For example Chen et al. (2013) find that women bid more and earn less than men in a first-price auction. Castillo & Cross (2008) compare findings in ultimatum and dictator games and find that in the dictator game men are more altruistic than women but that no difference in gender related behaviour is observed in the ultimatum game. Sutter et al. (2009) find no pure gender effects in a "power-to-take game" but find that single sex pairings are more competitive and retalitative (leading to a decrease in efficiency) than their mixed gender pairing counterparts. In Gneezy et al. (2009) males in a patriarchal society are found to be more competitive than females whereas the opposite is true in a matriarchal society. Gneezy et al. (2003) observe greater productivity amongst men in a competitive environment (in contrast to a piece rate environment) but not for women.

2.3. Repeated coordination games

The issue of behaviour in repeated coordination games and the examination of dynamic decision making is not one that has received much attention in the experimental economics literature. In this experiment subjects were asked to play the same coordination game five times in which subjects received feedback after each game and thus we might also expect some correlation in behaviours over periods. Although subjects played a different subject each time (and were aware of this), in our experiment subjects do remain paired with the same gender throughout. If we can observe convergence patterns in behaviours we might therefore assume that the effects of gender are stronger as they persist even with a change of co-participant. We are unable to find any similar literature or experimental results which look at repeated coordination games with random stranger matching and feedback between games (the studies described below describe experiments in which subjects were in fixed pairs) and so the data we have provided here gives some interesting insights. We will examine this is more detail empirically in the results section and will initially describe previous studies here.

In Sonsino & Sirota (2003) almost half of subject pairs (which were always mixed gender and with gender based player labels) playing a repeated modified battle of the sexes[34] game

[34] Payoffs were (95, 168), (30, 30), (30, 30), (198, 99)

converge to a strategy of alternating between strategies over a number of rounds. A large proportion of subjects however also converge on a fixed strategy of choosing the same strategy repeatedly. With anonymous stranger matching females, more often than males, end up converging to an equilibrium which is their preferred (higher) outcome in the battle of the sexes game after a number of rounds[35]. Cooper et al. (1990) examine experimentally if, when multiple equilibria are present, some equilibria become more "natural" as a coordination outcome and find that a Pareto dominated outcome is often chosen. Arifovic et al. (2011) run 40 repeated rounds of the battle of the sexes game with fixed pairs and find that behaviour in this game often reaches an equilibrium in which subjects are alternating between strategies with a partner (thus leading to average equal monetary outcomes at the end of the experiment[36]) or settling on one Nash equilibrium.

The rest of this paper will be structured in the following way. In section three we present a novel experimental design which provides insights into the effects of gender information about a co-participant, coordination behaviour and punishment behaviour, in section four we present the results of the experiment and in section five we present a final discussion.

3. Experimental Design

The treatment variables used in this experiment were punishment, compromise and gender information. All three of these elements are explained and examined in the sections which follow.

3.1. Gender revelation process

As described in chapter one, Holm (2000) runs battle of the sexes games and uses two methods to make the gender of a co-participant salient to subjects. In one he merely wrote "male student" or "female student" on a subject's experimental instructions to indicate the gender of a co-participant. In another he used gender specific fake names to indicate gender. The issue of how to introduce gender information to subjects in this experiment is one which requires much care in achieving a sensible balance between making the gender of a co-participant salient to

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[35] They also run treatments in which subjects are introduced to each other face to face before they had any knowledge of the experiment) before the experiment and do not observe this effect here.
[36] All games were paid out at the end of the experiment.

subjects without inducing demand possible effects (See for example Zizzo, 2010). As in Datta Gupta et al. (2013) and Holm (2000) we use fake names to introduce a co-participant's gender to a subject. We also tell subjects that fake names relate to actual gender: In Datta Gupta et al. (2013) in particular, the importance of telling subjects that fake names are indicative of a subject's gender is examined and it is concluded that this is important in order to ensure that subjects make the connection between a fake name and gender identity. In practice, subjects were given a list of five names[37] at the beginning of the experiment (one for each period) and instructed to enter the fake name in the box on their screen when prompted. This is shown in the screen shoot from the experiment below:

[37] Names used were the same as those used in the chapter one

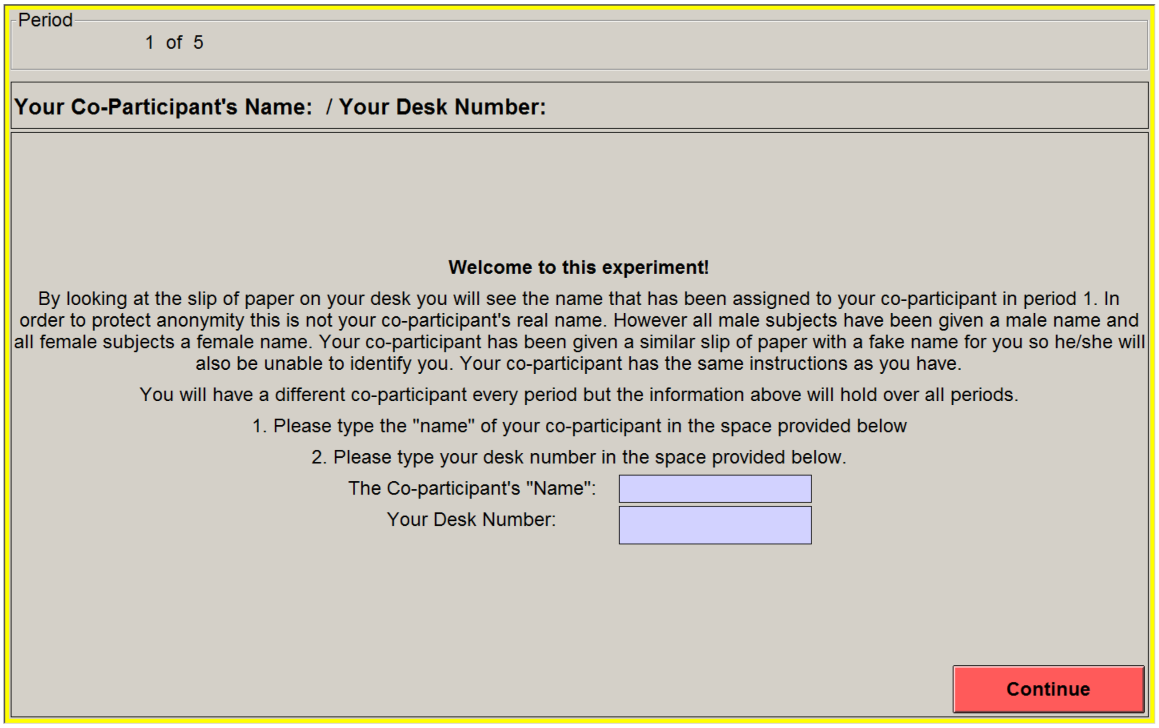

Figure 3.1.1. The welcome screen

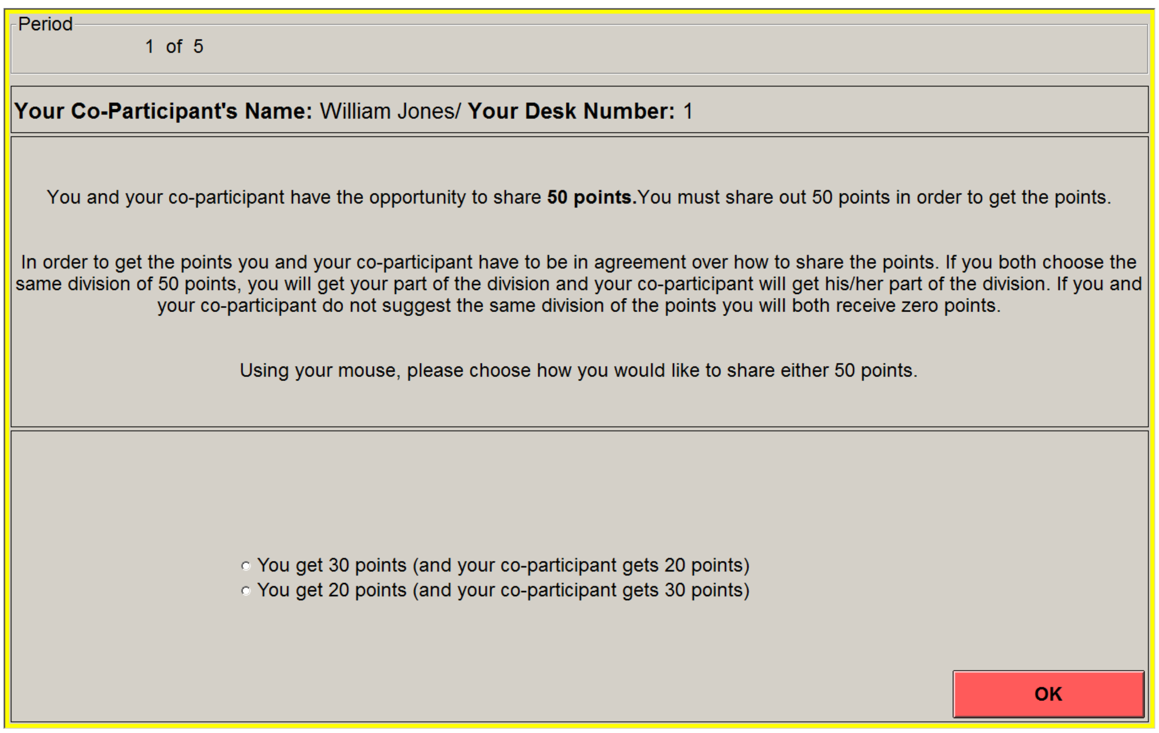

Figure 3.1.2. Game presentation in the experiment

3.2. Punishment technology

Subjects could engage in costly punishment after seeing the results of the coordination game but were aware that punishment would be available from the start of the experiment. Punishment was costly, an experimental method which was chosen for three reasons: The first is that this practice is common place in economic experiments involving punishment (such as those described above) and the second was in ensure that punishment decisions were based on a preference to do so and not due to subjects potential pure egotism (see Carpenter, 2006, for further discussion[38]). Third, Rabin (1993) develops a model in which people are willing to make financial sacrifices in order to inflict punishment on others. Subjects were given three punishment options:

1. To not punish
2. To take 10 points off their co-participant at a cost of 2 points to themselves
3. To take 50 points off their co-participant at a cost of 10 points to themselves[39].

The lower punishment level will be referred to as a “Slap on the Wrist” and the higher as “Full Monty[40]” in this paper[41]. Figuratively a “Slap on the Wrist” means to receive a light punishment (for doing something wrong). We use the term since this level of punishment was designed to allow subjects to send a minimal signal of punishment without being too harsh. Similarly, “Full Monty” means ‘everything which is necessary, appropriate, or possible’ and we use it since the level of punishment was high in comparison with possible earnings. These punishment options were listed for participants after they had seen the outcome of the game and the order in which the three options were presented was randomised. Subjects were aware that this punishment stage would be presented to them after the results of the game had been revealed from the beginning of the experiment. After all subjects had completed the punishment stage subjects

[38] They state that when punishment is costless *“there are equilibria in which strictly egoistic players punish alongside those with preferences to punish”* (Carpenter, 2006, p. 524)
[39] We decided on a cost of punishment at a level of 5:1 since this seemed like a viable “cost-punishment inflicted” ratio to be viable to subjects and to make them consider it seriously. The literature standard is 3:1. See Carpenter, 2006 and Rabin, 1993 for a further discussion of how decreasing the costs of punishment (i.e. increasing this ratio) leads to greater punishment levels.
[40] Definition taken from the online version of the Oxford English Dictionary (http://www.oed.com/view/Entry/253885). This is a commonly used phrase in British English slang.
[41] This terminology was not used in the experiment.

were informed if their co-participant had punished them and of their total earnings for that period.

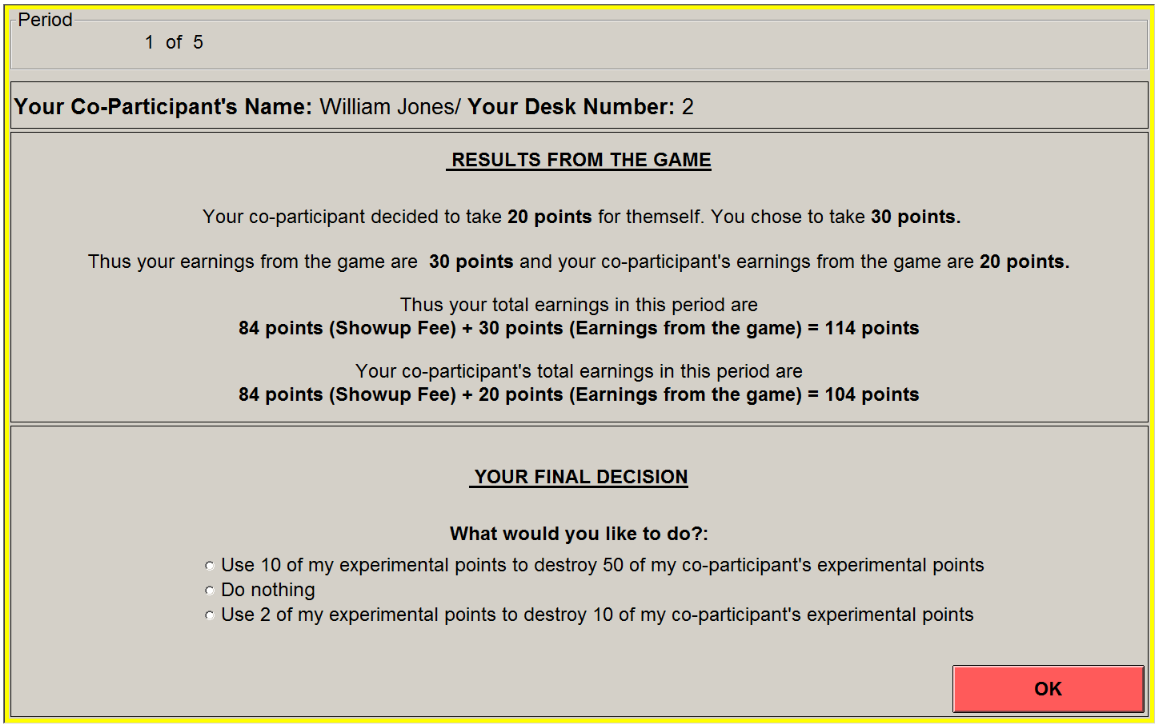

Figure 3.2.1. The results screen with punishment decision screen

3.3. The Games, Compromise Option and Theoretical Considerations

We use two variants of the battle of the sexes game[42]. There are a number of forms of this game but in the most common form the game is often used to describe the tension between a couple who have different preferences and thus payoffs from attending different events. However both achieve higher payoffs from attending an event together rather than attending a preferred event on their own. Going to one's own preferred event is described as hawkish behaviour, whereas going to a partner's preferred event is described as dovish behaviour. In our game subjects are presented with a simple list of ways in which amounts could be divided between them in which one subject will receive more than their co-participant if coordination occurs. The difficulties in achieving coordination in this game are evident. However if information on gender conveys ideas about who "should" choose the higher or lower amount, one would expect that mixed gender couples will achieve higher payoffs than pairings without gender information and unisex

[42] Luce & Raiffa (1957) provide an example of this type of asymmetric payoffs matrix.

pairings with gender information since knowing the gender of a co-participant is different to one's own may make one asymmetric equilibrium focal . Our second game is an adapted version of the game (battle of the sexes game with compromise) in which we add an inefficient equitable split to the options available to subjects. In this case subjects do have the opportunity to resolve the issue of inequality in payoffs but at the sacrifice of total earnings. Charness & Rabin (2002) find that *"inequality reduction is not a good explanation of Pareto damaging behaviour"* (Charness & Rabin, 2002, p.819) and it will be interesting to see if we observe similar results here as subjects are forced to take on a Pareto dominated outcome if they coordinate on an equitable outcome.

The battle of the sexes game takes the following form:

Table 3.3.1. Battle of the Sexes Game

		Player 2	
		Hawkish (β)	Dovish ($1-\beta$)
Player 1	Hawkish (α)	(0, 0)	(30, 20)
	Dovish ($1-\alpha$)	(20, 30)	(0, 0)

In this game there are two pure strategy Nash equilibria – when subjects coordinate on choosing {Hawkish, Dovish} or {Dovish, Hawkish}. To find possible non-degenerate mixed strategy equilibria, consider Player 1 to choose Hawkish with probability α and Player 2 to choose Hawkish with probability β[43]. Following the standard solution procedure, we get $\alpha^* = \beta^* = \frac{3}{5}$. It is shown in the appendix that the payoff from playing the mixed strategy equilibrium is 12 which is lower than either of the payoffs which could be achieved via coordination where the lowest possible payoff from coordination is 20.

We now complete the same analysis with our second game, the battle of the sexes game with a compromise option, a battle of the sexes game with the addition of an equal yet inefficient split of money:

[43] Additionally since subjects in the treatments without gender information have no contextual information in the game we would anticipate that these subjects would receive lower earnings than their counterparts in a treatment with common gender information since without contextual information the mixed strategy Nash equilibrium will be played. (See for example Mehta et al., 1994, Schelling, 1960)

Table 3.3.2. Battle of the Sexes with a Compromise Option

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)	(0, 0)
	Dovish (β_1)	(20, 30)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(15, 15)

This game has three pure strategy Nash equilibria, when subjects coordinate on either {Hawkish, Dovish}, {Dovish, Hawkish} or {Compromise, Compromise}. To calculate the possible non-degenerate mixed strategy equilibrium consider Player i (i = 1, 2) to choose Hawkish with probability α_i and Dovish with probability β_i. Following the standard procedure we find the equilibrium strategies for player 1 as: $\alpha_1^* = \frac{1}{3}$ and $\beta_1^* = \frac{2}{9}$. Similarly, the equilibrium strategy for player 2 is: $\alpha_2^* = \frac{1}{3}$ and $\beta_2^* = \frac{2}{9}$. Expected payoffs from the game are $6\frac{2}{3}$ points for each player. Finally, there exists an MSNE where player 1 mixes between a strategy of choosing hawkish and compromise and player 2 mixes between dovish and compromise (and vice versa) as shown in the table below.

Table 3.3.3. Battle of the Sexes with a Compromise Option (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise ($1-\alpha_2$)
Player 1	Hawkish (α_1)	(30, 20)	(0, 0)
	Compromise ($1-\alpha_1$)	(0, 0)	(15, 15)

In this case for player 1: $\alpha_1^* = \frac{3}{7}$ and $(1 - \alpha_1) = \frac{4}{7}$ and for player 2: $\alpha_2^* = \frac{1}{3}$ and $(1 - \alpha_1) = \frac{2}{3}$. The expected payoff from playing the MSNE is 10 for player 1 and $8\frac{12}{21}$ for player 2. All the calculations are included in the appendix.

In addition it is possible that gender serves as a signal to induce correlated equilibrium. In a correlated equilibrium players receive a signal about which equilibrium to coordinate on. After receiving this signal they have no motivation to deviate from this strategy since deviation would lead to a lower payoff than if they had not deviated. Gender could be such a signal if it offers conventions about which party should receive more. For example in an MF partnership there could be a convention that the male should receive the higher amount. Regardless of if one or both players believe that this is "right" they know that if they adhere to this convention both parties will end up with more since mis-coordination leads to zero payoffs. However, considering correlated equilibria does not add anything to the set of Nash equilibria.

We also believe it is relevant and interesting to consider aspect of theories of inequality aversion in this context. In Fehr & Schmidt (1999) peoples' perceptions of fairness are based on *the notion of an equitable outcome* (p.820). Therefore if subjects are inequality adverse we would expect to see high use of the equitable outcome. They also model what they term as "self-centred inequality aversion" as a form of inequality aversion where subjects *…are willing to give up some material payoff to move in the direction of more equitable outcomes* (p.819). We may therefore have further motivation to believe that costly punishment will be seen by subjects as a way in which to reduce inequality if it occurs. However due to coordination nature of the game, if an inequitable coordination outcome is achieved, the subject themselves must have made an inequitable (hawkish or dovish) strategy choice. In this case it would seem unlikely that following this decision, the decision to punish in order to "even up" inequitable payoffs would be made, unless subjects view punishment as a "tool" to even out outcomes before the game is even played – i.e. perhaps due to knowledge of certain social norms regarding expectations of who will choose hawkish or dovish (as discussed above) they play these options despite a "distaste" for the potential inequitable outcome but do so in order to aid coordination. However on achieving coordination punishment could be used as a "tool" to bring payoffs into a more equitable form.

3.4. Treatments and treatment labelling

The following notation will be used to denote treatments type: (N)G denotes if subjects did (not) receive gender information on a co-participant. (N)P denotes if subjects did (not) received access to a punishment technology. (N)C denotes if subjects had the option to pick an inefficient but equal split. Therefore:

Table 3.4.1. Treatment Variables

	Present	Not Present
Punishment	P	NP
Gender information	G	NG
Compromise option	C	NC

We thus label our treatments as follows in treatments with and without the inefficient but equal split (compromise):

Table 3.4.2. Treatment Table (without compromise)

	Punishment	No Punishment
Gender Information	G-P-NC	G-NP-NC
No Gender Information	NG-P-NC	NG-NP-NC

Table 3.4.3. Treatment Table (with compromise)

	Punishment	No Punishment
Gender Information	G-P-C	G-NP-C
No Gender Information	NG-P-C	NG-NP-C

The experiment therefore employs a 2x2x2 factorial design. In this way we can investigate first if there are social norms relating to gender that allow subjects to coordinate more effectively on a certain distribution, with or without the ability to punish, but also if certain actions result in greater punishment and sanctions. We also investigate if punishment is successful in converging male and female behaviour to any kind of social norm. It also allows us to investigate if game form is important in behavioural patterns.

3.5. Treatment Comparisons

The following treatment effects can easily be observed:

Effects of gender information (G-NP-NC v. NG-NP-NC, G-NP-C v. NG-NP-C): In the G-NP treatments subjects play the relevant game with gender information whilst in the NG-NP treatment the gender information is removed but the same game is played. A comparison of these two treatments thus provides us with a clean measure of the effects of gender information.

Effects of gender information with punishment (G-P-NC v. NG-P-NC, G-P-C v. NG-P-C): These treatment comparisons provide us with similar measures as above but in the presence of the punishment technology.

Effects of punishment (NG-P-NC v. NG-NP-NC, NG-P-C v. NG-NP-C): In the NG-NP treatment subjects play the game without the punishment technology present. In the NG-P treatment subjects play the same game but can punish a co-participant after seeing the results of the game. A comparison of these two treatments thus provides us with a clean measure of the effects of punishment.

Effects of punishment (G-P-NC v. G-NP-NC, G-P-C v. G-NP-C): These treatment comparisons provide us with similar measures as above but in the presence of the gender information.

Effects of the compromise option (-C suffixed games v. -NC suffixed games): In the -NC suffixed games subjects play a standard battle of the sexes game sometimes with the addition of the punishment technology and/or gender information. In the -C suffixed games subjects play the same games with the additional option of compromise. A comparison of these two treatments thus provides us with a clean measure of the effects of the compromise option.

3.6. Experimental Procedures and Practicalities

The experiment was run in a lab provided by the Centre for Behavioural and Experimental Social Science (CBESS) based on the UEA campus. The laboratory has 20 computer terminals, separated by a modular partitioning system. Through the CBESS experimental subject pool, which includes over 1500 registered participants from diverse demographic backgrounds and nationalities, we were able to recruit via the "Online Recruitment System for Economic Experiments - ORSEE" (Greiner, 2004).

Once recruited, subjects were told where and when to attend a session. Subjects entered the lab and were assigned to a seat. Subjects were able to read a set of paper instructions on their desk. The instructions were also read aloud to ensure that subjects had a thorough understanding of the experimental procedure. After the instructions were read aloud subjects were asked to complete a number of practice questions to ensure understanding. Subjects were told to raise their hands if they were unsure about anything.

Throughout the experiment no communication between participants was permitted at any time and subjects were seated in individual partitioned booths to ensure privacy. Subjects had been made aware of the procedures of random stranger matching and random period selection for payment in the instructions and understanding of these crucial elements was assessed in the practice questions. Instructions can be seen in the appendix to this chapter.

Subjects repeated the game five times using random stranger matching with feedback between periods. This meant that there was no opportunity to build reputation between pairs. Subjects played the game and made decisions separately and simultaneously and were then told the choice their co-participant had made and how this combined (with regards to earnings i.e. if they had coordinated with their co-participant) with their own choices. After seeing which strategy their co-participant had chosen, and consequently the outcome of the game, subjects were given the opportunity to punish their co-participant whilst also being aware that their co-participant was currently making the same decision. Subjects could choose to not punish or could choose to inflict costly punishment on their co-participant. Again subjects made this decision simultaneously and were only informed of their co-participant's decision after the decision had been made. In this way the decision to punish was based purely on own perceptions of behaviour rather than as retaliation for a co-participant punishing. The random stranger matching procedure also ensured that retaliation for punishment could not be inflicted on a co-participant in a later period. After seeing the punishment decision subjects moved onto the next period with a new co-participant.

4. Hypotheses

We investigate the following hypotheses:

Hypothesis 1: ***(Punishment)*** Punishment will affect behaviour.

We saw in the punishment literature above that the presence of punishment can affect behaviour. We thus hypothesise that it will also affect behaviour here. However, more specifically we investigate the following punishment based sub hypotheses:

> **Hypothesis 1a:** ***(Punishment and coordination)*** Coordination will decrease punishment activity.
>
> Due to the nature of the coordination game, successful coordination would suggest that a co-participant had acted in a way that had been expected or was seen as acceptable by a co-participant. Thus we would expect successful coordination to decrease punishment.
>
> **Hypothesis 1b:** ***(Own Gender and Punishment)*** Own gender will affect punishment rates.
>
> It has often been found in the biological and anthropological literature that males behave in a more aggressive and dominant way than females. For example Darwin describes females as more *coy* in their decision making whilst Tiger (2005) suggest that males are more dominant than females. However we have no direct evidence to support differing punishment behaviour in either direction with regard to gender. We therefore use hypothesis 1b.
>
> **Hypothesis 1c:** ***(Punishment and Choices)*** The addition of punishment will effect individual choice behaviour in the game.

In the past literature it has been found that punishment can have significant effects of behaviour (particularly in situation where a free-riding opportunity exists) as described in the literature section above. We would therefore expect behaviour to differ between comparable treatments with and without punishment. It should be noted that whilst the two sub-hypotheses above relate to actual punishment, this hypothesis relates to potential punishment or the threat of punishment.

Hypothesis 2: ***(Effects of Gender Information on choices)***

Hypothesis 2a: ***(Gender information and punishment rates)*** Gender information will affect punishment rates

Hypothesis 2b: ***(Gender information and choices)*** Gender information will affect choices made in the game

As illustrated in the review of literature above, we have very mixed evidence about the effects of gender information on choices in coordination game from previous studies. We therefore propose hypothesis 2b.

5. Results

In this results section we provide what we consider to be the most insightful and interesting results from the experiment. The experiment contains a large data set due to its 2x2x2 factorial design and so we report the findings we found to be most relevant to this investigation here. Where relevant, when examining the treatments with gender information, we report data for all four gender pairing subgroups: MM - A male playing against a male, FF - A female playing against a female, FM - A female playing against a male, MF - A male playing against a female. The following key is used to represent pairing types:

Table 5.1(a). Summary of Pairing Types

MM	male's decision against a male	→	Unisex Pairings
FF	female's decision against a female		
FM	female's decision against a male	→	Mixed Gender Pairings
MF	male's decision against a female		

We obtained the following number of observations in each subject subgroup:

Table 5.1(b). Number of observations per subject subgroup

	Treatments without gender information		Treatments with gender information			
Treatment	**Males**	**Females**	**MM**	**MF**	**FF**	**FM**
NG-NP-NC	30	30	n/a	n/a	n/a	n/a
NG-P-NC	30	30	n/a	n/a	n/a	n/a
G-P-NC	n/a	n/a	30	30	30	30
G-NP-NC	n/a	n/a	30	30	30	30
NG-NP-C	29	31	n/a	n/a	n/a	n/a
NG-P-C[44]	30	29	n/a	n/a	n/a	n/a
G-P-C	n/a	n/a	30	30	30	30
G-NP-C	n/a	n/a	30	30	30	30

We will now examine treatment effects in various directly measurable outcomes in the experiment and, where relevant, will examine within treatment effects between subject subgroups. Within this, we may also use a number of different subject subgroup comparisons in order to test the data and provide insights into behavioural patterns and these are explained in the table below. It should be noted that we may find significant effects in some of these comparisons for purely random reasons. A larger sample could be useful for future research in order to test for the robustness of these results.

[44] One subject had to be excluded from the data in this treatment since they failed to complete the demographic questionnaire and as such we could not confirm if this subject was male or female which was essential to analysis in this experiment.

Table 5.2. Summary of subject comparisons

Sub group analysed	**Purpose of analysis**
Males	How males are affected by treatment variables
Female	How females are affected by treatment variables
MM	How males playing against males are affected by treatment variables
FF	How females playing against females are affected by treatment variables
FM	How females playing against males are affected by treatment variables
MF	How males playing against females are affected by treatment variables
Males v. Females	How own gender effects behaviour
MM v. MF	How the gender of a co-participant affects male behaviour
FF v. FM	How the gender of a co-participant affects female behaviour
FF v. Females	How a female knowing a co-participant is female affects behaviour compared to not knowing the gender of a co-participant
FM v. Females	How a female knowing a co-participant is male affects behaviour compared to not knowing the gender of a co-participant
MM v. Males	How a male knowing a co-participant is male affects behaviour compared to not knowing the gender of a co-participant
MF v. Males	How a male knowing a co-participant is female affects behaviour compared to not knowing the gender of a co-participant

5.1. Period 1 Analysis Only (Independent Observations)

Since subjects were given feedback between games we first look at results from period one in isolation in order to examine the purely independent outcomes in the games. We find a number of interesting results which we report below. We use the chi-squared test (or the Fisher's exact test when observation numbers are low) when examining period one only since these observations can be deemed truly independent as subjects had previously received no feedback on choices made by a co-participant. It is also relevant and natural to look at individual choices in this experiment since choices are made in isolation from a co-participant and without communication.

5.1.1. Individual Choices (Period 1 only)

Let us first consider individual choices made by subjects. In order to provide a robustness check we first report results we find in period one of our experiment in treatment (G-NP-NC) in comparison to those found in Holm (2000). This comparison is relevant and interesting because in the G-NP-NC treatment we, as in Holm (2000), provide subjects with gender information about a co-participant, don't allow punishment and use and battle of the sexes type game. Also Holm's equivalent game was one shot and as such it is most relevant to consider only the first period of our experiment in this comparison.

Table 5.1.1.1. Choices made in battle of sexes treatment with gender information (G-NP-NC)

Pairing	Our Experiment (Period 1 only)		Holm (Name Labels)[45]		Holm (Gender Labels)[46]	
	Hawkish	**Dovish**	**Hawkish**	**Dovish**	**Hawkish**	**Dovish**
FF	46.67% (14)	53.33% (16)	55.3% (21)	44.7% (17)	66.7% (22)	33.3% (11)
MF	66.67% (20)	33.33% (10)	77.1% (37)	22.9% (11)	68.3% (28)	31.7% (13)
MM	50% (15)	50% (15)	55.3% (21)	44.7% (17)	51.9% (28)	48.1% (26)
FM	53.33% (16)	46.67% (14)	35.7% (10)	64.3% (18)	35.3% (6)	64.7% (11)

As reported in the table above, in both of Holm's experiments (with name labels and with gender labels) the difference in hawkish behaviour between those with a male and female co-participant was large. In the treatment with gender labels this was significant at p = 0.016** and in the treatment with name labels at p = 0.012** and thus significant at a 5% level using a chi-squared test. Using a (two-tailed) chi-squared test we do not find significant differences between behaviours dependent on the gender of a co-participant (when own gender is pooled).

[45] Subjects were told the gender of their co-participant via fake names which related to the gender of a co-participant.
[46] Subjects were told the gender of their co-participant directly i.e. "female" or "male" was indicated

However we find that in period one there is some evidence of difference between the behaviour of males only dependent on the gender of a co-participant. This however lies out with the standard levels of significance ($\beta = 1.7143$, $p = 0.190$)[47]. Certainly we are able to observe that, with regards to rankings, MF subjects are the most hawkish in both our experiment and in Holm (2000). Therefore if we consider only males in period one, we are able to observe some evidence of differences in hawkish behaviour depending on the gender of a co-participant. This provides some consistency with Holm's result in which subjects are more hawkish towards women than men.

> ***Result 1:*** *We have some evidence that males discriminate on the basis of gender of a co-participant. This is consistent with Holm (2000). As per Holm (2000) MF subjects rank highest in incidences of choosing the hawkish option.*

We will now consider the relevant treatment comparisons as defined above in order to complete our period one analysis. We will only consider hypotheses 1c and 2b in this section since hypotheses 1a, 1b and 2a relate to "actual" punishment rates which were too low in period one to conduct meaningful analysis. Let us first consider the effects of gender information on behaviour as described in hypothesis 2b. In order to provide a full picture of which subjects are driving behavioural differences due to the introduction of gender information we make the following set of treatment comparisons. The potential treatment effects that we can examine through these comparisons are shown above in table 5.2.1.2 below:

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[47] Tests about the significance of differences between MM, MF, MF and FF pairings are not reported in Holm (2000)

Table 5.1.1.2. Treatment comparisons for the effects of gender information

Treatment Comparisons	Subject subgroups analysed
G-NP-C v. NG-NP-C	1. All Subjects 2. Males Only 3. Females Only 4. FF (G) v. Females (NG) 5. FM (G) v. Females (NG) 6. MM (G) v. Males (NG) 7. MF (G) v. Males (NG)
G-NP-NC v. NG-NP-NC	
G-P-C v. NG-P-C	
G-P-NC v. NG-P-NC	

Our first comparison will be between the treatments G-NP and NG-NP (both with and without the compromise option as defined in the table above). As such here we are examining where, and to whom, gender information is relevant in causing behavioural differences since this is the variable which varies between treatments here. In particular, first we are examining this effect in isolation, without the presence of a punishment technology. We find that, when there is no punishment present, and where there is no compromise option available, and examining each of the genders separately using the comparisons detailed above in table 5.1.1.2., we observe no difference in behaviour between those with and without gender information. (Table 5.1 in the appendix).

However when subjects are given the compromise option we do find some effect of gender information. The addition of the option of a compromise is clearly having an effect on how gender information is utilised by subjects.

Table 5.1.1.3. Choices made with compromise (C) - Period 1 only

		Treatment							
		Males				Females			
		G-NP (All Males)	G-NP (MF)	G-NP (MM)	NG-NP (All Males)	G-NP (All Females)	G-NP (FM)	G-NP (FF)	NG-NP (All Females)
Amount taken	15 (Compromise)	48.33% (29)	43.33% (13)	53.33% (16)	41.38% (12)	53.33% (32)	50.00% (15)	56.67% (17)	41.94% (13)
	20 (Dovish)	25.00% (15)	26.67% (8)	23.33% (7)	44.83% (13)	30.00% (18)	36.67% (11)	23.33 (7)	38.71% (12)
	30 (Hawkish)	26.67% (16)	30.00% (9)	23.33 (7)	13.79% (4)	16.67% (10)	13.33% (4)	20.00% (6)	19.35% (6)

Using a two-tailed chi-squared test we find that gender information significantly decreases the use of the dovish option (β = 3.6758, p = 0.055) overall (all subjects pooled) and that this result is driven by males (β = 3.5644, p = 0.059). In turn we find that this result for males is driven by MM subjects in the G-NP treatment who are significantly less dovish than males in the NG-NP treatment (β = 3.0403, p = 0.081). There are no significant strategy choice differences between treatments on other strategy options.

We now make the same comparisons but this time we examine if the gender information effects we observed above manifest themselves differently in the presence of the punishment technology. It is important to note that when subjects made their first period decisions they were aware of the presence of a punishment technology, and thus the possibility of being punished, but had not yet had any experience of being punished as this decision was made after individual choices had been made. The effects of punishment here thus represent the pure "threat" of potential punishment.

If we consider the effects of gender when there is the possibility of punishment we again find that there are no effects of gender information in the treatments without a compromise option (table 5.2 in the appendix). However, again it is males in the treatment with a compromise option who drive differences in behaviour between treatments with and without gender information as seen in table 5.1.1.4 below:

Table 5.1.1.4. Choices made with compromise (C) and punishment (P) - Period 1 only

		Treatment							
		Males				**Females**			
		G-P (All Males)	G-P (MF)	G-P (MM)	NG-P (All Males)	G-P (All Females)	G-P (FM)	G-P (FF)	NG-P (All Females)
Amount taken	15 (Compromise)	46.67% (28)	50.00% (15)	43.33% (13)	66.67% (20)	60.00% (36)	70.00% (21)	50.00% (15)	62.07% (18)
	20 (Dovish)	21.67% (13)	16.67% (5)	26.67% (8)	16.67% (5)	20.00% (12)	13.33% (4)	26.67% (8)	24.14% (7)
	30 (Hawkish)	31.67% (19)	33.33% (10)	30.00% (9)	16.67% (5)	20.00% (12)	16.67% (5)	23.33% (7)	13.79% (4)

Whilst without punishment (and the compromise option present) we found that gender information decreases use of the dovish option in the treatments with gender information amongst MM subjects, with punishment gender information decreases the use of the equal option amongst males ($\beta = 3.2143$, $p = 0.073$). Again we find this phenomenon is driven by MM subjects who are significantly less likely to choose equal in the G-P-C treatment than their male counterparts in the NG-P-C treatment ($\beta = 3.2997$, $p = 0.069$).

> ***Result 2:*** *Thus combining these outcomes in the games with compromise we can conclude knowing the gender of a co-participant has the greatest effect on males who are playing against males. We find that males without gender information are significantly more likely to choose one of the lower outcomes (dovish or equal) than their MM counterparts both with and without punishment with the presence of punishment pushing males towards the even lower and equitable payoff option.*
> *We therefore have some evidence to support hypotheses 2b.*

Thus with the introduction of gender information (and perhaps the reduction in social distance) males playing against males move away from using the lower payoff strategies. We therefore have evidence that gender information affects behaviour amongst male subjects.

Let us now consider the effects of the presence of the punishment technology on behaviour in period one only. We are therefore considering hypothesis 1c. We will begin by examining the effects of the addition of a punishment technology in isolation of gender information. We therefore make the following subject comparisons here:

Table 5.1.1.5. Treatment comparisons for the effects of the punishment technology

Treatment Comparisons	Subject subgroups analysed
G-NP-C v. G-P-C	All pairing types (MM, MF, FF, FF), all males, all females
G-NP-NC v. G-P-NC	
NG-NP-C v. NG-P-C	all males, all females
NG-NP-NC v. NG-P-NC	

In the treatments without a compromise option (and no gender information) we find no differences in behaviour for either men or women between treatments with and without punishment present (Table 5.3. in the appendix). However, in the treatment with compromise it is again males who are affected by the treatment variable (Table 5.1.1.6. below).

Table 5.1.1.6. Choices made with compromise (C) - Period 1 only

		Treatment			
		Males		Females	
		NG-P (All Males)	NG-NP (All Males)	NG-P (All Females)	NG-NP (All Females)
Amount taken	15 (Compromise)	66.67 (20)	41.38 (12)	62.07 (18)	41.94 (13)
	20 (Dovish)	16.67 (5)	44.83 (13)	24.14 (7)	38.71 (12)
	30 (Hawkish)	16.67 (5)	13.79 (4)	13.79 (4)	19.35 (6)

With compromise available, males are significantly more likely to choose an equal outcome when there is punishment compared to when there is no punishment opportunity (β = 3.7990, p = 0.051). They also chose dovish less when punishment is present (β = 5.5158, p = 0.019). Females display no such differences in behaviour between treatments.

We now consider the same treatment effects but this time in the presence of gender information. We find there is no effect of punishment availability when there is no compromise option for both males and females (see tables 5.4. and 5.5 in the appendix). However in the treatment with a compromise option we find that FM subjects are affected by the availability of punishment (table 5.1.1.8). Males are not significantly affected (Table 5.1.1.7).

Table 5.1.1.7. Choices made by males with compromise (C) - Period 1 only

		Treatment					
		G-P-C (Males)	G-P-C (MM)	G-P-C (MF)	G-NP-C (Males)	G-NP-C (MM)	G-NP-C (MF)
Amount taken	15 (Compromise)	46.67 (28)	43.33 (13)	50.00 (15)	48.33 (29)	53.33 (16)	43.33 (13)
	20 (Dovish)	21.67 (13)	26.67 (8)	16.67 (5)	25.00 (15)	23.33 (7)	26.67 (8)
	30 (Hawkish)	31.67 (19)	30.00 (9)	33.33 (10)	26.67 (16)	23.33 (7)	30.00 (9)

Table 5.1.1.8. Choices made by females with compromise (C) - Period 1 only

		Treatment					
		G-P (Females)	G-P (FF)	G-P (FM)	G-NP (Females)	G-NP (FF)	G-NP (FM)
Amount taken	15 (Compromise)	60.00 (36)	50.00 (15)	70.00 (21)	53.33 (32)	56.67 (17)	50.00 (15)
	20 (Dovish)	20.00 (12)	26.67 (8)	13.33 (4)	30.00 (18)	23.33 (7)	36.67 (11)
	30 (Hawkish)	20.00 (12)	23.33 (7)	16.67 (5)	16.67 (10)	20.00 (6)	13.33 (4)

FM subjects are more dovish when there is no punishment available. They are less likely to choose a dovish strategy with punishment ($\beta = 4.3556$, $p = 0.037$). We summarise the results from the effects of the presence of the punishment technology here:

> ***Result 3:*** *Thus, in the presence of compromise, females' behaviour is only changed by the presence of punishment if gender information is present; males are only affected by the presence of punishment if gender information is not present. In the converse cases differences in behaviour are not observed.*

Perhaps we can conclude that behavioural changes in females are only triggered when they receive some kind of personal information about a co-participant. We therefore have evidence that supports hypothesis 1c. Also, as per the previous literature in the area of punishment, we also find that punishment has an effect on behaviours in some cases. The way in which punishment affects males and females is however different. As previously mentioned, one of the aims of this experiment was to investigate if punishment would affect behaviour when there is no free riding opportunity. As illustrated, dependent on the game type, the presence of punishment does indeed have an effect on behaviours.

In order to complete our analysis of our period one data we conduct chi-squared tests to establish if the MSNEs calculated above bear any resemblance to the actual behaviour we observe in the game. We only examine period one data here because it allows us to examine truly independent observations as required by the chi-squared test. Using a 5% significance level we find that the cells shaped in grey represent behaviour which is significantly similar to that predicted by the MSNE. The values reported are p-values.

It is interesting to note that in the games in which there was no gender information and no compromise option (i.e. the battle of the sexes game with no subject information) the MSNE in which subjects mix between dovish and hawkish is good predictor of actual behaviour. This result could be predicted by the theory above in that, in the absence of any focal outcome (for example an equal outcome) subjects resort to playing the MSNE.

We also find that the MSNE All is a (weak) predictor of behaviour in games with compromise and no gender information for females only. However when gender information and compromise is present the MSNE All becomes a good predictor of behaviour for all pairing types expect FM subjects where behaviour is significantly different from the MSNE where subjects mix over all three strategy options in this game format.

Table 5.1.1.9. Comparisons to predicted MSNE (Period 1 only)

Males	MSNE All[48]	MSNE DH[49]	MSNE HE (P1)[50]	MSNE DE (P2)
NG-NP-C	0.01	0.00	0.15	0.13
NG-P-C	0.04	0.00	0.05	0.29
NG-NP-NC	n/a	0.93	n/a	n/a
NG-P-NC	n/a	0.18	n/a	n/a
Females				
NG-NP-C	0.05	0.02	0.45	0.24
NG-P-C	0.07	0.00	0.07	0.58
NG-NP-NC	n/a	0.93	n/a	n/a
NG-P-NC	n/a	0.54	n/a	n/a
MM				
G-NP-C	0.48	0.01	0.49	0.43
G-P-C	0.83	0.05	0.95	0.24
G-NP-NC	n/a	0.54	n/a	n/a
G-P-NC	n/a	0.33	n/a	n/a
MF				
G-NP-C	0.83	0.05	0.95	0.24
G-P-C	0.73	0.02	0.90	0.15
G-NP-NC	n/a	0.76	n/a	n/a
G-P-NC	n/a	0.76	n/a	n/a
FF				
G-NP-C	0.27	0.01	0.27	0.51
G-P-C	0.50	0.02	0.57	0.44
G-NP-NC	n/a	0.33	n/a	n/a
G-P-NC	n/a	0.76	n/a	n/a
FM				
G-NP-C	0.04	0.00	0.15	0.51
G-P-C	0.02	0.00	0.03	0.16
G-NP-NC	n/a	0.76	n/a	n/a
G-P-NC	n/a	0.54	n/a	n/a

In summary we find the following treatment effects with regard to individual choices when considering period one only. We find that all significant differences between treatments are found when there is a compromise option available. We thus conclude that the addition of the compromise option is an important element in activating the treatments effects we examine both with regard to the availability of gender information and the presence of the punishment

[48] MSNE where subjects mix between all three strategy options
[49] MSNE where subjects mix between the dovish and hawkish strategy options
[50] These 2 columns represent the MSNE where one player mixes between hawkish and equal with the expectation that the other player mixes between dovish and equal (and vice versa)

technology and have evidence that hypothesis 3 can be accepted since the compromise option does appear to be affecting behaviour. Also males and in particular MM subjects are significantly affected by gender information. Finally, males' behaviour is affected by punishment technology with no gender information present whereas females' behaviour is affected by punishment only if gender information is present.

5.2. Dynamic Models (All periods)

We now move onto examining behaviour over all periods. Using a dynamic panel probit model run with the option of robust standard errors clustered on the individual level, we examine strategy choices in the games and punishment behaviour over all periods. We use the probit model in line with much of the literature in this area. Whilst logit models were also considered, the probit model provided very similar but intuitive solution and also provides a distribution with flatter tails than the logit model. The probit model was also chosen since it provides coefficients of between 0 and 1 meaning we are able to present marginal probabilities in our results tables. Also, in contrast to maximum likelihood models, the probit model allows us to avoid issues of heteroscedasticity.

We will include a number of different demographic variables at this stage of analysis. We collected self-reported demographic information from subjects on gender, country of origin, faculty of study and level of study. With regard to country of origin, we use categories of Western Europe and South/South East Asian in our data analysis[51]. In order to categorise subjects into these two categories we use definitions from the CIA World Fact Book[52] (South/South East Asian) and the UCLA Center for European and Eurasian Studies[53] (Western Europe).

- South/South East Asian: China, Hong Kong, Indonesia, Japan, Macau, Malaysia, Singapore, Taiwan, Thailand, Vietnam
- Western Europe: Austria, Finland, France, Germany, The Netherlands, Greece, Ireland, Italy, UK

[51] One subject declared their country of origin as "Meida". We were unable to identify this as a country and as such these subject is left out of this categorisation.
[52] https://www.cia.gov/library/publications/the-world-factbook/wfbExt/region_eas.html
[53] http://www.international.ucla.edu/euro/countries/westeurope/

- Other declared regions: Azerbaijan, Brazil, Bulgaria, Canada, Columbia, Congo, Czech Republic, Ghana, Hungary, India, Jordan, Kenya, Liberia, Lithuania, Malawi, Mauritius, Mexico, Nigeria, Pakistan, Peru, Poland, Romania, Solomon Islands, Sri Lanka, Ukraine, USA, Venezuela, Zimbabwe

We provide a summary of the demographic data is shown below in table 5.2.1(a). In order to check for collinearity between independent demographic variables we run tests using pairwise correlation coefficients on all demographic variable used in the tables below. Using the standard range of coefficients for strongly co-linear relationships (-0.9 to 0.9) we do not find any collinearity between variables which would be deemed of concern using standard measures. The pairwise correlation coefficients are presented in the appendix for this chapter.

Table 5.2.1(a). Summary of Demographic Data (Without Compromise - NC)

	NG-NP-NC		NG-P-NC		G-NP-NC				G-P-NC			
	Males	Females	Males	Females	MM	MF	FF	FM	MM	MF	FF	FM
South-East Asian	53.33%	53.33%	16.67%	46.67%	43.33%	40%	66.67%	63.33%	36.67%	20%	46.67%	75.86%
Western European	40%	23.33%	60%	36.67%	53.33%	50%	23.33%	23.33%	56.67%	53.33%	26.67%	20.69%
Undergraduates	56.67%	43.33%	86.67%	50%	60%	63.33%	33.33%	43.33%	76.67%	73.33%	50%	40%
Social Sciences Students	60%	53.33%	30%	36.67%	60%	50%	50%	60%	46.67%	36.67%	56.67%	56.67%
Humanities Students	26.67%	23.33%	20%	36.67%	6.67%	16.67%	23.33%	20%	23.33%	13.33%	10%	26.67%

Table 5.2.1(b). Summary of Demographic Data (With Compromise - C)

	NG-NP-C		NG-P-C		G-NP-C				G-P-C			
	Males	Females	Males	Females	MM	MF	FF	FM	MM	MF	FF	FM
South-East Asian	24.14%	58.06%	20%	41.38%	23.33%	20%	33.33%	30%	30%	20%	26.67%	23.33%
Western European	68.97%	25.81%	66.67%	34.48%	66.67%	66.67%	26.67%	43.33%	56.67%	50%	43.33%	50%
Undergraduates	82.76%	54.84%	70%	55.17%	90%	86.67%	63.33%	63.33%	86.67%	80%	73.33%	73.33%
Social Sciences Students	44.83%	51.61%	23.33%	55.17%	60%	53.33%	46.67%	40%	53.33%	40%	26.67%	50%
Humanities Students	17.24%	16.13%	20%	20.69%	13.33%	13.33%	10%	20%	20%	20%	30%	23.33%

We now present the results of the experiment over all periods. For reference we provide a summary of choices (strategy choices in the game and punishment decisions) and coordination outcomes from all periods into the two tables which follow. The first provides a summary of the data without compromise (NC) whilst the second provides a summary of the treatment with compromise (C).

Table 5.2.2(a). Summary of Choice Data over all periods (Without Compromise - NC)[54]

	NG-NP-NC		NG-P-NC		G-NP-NC				G-P-NC			
	Males	Females	Males	Females	MM	MF	FF	FM	MM	MF	FF	FM
Number of Subjects	30[55]	30	30	30	30	30	30	30	30	30	30	30
Number of observations	150	150	150	150	150	150	150	150	150	150	150	150
Coordination rates	42% (63)	36.67% (55)	46% (69)	40.67% (61)	45.33% (68)	54% (81)	53.33% (80)	54% (81)	54.67% (82)	43.33% (65)	53.33% (80)	43.33% (65)
Hawkish	57.33% (86)	63.33% (95)	54% (81)	62.67% (94)	52% (78)	57.33% (86)	54.67% (82)	54% (81)	51.33% (77)	58% (87)	54.67% (82)	60% (90)
Dovish	42.67% (64)	36.67% (55)	46% (69)	37.33% (56)	48% (72)	42.67% (64)	45.33% (68)	46% (69)	48.67% (73)	42% (63)	45.33% (68)	40% (60)
Slap on the Wrist	n/a	n/a	4% (6)	10.67% (16)	n/a	n/a	n/a	n/a	4.67% (7)	12% (18)	12.67% (19)	8.67% (13)
Full Monty	n/a	n/a	3.33% (5)	4% (6)	n/a	n/a	n/a	n/a	3.33% (5)	2.67% (4)	2.67% (4)	2% (3)

[54] Key for data: Percentage (Number of observations)
[55] There are half as many total observations in this treatment as no gender information was given to students. Thus whilst we wanted to obtain 30 observations of each category of subject with gender information (i.e. MM, MF, FF, FM so 120 observations) we only needed 30 each for males and females in the treatment without gender information.

Table 5.2.2(b). Summary of Choice Data over all periods (With Compromise - C)[56]

	NG-NP-C		NG-P-C		G-NP-C				G-P-C			
	Males	Females	Males	Females	MM	MF	FF	FM	MM	MF	FF	FM
Number of Subjects	29	31	30	29	30	30	30	30	30	30	30	30
Number of observations	145	155	150	145	150	150	150	150	150	150	150	150
Coordination on unequal	19.31% (28)	15.48% (24)	3.33% (5)	4.83% (7)	13.33% (20)	17.33% (26)	5.33% (8)	17.33% (26)	8% (12)	3.33% (5)	10.67% (16)	3.33% (5)
Coordination on equal	26.21% (38)	21.94% (34)	40% (60)	41.38% (60)	20% (30)	18.67% (28)	36% (54)	18.67% (28)	22.67% (34)	59.33% (89)	21.33% (32)	59.33% (89)
Hawkish	29.66% (43)	22.58% (35)	18.67% (28)	17.93% (26)	31.33% (47)	39.33% (59)	23.33% (35)	25.33% (38)	26.67% (40)	16.67% (25)	28.67% (43)	12% (18)
Dovish	24.83% (36)	30.32% (47)	20% (30)	19.31% (28)	22.67% (34)	15.33% (23)	17.33% (26)	30% (45)	17.33% (26)	11.33% (17)	24.67% (37)	8.67% (13)
Equal	45.52% (66)	47.1% (73)	61.33% (92)	62.76% (91)	46% (69)	45.33% (68)	59.33% (89)	44.67% (67)	56% (84)	72% (108)	46.67% (70)	79.33% (119)
Slap on the Wrist	n/a	n/a	3.33% (5)	8.28% (12)	n/a	n/a	n/a	n/a	8% (12)	2% (3)	8% (12)	8% (12)
Full Monty	n/a	n/a	4% (6)	4.83% (7)	n/a	n/a	n/a	n/a	14.67% (22)	2% (3)	2.67% (4)	4% (6)

[56] Key for data: Percentage (Number of observations)

5.2.1. The effect of repeated games on individual choices

First we examine individual strategy choices made in the games defined above. In the analysis of individual choices which follows we use the following variables. We provide a definition and explanation of each here:

Table 5.2.1.1. Variables in dynamic analysis

Variable	Explanation
Gender information available	Dummy on if subject was given gender information on a co-participant
Punishment available	Dummy on if subject had access to the punishment technology
Hawkish lag	Dummy on if a subject choose hawkish in the previous period
Dovish lag	Dummy on if a subject choose dovish in the previous period
Equal lag	Dummy on if a subject choose equal in the previous period
Co-participant hawkish lag	Dummy on if a subject's co-participant in the previous period choose hawkish
Co-participant dovish lag	Dummy on if a subject's co-participant in the previous period choose dovish
Co-participant equal lag	Dummy on if a subject's co-participant in the previous period choose equal
Coordination achieved in previous period	Dummy on if a subject coordinated in the previous period
Co-participant "Full Monty" lag	Dummy on if a subject's co-participant in the previous period choose to punish the subject using "Full Monty"
Co-participant "Slap on the Wrist" lag	Dummy on if a subject's co-participant in the previous period choose to punish the subject using "Slap on the Wrist"
"Full Monty" lag	Dummy on if a subject choose to punish using "Full Monty" in the previous period
"Slap on the Wrist" lag	Dummy on if a subject choose to punish using "Slap on the Wrist" in the previous period
Males	Dummy on if a subject was male
South-East Asian[57]	Dummy on if a subject was from South/ South-East Asia[58]
Western European	Dummy on if a subject was from Western Europe[59]
Undergraduates	Dummy on if a subject was an undergraduate
Social Sciences Students	Dummy on if a subject was studying a Social Science Subject
Humanities Students	Dummy on if a subject was studying a Humanities Subject
Science and Medicine Students	Dummy on if a subject was studying a Science or Medical Subject

[57] In a few cases one or more of these demographic variables is not included due to that demographic not being adequately represented in the sub-category being examined.
[58] See definition above.
[59] See definition above.

As we proceeded in the period one analysis above, let us first examine the effects of gender information on individual choices. We will therefore make the treatment comparisons listed in table 5.1.1.2 above. As previously, in order to provide a full picture of behavioural patterns we first analyse data for all subjects before subsequently providing the same analysis for each of the genders (males and females) separately. Where appropriate and interesting, and for the sake of brevity, we also report findings comparing behaviours by individual gender pairing types (MM, MF, FF and FM) to those of the same gender in the treatments without gender information.

Let us first consider the games without the compromise option available (suffix -NC). This analysis offers some interesting results both with and without the presence of the punishment technology. First we consider the effects of gender information in the presence of the punishment technology. The analysis of treatment effects between the games G-P-NC and NG-P-NC is shown in table 5.6 in the appendix. We find that it is only when we look at females in isolation that we see the effects of gender information becoming evident: with gender information present female subjects are more likely to choose dovish ($\beta = 0.461$) and less likely to choose hawkish ($\beta = -0.461$). We therefore conclude that the marginal decrease (increase) in probability of choosing hawkish (dovish) is 46.1% for female subjects with gender information compared to females without gender information. This interpretation of the coefficients can also be applied to all the coefficients reported below: We find that this result is driven by FF subjects as shown in table 5.2.1.2 ($\beta = 0.439$ – dovish, $\beta = -0.439$ – hawkish). No such differences are found for males (Tables 5.6 and 5.7 in the appendix)

> ***Result 4:*** *Without the compromise option, females (and in particular females in unisex pairings) are affected by gender information in the presence of punishment. Males are not. Females are therefore less likely to exhibit hawkish behaviour when they have gender information available. We therefore have evidence to support hypothesis 2b.*

Table 5.2.1.2. The effect of gender information – G-P-NC (FF subjects) v. NG-P-NC (Female subjects)[60]

	30 (Hawkish)	20 (Dovish)
FF Subjects (with gender info) **Base: Females subjects without gender information**	-0.439* (0.23)	0.439* (0.23)
Hawkish lag **Base: Dovish lag**	0.486 (0.34)	-0.486 (0.34)
Co-participant hawkish lag **Base: Co-participant dovish lag**	-1.118*** (0.20)	1.118*** (0.20)
Coordination achieved in previous period	-0.074 (0.20)	0.074 (0.20)
Co-participant "Full Monty" lag	-0.658 (0.52)	0.658 (0.52)
Co-participant "Slap on the Wrist" lag	-0.362 (0.29)	0.362 (0.29)
"Full Monty" lag	-0.050 (0.29)	0.050 (0.29)
"Slap on the Wrist" lag	-0.454 (0.57)	0.454 (0.57)
South-East Asian	0.210 (0.28)	-0.210 (0.28)
Western European	-0.059 (0.27)	0.059 (0.27)
Undergraduates	0.071 (0.20)	-0.071 (0.20)
Social Sciences Students	0.109 (0.26)	-0.109 (0.26)
Humanities Students **Base: Medicine and science students**	-0.384 (0.31)	0.384 (0.31)
Constant	0.933** (0.41)	-0.933** (0.41)
No. of Obs.	240	240
Wald chi2(13)	43.50	43.50

We are unable to observe any effects of the availability of gender information here without the punishment technology present (i.e. G-NP-NC v. NG-NP-NC as shown in table 5.8 in the appendix) unlike in the comparable treatments with a punishment technology available. This result also holds when we consider pairing types individually. We hypothesise that the presence of punishment is required in order to "activate" the effects of having gender information on a co-participant. We will see in the section that follows that this same result also appears with the compromise option available but we will discuss this in more detail after the appropriate results section.

Therefore, let us now consider the same comparisons of treatments but with the compromise option available. As in the previous analysis without the compromise option we will first consider a comparison of treatments with punishment present. The comparison of G-P-C and NG-P-C is shown in table 5.2.1.3(a) below. We notice a number of interesting results here: We find that males are the more likely to choose the equal strategy with gender information available ($\beta = 0.347$)[61]. In order to examine this result further, in the tables which follow, we

[60] Throughout this thesis we will use the following key to indicate significance within the tables:
* significant at 10% level
** significant at 5% level
** significant at 1% level

[61] We note that the coefficient on "Western European" is also significant for the dependent variable "Hawkish" in the regression. We therefore run two further regressions restricting our sample to 1.Western European males and

also individually compare behaviour in the two different "types" of males pairing with gender information (MM and MF) with the behaviour of males in the treatments without gender information. We find that significant differences in behaviour are observed between males with a (known) female partner (MF pairings in the treatment with gender information - as shown in table 5.2.1.3(b) below - $\beta = 0.491$) as compared to males without gender information. We observe no such significance for MM pairings (with gender information) when compared to those males without gender information. With the compromise option available, we also find that females in mixed gender pairings (FM) are more likely to choose equal than females without gender information as shown in table 5.2.1.3(c) below ($\beta = 0.419$). We however do not observe this result when we pool all females.

> ***Result 5:*** *With the compromise option and punishment technology available, males are more likely to choose equal if they have gender information available. We did not observe this effect for males in the same comparisons of treatments without the compromise option. We find that this effect is also universal to mixed gender pairings in these treatment comparisons. Without the compromise option available gender effects were only observed for FF subjects. We therefore have further evidence to support hypothesis 2b.*

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2. Non-western European males only. We find that the coefficient on our treatment variable ("Gender information available") does not differ significantly (we report the p values from a t-test for differences between the reported coefficients from males only and in the two nationality subgroups) and it remains negative and insignificant. We view this as a robustness check of our data:
Western Europeans Males: $\text{Coefficient}_{(\text{Hawkish})} = -0.4030745$, $p = 0.4857$
Non Western European Males: $\text{Coefficient}_{(\text{Hawkish})} = -0.2843279$, $p = 0.5616$

Table 5.2.1.3(a). The effect of gender information – G-P-C v. NG-P-C

		30 (Hawkish)	20 (Dovish)	15 (Equal)
All subjects	Gender information available	0.027 (0.14)	-0.232* (0.13)	0.151 (0.12)
	Hawkish lag	1.756*** (0.17)	0.364** (0.17)	-1.805*** (0.17)
	Dovish lag **Base: Equal lag**	0.934*** (0.17)	1.033*** (0.16)	-1.588*** (0.16)
	Co-participant hawkish lag	0.217 (0.17)	0.459*** (0.16)	-0.648*** (0.16)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.881*** (0.17)	0.210 (0.17)	-1.028*** (0.18)
	Coordination Achieved in the previous period	0.202 (0.16)	-0.246 (0.16)	-0.232 (0.16)
	Co-participant "Full Monty" lag	-0.517* (0.28)	0.400* (0.24)	0.109 (0.24)
	Co-participant "Slap on the Wrist" lag	0.444** (0.22)	0.116 (0.23)	-0.531**(0.23)
	"Full Monty" lag	0.005 (0.25)	-0.244 (0.26)	0.160 (0.23)
	"Slap on the Wrist" lag	0.209 (0.28)	0.049 (0.25)	-0.257 (0.25)
	Males	0.117 (0.18)	0.058 (0.18)	-0.147 (0.17)
	South-East Asian	-0.205 (0.18)	0.054 (0.18)	0.114 (0.16)
	Western European	0.003 (0.13)	-0.081 (0.13)	0.024 (0.12)
	Undergraduates	0.094 (0.16)	0.152 (0.15)	-0.160 (0.14)
	Social Sciences Students	-0.165 (0.16)	0.157 (0.15)	0.056 (0.14)
	Humanities Students **Base: Medicine and science students**	-0.042 (0.18)	0.047 (0.18)	0.029 (0.16)
	Constant	-1.862*** (0.26)	-1.469*** (0.25)	1.531*** (0.24)
	No. of Obs.	716	716	716
	Wald chi2(16)	157.80	77.93	230.16
Males	Gender information available	-0.068 (0.22)	-0.454* (0.21)	0.347* (0.19)
	Hawkish lag	2.112*** (0.26)	-0.029 (0.26)	-2.029*** (0.29)
	Dovish lag **Base: Equal lag**	1.122*** (0.26)	0.813*** (0.24)	-1.682*** (0.28)
	Co-participant hawkish lag	0.500** (0.25)	0.389 (0.25)	-1.009*** (0.29)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.863*** (0.26)	0.365 (0.25)	-1.295*** (0.30)
	Coordination Achieved in the previous period	0.350 (0.24)	-0.291 (0.23)	-0.529* (0.30)
	Co-participant "Full Monty" lag	-0.430 (0.36)	0.225 (0.33)	0.233 (0.31)
	Co-participant "Slap on the Wrist" lag	0.193 (0.31)	0.280 (0.30)	-0.480 (0.31)
	"Full Monty" lag	0.071 (0.42)	0079 (0.35)	-0126 (0.35)
	"Slap on the Wrist" lag	0.197 (0.39)	0.437 (0.39)	-0.581 (0.37)
	Males	n/a	n/a	n/a
	South-East Asian	-0.335 (0.30)	0.335 (0.30)	-0.017 (0.28)
	Western European	-0.630** (0.30)	0.096 (0.30)	0.367 (0.27)
	Undergraduates	0.308 (0.31)	0.349 (0.29)	-0.425 (0.26)
	Social Sciences Students	0.048 (0.24)	0.308 (0.23)	-0.216 (0.22)
	Humanities Students **Base: Medicine and science students**	0.147 (0.28)	-0.496 (0.30)	0.285 (0.24)
	Constant	-2.001*** (0.38)	-1.559*** (0.39)	1.829*** (0.39)
	No. of Obs.	360	360	360
	Wald chi2(15)	92.54	42.64	108.39
Females	Gender information available	-0.025 (0.19)	-0.109 (0.19)	0.083 (0.18)
	Hawkish lag	1.528*** (0.26)	0.688*** (0.26)	-1.800*** (0.25)
	Dovish lag **Base: Equal lag**	0.843*** (0.23)	1.193*** (0.23)	-1.666*** (0.23)
	Co-participant hawkish lag	-0.005 (0.24)	0.344 (0.23)	-0.333 (0.23)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.853*** (0.24)	0.162 (0.25)	-0.995*** (0.25)
	Coordination Achieved in the previous period	0.032 (0.24)	-0.128 (0.23)	-0.141 (0.22)
	Co-participant "Full Monty" lag	-0.842* (0.51)	0.720* (0.41)	-0.042 (0.43)
	Co-participant "Slap on the Wrist" lag	0.621* (0.33)	-0.084 (0.37)	-0.577 (0.36)
	"Full Monty" lag	0.346 (0.42)	0.235 (0.37)	-0.479 (0.39)
	"Slap on the Wrist" lag	-0.200 (0.34)	-0.712* (0.41)	0.627* (0.32)
	Males	n/a	n/a	n/a
	South-East Asian	0.490 (0.25)	-0.192 (0.25)	-0.268 (0.24)
	Western European	0.048 (0.24)	-0.045 (0.23)	0.016 (0.22)
	Undergraduates	0.074 (0.20)	0.067 (0.20)	-0.103 (0.19)
	Social Sciences Students	-0.473 (0.23)	0.189 (0.23)	0.268 (0.22)
	Humanities Students **Base: Medicine and science students**	-0.191 (0.24)	0.306 (0.24)	-0.107 (0.23)
	Constant	-1.668*** (0.36)	-1.573*** (0.35)	1.450*** (0.34)
	No. of Obs.	356	356	356
	Wald chi2(15)	72.84	50.30	121.18

Table 5.2.1.3(b). The effect of gender information – G-P-C (MF subjects) v. NG-P-C (Males)

	30 (Hawkish)	20 (Dovish)	15(Equal)
MF Subjects (with gender info) **Base: Males subjects without gender information**	-0.448 (0.28)	-0.211 (0.27)	0.491** (0.24)
Hawkish lag	2.639*** (0.48)	-0.091 (0.35)	-1.880*** (0.36)
Dovish lag **Base: Equal lag**	1.863*** (0.48)	0.736** (0.32)	-1.726*** (0.35)
Co-participant hawkish lag	0.070 (0.38)	0.745** (0.33)	-0.982*** (0.36)
Co-participant dovish lag **Base: Co-participant equal lag**	0.628* (0.38)	0.385 (0.31)	-1.046*** (0.34)
Coordination Achieved in the previous period	0.943** (0.43)	-0.479 (0.33)	-0.438 (0.36)
Co-participant “Full Monty” lag	0.034 (0.64)	0.597 (0.52)	-0.504 (0.49)
Co-participant “Slap on the Wrist” lag	0.176 (0.42)	0.293 (0.38)	-0.522 (0.37)
“Full Monty” lag	0.832 (0.73)	-0.326 (0.68)	-0.353 (0.70)
“Slap on the Wrist” lag	0.625 (0.93)	0.448 (0.57)	-0.822 (0.54)
South-East Asian	-0.414 (0.44)	0.621 (0.44)	-0.296 (0.36)
Western European	-0.774 (0.42)	0.577 (0.42)	0.021 (0.33)
Undergraduates	0.620 (0.43)	0.026 (0.37)	-0.262 (0.32)
Social Sciences Students	0.490 (0.34)	-0.037 (0.32)	-0.225 (0.28)
Humanities Students **Base: Medicine and science students**	0.041 (0.41)	-0.368 (0.34)	0.380 (0.31)
Constant	-2.746*** (0.59)	-1.691*** (0.53)	1.932*** (0.47)
No. of Obs.	240	240	240
Wald chi2(15)	53.65	35.50	77.86

Table 5.2.1.3(c). The effect of gender information – G-P-C (FM subjects) v. NG-P-C (Females)

	30 (Hawkish)	20 (Dovish)	15(Equal)
FM Subjects (with gender info) **Base: Females subjects without gender information**	-0.118 (0.27)	-0.452 (0.25)	0.419* (0.23)
Hawkish lag	1.754*** (0.40)	0.773** (0.36)	-2.018*** (0.38)
Dovish lag **Base: Equal lag**	1.115*** (0.34)	0.994*** (0.31)	-1.653*** (0.33)
Co-participant hawkish lag	0.423 (0.37)	0.468 (0.32)	-0.796** (0.34)
Co-participant dovish lag **Base: Co-participant equal lag**	1.222*** (0.36)	0.149 (0.36)	-1.275*** (0.36)
Coordination Achieved in the previous period	-0.253 (0.38)	-0.038 (0.32)	-0.112 (0.33)
Co-participant “Full Monty” lag	-1.235* (0.72)	0.439 (0.55)	0.452 (0.56)
Co-participant “Slap on the Wrist” lag	0.827 (0.51)	-0.342 (0.63)	-0.501 (0.49)
“Full Monty” lag	-0.167 (0.55)	0.595 (0.43)	-0.359 (0.44)
“Slap on the Wrist” lag	-0.981* (0.53)	-0.390 (0.48)	1.083** (0.45)
South-East Asian	0.749** (0.40)	-0.336 (0.34)	-0.338 (0.32)
Western European	-0.068 (0.36)	0.040 (0.31)	-0.085 (0.30)
Undergraduates	-0.076 (0.28)	0.084 (0.27)	0.028 (0.25)
Social Sciences Students	-0.336 (0.35)	0.128 (0.30)	0.133 (0.31)
Humanities Students **Base: Medicine and science students**	0.027 (0.39)	-0.095 (0.35)	0.019 (0.34)
Constant	-1.936*** (0.52)	-1.471*** (0.46)	1.572*** (0.47)
No. of Obs.	236	236	236
Wald chi2(15)	45.71	29.45	72.26

Table 5.2.1.3(d). The effect of gender information – G-P-C (FF subjects) v. NG-P-C (Females)

	30 (Hawkish)	**20 (Dovish)**	**15(Equal)**
Gender information available	0.129 (0.22)	0.108 (0.22)	-0.215 (0.21)
Hawkish lag	1.329*** (0.29)	0.772** (0.31)	-1.806*** (0.31)
Dovish lag **Base: Equal lag**	0.583** (0.27)	1.235*** (0.27)	-1.568*** (0.27)
Co-participant hawkish lag	-0.132 (0.28)	0.195 (0.27)	-0.082 (0.27)
Co-participant dovish lag **Base: Co-participant equal lag**	0.787*** (0.27)	0.187 (0.28)	-1.021*** (0.29)
Coordination Achieved in the previous period	0.077 (0.27)	-0.046 (0.27)	-0.290 (0.28)
Co-participant “Full Monty” lag	-0.683 (0.53)	0.872* (0.46)	-0.328 (0.49)
Co-participant “Slap on the Wrist” lag	0.573 (0.36)	-0.043 (0.40)	-0.595 (0.41)
“Full Monty” lag	0.281 (0.58)	0.183 (0.52)	-0.553 (0.52)
“Slap on the Wrist” lag	0.180 (0.39)	-0.509 (0.44)	0.103 (0.39)
South-East Asian	0.371 (0.28)	-0.376 (0.29)	-0.037 (0.27)
Western European	-0.043 (0.27)	0.109 (0.27)	-0.004 (0.26)
Undergraduates	0.204 (0.24)	-0.102 (0.24)	-0.089 (0.23)
Social Sciences Students	-0.483* (0.27)[62]	0.398 (0.28)	0.135 (0.26)
Humanities Students **Base: Medicine and science students**	-0.329 (0.27)	0.422 (0.27)	-0.079 (0.27)
Constant	-1.526*** (0.41)	-1.676*** (0.41)	1.491*** (0.41)
No. of Obs.	236	236	236
Wald chi2(15)	47.13	40.38	79.97

Without punishment (i.e. in a comparison of G-NP-C and NG-NP-C as shown in table 5.9 in the appendix) we find that there are no effects of gender information on behaviour. We also find no effects of gender information when we separate out into individual pairing types.

[62] As before we conduct a robustness check restricting our sample to: 1. Social Science subjects only and 2. Non-Social Science subjects. We find that coefficients on our treatment variable for these subject subgroups do not differ significantly from those in the non-restricted sample. We regard this as a robustness check of our findings.
Social Science Subjects: $\text{Coefficient}_{(\text{Hawkish})} = -0.1825314$, $p = 0.4455$
Non Social Science Subjects: $\text{Coefficient}_{(\text{Hawkish})} = 0.2243925$, $p = 0.6956$

> ***Result 6:*** *With the compromise option available, effects of gender information disappear when not examined in conjunction with treatments with the punishment technology available.*

This result is interesting: Both with and without the compromise option available, it is also only in the treatment comparisons where the punishment technology is available that gender information changes behaviours between treatments with and without gender information present. We conclude that the presence of the punishment technology is important in motivating subjects to consider the gender of co-participant.

We will next examine the effects of the availability of the punishment technology on individual strategy choices in the game. We make the same treatment comparisons and examine the same subject subgroups as shown in table 5.1.1.5 above.

Let us first consider at comparison of G-NP-NC v. G-P-NC as shown in tables 5.10 and 5.11 in the appendix. Thus, here we wish to examine the effects of the punishment technology on behaviour in the presence of gender information and without the compromise option. We are unable to establish a significant effect of the punishment technology on strategy choices in the game. The same result is found when gender information and the compromise option is not available (NG-NP-NC v. NG-P-NC as shown in table 5.12 in the appendix.)

> ***Result 7:*** *Without the compromise option available, the punishment technology does not affect behaviour in the games.*

We therefore reject hypothesis 1c when the compromise option isn’t present.

Let us now consider the effects of punishment availability when subjects also had the compromise option available. First we consider this in the presence of gender information (G-NP-C v. G-P-C) as presented in tables 5.2.1.4(a) and 5.2.1.4(b) below. Unlike in the comparisons of treatments without the compromise option (NC) examined above, we do find effects of the punishment technology here. We find that the presence of the punishment technology reduces hawkish behaviour amongst males (β = -0.306) that this is driven by MF subjects (β = -0.569) since MM subjects are not affected by the addition of a punishment technology when examined in isolation.

Result 8: *With the compromise option available, MF subjects are more likely to choose the hawkish option without punishment and move away from this strategy choice with punishment. This is contrary to effects we found in the comparison of treatments without compromise.*

We also find that the presence of a punishment technology increases use of the equal option amongst both males and females (β = 0.314 and β = 0.230 respectively). However when investigating each subject pairing individually we find that this effect is only observed in mixed gender pairings (MF and FM - β = 0.467 and β = 0.617 respectively). We notice that this effect was also observed when we were examining the effects of gender information in treatments with punishment technology and the compromise option present (G-P-C v. NG-P-C). Clearly subjects in mixed gender pairings are the most affected by the treatment variables we define.

Result 9: *With the compromise option available, mixed gender pairings are more likely to choose equal in the presence of the punishment technology. We therefore have evidence to support hypothesis 2b in the game with compromise and gender information present.*

Table 5.2.1.4(a). The effect of punishment – G-NP-C v. G-P-C

		30 (Hawkish)	20 (Dovish)	15 (Equal)
All subjects	Punishment Available	-0.256** (0.11)	-0.069 (0.11)	0.269*** (0.10)
	Hawkish lag	1.427*** (0.16)	0.402*** (0.13)	-1.655*** (0.13)
	Dovish lag **Base: Equal lag**	0.795*** (0.14)	1.041*** (0.21)	-1.606*** (0.14)
	Co-participant hawkish lag	0.512*** (0.12)	0.551*** (0.12)	-1.005*** (0.13)
	Co-participant dovish lag **Base: Co-participant equal lag**	1.089*** (0.13)	0.022 (0.14)	-1.182*** (0.14)
	Coordination Achieved in the previous period	0.083 (0.12)	-0.205 (0.12)	-0.251** (0.13)
	South-East Asian	0.061 (0.14)	0.166 (0.15)	-0.185 (0.14)
	Western European	-0.102 (0.14)	0.123 (0.14)	-0.027 (0.13)
	MM	0.027 (0.14)	0.198 (0.15)	-0.177 (0.14)
	FM	-0.195 (0.16)	0.187 (0.16)	0.005 (0.14)
	FF	-0.057 (0.14)	-0.295* (0.16)	-0.142 (0.14)
	MF	Base	Base	Base
	Undergraduates	0.113 (0.13)	-0.152 (0.13)	0.026 (0.12)
	Social Sciences Students	-0.047 (0.12)	0.120 (0.12)	-0.069 (0.11)
	Humanities Students **Base: Medicine and science students**	0.184 (0.15)	-0.180 (0.17)	-0.039 (0.14)
	Constant	-1.588*** (0.22)	-1.611*** (0.23)	1.556*** (0.21)
	No. of Obs.	960	960	960
	Wald chi2(14)	206.30	110.17	299.80
Males	Punishment Available	-0.306* (0.17)	-0.132 (0.17)	0.314** (0.16)
	Hawkish lag	1.565*** (0.23)	0.274 (0.20)	-1.823*** (0.23)
	Dovish lag **Base: Equal lag**	0.705*** (0.20)	0.862*** (0.40)	-1.511*** (0.26)
	Co-participant hawkish lag	0.897*** (0.20)	0.353* (0.18)	-1.262*** (0.23)
	Co-participant dovish lag **Base: Co-participant equal lag**	1.281*** (0.20)	0.001 (0.21)	-1.418*** (0.25)
	Coordination Achieved in the previous period	0.160 (0.17)	-0.261 (0.19)	-0.405* (0.21)
	South-East Asian	-0.156 (0.23)	0.196 (0.24)	-0.028 (0.23)
	Western European	-0.348 (0.23)	-0.057 (0.25)	0.291 (0.23)
	MM	Base	Base	Base
	FM	n/a	n/a	n/a
	FF	n/a	n/a	n/a
	MF	-0.011 (0.15)	-0.228 (0.16)	0.182 (0.14)
	Undergraduates	0.214 (0.24)	0.016 (0.23)	-0.197 (0.23)
	Social Sciences Students	0.123 (0.17)	0.004 (0.17)	-0.140 (0.16)
	Humanities Students **Base: Medicine and science students**	0.354 (0.22)	-0.636* (0.34)	0.042 (0.22)
	Constant	-1.759*** (0.35)	-1.143*** (0.35)	1.520*** (0.34)
	No. of Obs.	480	480	480
	Wald chi2(12)	119.17	44.21	140.05
Females	Punishment Available	-0.190 (0.15)	-0.071 (0.16)	0.230* (0.14)
	Hawkish lag	1.340*** (0.24)	0.440** (0.19)	-1.501*** (0.18)
	Dovish lag **Base: Equal lag**	0.897*** (0.20)	1.097*** (0.31)	-1.679*** (0.19)
	Co-participant hawkish lag	0.171 (0.17)	0.707*** (0.16)	-0.806*** (0.17)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.859*** (0.19)	0.036 (0.22)	-0.972*** (0.20)
	Coordination Achieved in the previous period	-0.008 (0.17)	-0.179 (0.18)	-0.107 (0.17)
	South-East Asian	0.238 (0.20)	0.024 (0.20)	-0.246 (0.18)
	Western European	0.041 (0.18)	0.227 (0.19)	-0.225 (0.18)
	MM	n/a	n/a	n/a
	FM	-0.124 (0.15)	-0.126 (0.16)	0.168 (0.14)
	FF	Base	Base	Base
	MF	n/a	n/a	n/a
	Undergraduates	0.064 (0.16)	-0.209 (0.17)	0.126 (0.15)
	Social Sciences Students	-0.229 (0.18)	0.274 (0.20)	-0.021 (0.16)
	Humanities Students **Base: Medicine and science students**	0.022 (0.20)	0.049 (0.21)	-0.061 (0.19)
	Constant	-1.469*** (0.26)	-1.480*** (0.26)	1.275*** (0.24)
	No. of Obs.	480	480	480
	Wald chi2(14)	89.77	68.73	157.13

Table 5.2.1.4(b). The effect of punishment – G-NP-C v. G-P-C

		30 (Hawkish)	20 (Dovish)	15 (Equal)
MM	Punishment available	-0.095 (0.22)	-0.276 (0.23)	0.235 (0.22)
	Hawkish lag	1.785*** (0.55)	0.311 (0.26)	-2.025*** (0.35)
	Dovish lag **Base: Equal lag**	0.612** (0.32)	0.971*** (0.40)	-1.396*** (0.37)
	Co-participant hawkish lag	0.961*** (0.50)	0.280 (0.24)	-1.293*** (0.33)
	Co-participant dovish lag **Base: Co-participant equal lag**	1.283*** (0.45)	-0.226 (0.29)	-1.348*** (0.37)
	Coordination Achieved in the previous period	-0.092 (0.31)	0.067 (0.24)	-0.461 (0.31)
	South-East Asian	-0.580 (0.48)	0.262 (0.35)	0.255 (0.38)
	Western European	-0.503 (0.54)	-0.121 (0.35)	0.405 (0.37)
	Undergraduates	0.453 (0.58)	-0.004 (0.32)	-0.319 (0.37)
	Social Sciences Students	-0.166 (0.24)	0.123 (0.25)	-0.020 (0.27)
	Humanities Students **Base: Medicine and science students**	0.205 (0.30)	-0.943* (0.51)	0.252 (0.34)
	Constant	-1.714*** (0.56)	-1.171** (0.51)	1.457** (0.58)
	No. of Obs	240	240	240
	Wald chi2(11)	58.77	26.80	56.90
MF	Punishment available	-0.569** (0.36)	0.037 (0.25)	0.467** (0.23)
	Hawkish lag	1.358*** (0.26)	0.222 (0.29)	-1.537*** (0.29)
	Dovish lag **Base: Equal lag**	0.998*** (0.41)	0.637** (0.32)	-1.615*** (0.35)
	Co-participant hawkish lag	1.039*** (0.39)	0.431 (0.29)	-1.435*** (0.31)
	Co-participant dovish lag **Base: Co-participant equal lag**	1.411*** (0.33)	0.208 (0.31)	-1.595*** (0.31)
	Coordination Achieved in the previous period	0.459* (0.27)	-0.696** (0.28)	-0.400 (0.30)
	South-East Asian	0.267 (0.34)	0.154 (0.37)	-0.329 (0.35)
	Western European	-0.335 (0.41)	-0.020 (0.36)	0.342 (0.35)
	Undergraduates	0.038 (0.33)	-0.008 (0.37)	-0.103 (0.34)
	Social Sciences Students	0.404 (0.27)	-0.178 (0.25)	-0.278 (0.24)
	Humanities Students **Base: Medicine and science students**	0.545 (0.40)	-0.408 (0.42)	-0.233 (0.34)
	Constant	-1.926*** (0.49)	-1.238*** (0.47)	1.699*** (0.44)
	No. of Obs.	240	240	240
	Wald chi2(11)	66.73	18.14	74.20
FF	Punishment available	0.062 (0.20)	0.164 (0.22)	-0.161 (0.20)
	Hawkish lag	1.217*** (0.25)	0.505** (0.26)	-1.439*** (0.25)
	Dovish lag **Base: Equal lag**	0.789*** (0.26)	0.952*** (0.26)	-1.461*** (0.26)
	Co-participant hawkish lag	-0.143 (0.24)	0.437* (0.25)	-0.280 (0.23)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.645*** (0.24)	0.184 (0.28)	-0.865*** (0.27)
	Coordination Achieved in the previous period	0.064 (0.23)	-0.094 (0.26)	-0.152 (0.24)
	South-East Asian	0.288 (0.24)	-0.109 (0.28)	-0.193 (0.24)
	Western European	0.343 (0.24)	0.101 (0.25)	-0.352 (0.24)
	Undergraduates	0.116 (0.22)	0.089 (0.24)	-0.124 (0.21)
	Social Sciences Students	-0.133 (0.23)	0.567 (0.25)	-0.247 (0.22)
	Humanities Students **Base: Medicine and science students**	-0.356 (0.28)	0.605 (0.37)	-0.111 (0.27)
	Constant	-1.536*** (0.34)	-1.921*** (0.42)	1.563*** (0.33)
	No. of Obs.	240	240	240
	Wald chi2(11)	39.53	29.80	70.70
FM	Punishment available	-0.256 (0.25)	-0.683 (0.44)	0.617*** (0.78)
	Hawkish lag	1.561*** (0.32)	0.279 (0.38)	-1.693*** (0.78)
	Dovish lag **Base: Equal lag**	1.224*** (0.42)	0.415 (0.47)	-1.797*** (0.74)
	Co-participant hawkish lag	0.570** (0.27)	1.030*** (0.29)	-1.404*** (0.33)
	Co-participant dovish lag **Base: Co-participant equal lag**	1.147*** (0.36)	-0.620 (0.54)	-0.976*** (0.38)
	Coordination Achieved in the previous period	-0.181 (0.26)	-0.380 (0.30)	-0.129 (0.33)
	South-East Asian	0.236 (0.33)	0.386 (0.50)	-0.385 (0.36)
	Western European	-0.401 (0.35)	0.642 (0.52)	-0.045 (0.30)
	Undergraduates	0.050 (0.26)	-0.785* (0.46)[63]	0.374 (0.49)
	Social Sciences Students	-0.368 (0.33)	0.153 (0.43)	0.175 (0.36)
	Humanities Students **Base: Medicine and science students**	0.533 (0.35)	-1.431 (0.70)	0.169 (0.32)
	Constant	-1.747*** (0.42)	-1.026** (0.50)	1.211* (0.64)
	No. of Obs.	240	240	240
	Wald chi2(11)	48.52	29.83	80.61

[63] In order to conduct robustness tests we also run the same regression with this sample restricted to 1. Undergraduates and 2. Non-Undergraduates. We find that the coefficients in our treatment variable ("Punishment available") do not change significantly or become significant. We view this as a robustness check of our findings.
Undergraduate: Coefficient $_{(Dovish)}$ = -.278129, p = 0.4597
Non Undergraduate: Coefficient $_{(Dovish)}$ = -1.139605, p = 0.6098

Let us now examine the same comparisons but without gender information present (NG-NP-C v. NG-P-C). This is presented in table 5.13 in the appendix. In this case we are unable to establish any effects of punishment availability on behaviours as we did when gender information was present.

> ***Result 10:*** *With the compromise option available, effects of the punishment technology are not observed when there is no gender information available.*

Therefore, gender information is clearly required in order to activate the effects of punishment technology. In the previous section relating to the effects of the addition of gender information we also observed the corresponding but opposite effect in treatments comparisons both with and without the compromise option present. That is, we observed that the presence of punishment is required in order to induce the effects of the addition of gender information.

In conclusion to this section examining the effects of the availability of punishment, in the presence of the compromise option we find that with gender information present, the presence of punishment technology affects behaviour for mixed gender pairings in particular. However without gender information present we find that there are no effects of the presence of the punishment technology. In contrast, we observed no such effects of punishment availability when there is no compromise option available. We thus have further evidence to support hypothesis 3. Also we notice that we have evidence to support that the presence of a punishment has effects on individual decisions in a coordination game with no free riding opportunity. This is interesting as it contributes to the literature which has shown that punishment effects behaviour in games where free riding was an option. We show that punishment can also effect behaviours when there is no opportunity for free riding.

5.2.2. Why punish?

Finally, we would like to examine the motivation which lies behind punishment decisions. Since punishment decisions were made directly after being told the outcome of that period (i.e. own choice, co-participant choice, coordination outcome) in this analysis we will only consider variables from the current period and not the lagged variables as previously in the analysis of individual choice within the games in the previous section. We therefore use the following variables in this analysis:

Table 5.2.2.1. Additional Variables used in dynamic punishment analysis

Variable	**Explanation**
Chose hawkish	Subject chose hawkish in current period
Chose dovish	Subject chose dovish in current period
Chose equal	Subject chose equal in current period
Co-participant chose hawkish	Subject's co-participant chose hawkish in current period
Co-participant chose dovish	Subject's co-participant chose dovish in current period
Co-participant chose equal	Subject's co-participant chose equal in current period
Coordination achieved	Subject coordinated with a co-participant in current period

We initially make the following treatment comparisons here since they allow us to examine the effect of the addition of gender information on punishment decisions:

Table 5.2.2.2. Treatment comparisons for the effects of the punishment technology

Treatment Comparisons	**Subject subgroups analysed**
NG-P-C v. G-P-C NG-P-NC v. G-P-NC	1. All subjects 2. Males Only 3. Females Only 4. FF (G) v. Females (NG) 5. FM (G) v. Females (NG) 6. MM (G) v. Males (NG) 7. MF (G) v. Males (NG)

Let us first consider the analysis of treatments with compromise. We observe some interesting patterns here: First we observe no effects of the addition of gender information on a co-participant with regard to punishment decisions when we consider males and females pooled (Table 5.2.2.3(a) below). However when we consider a comparison of MM subjects (i.e. with gender information) and males without gender information we find that males punish more when they know that a co-participant is a male compared to not knowing the gender of a co-participant as shown in table 5.2.2.3(b) below (β = 1.192). It appears that males make males more aggressive in punishment decisions! We therefore have evidence to support hypothesis 2a. However we find that the gender of a co-participant appears not to be relevant in individual punishment decisions for females and males in mixed gender pairings. Perhaps, in these latter mentioned subject subgroups, whilst decreasing the social distance (through the addition of gender information) makes a difference in some cases with regard to individual strategy choices in the game (as illustrated above), punishment decisions are based purely on actions and not personal attributes of a co-participant. However, we do notice that there are effects of own gender on punishment decisions present. In particular, we find that males punish “Full Monty” more than females (β = 1.172) and “Slap on the Wrist” less than females (β = -0.460). We summarise this result below:

> ***Result 11:*** *With the compromise option available, the presence of gender information only affects males in unisex pairings in their punishment decisions. Own gender is also relevant in this decision: Males who choose to punish are more aggressive in their punishment decisions than females.*

We therefore find evidence to support hypothesis 1b. Males appear to exhibit more aggressive behaviour than females.

Table 5.2.2.3(a). The effects of gender information on punishment decisions - NG-P-C v. G-P-C

		All Punishment	"Slap on the Wrist"	"Full Monty"
All subjects	Gender information available	0.178 (0.31)	0.208 (0.28)	0.196 (0.57)
	Choose Hawkish	0.331 (0.29)	0.243 (0.30)	0.356 (0.50)
	Choose Dovish **Base: Choose Equal**	0.083 (0.29)	0.302 (0.29)	-0.676 (0.58)
	Co-participant choose hawkish	0.095 (0.29)	0.062 (0.30)	-0.159 (0.51)
	Co-participant choose dovish **Base: Co-participant choose equal**	-0.234 (0.31)	0.005 (0.30)	-1.122 (0.73)
	Coordination Achieved	0.008 (0.25)	0.113 (0.25)	-0.218 (0.49)
	South-East Asian	0.466* (0.25)	0.177 (0.28)	0.874** (0.41)
	Western European	0.171 (0.22)	0.121 (0.24)	0.085 (0.39)
	Males	0.106 (0.42)	0.134 (0.36)	-0.216 (0.80)
	Undergraduates	0.115 (0.41)	-0.057 (0.35)	0.268 (0.78)
	Social Sciences Students	0.059 (0.29)	-0.433* (0.26)	1.024* (0.58)
	Humanities Students **Base: Medicine and science students**	-0.084 (0.37)	-0.048 (0.30)	-0.374 (0.69)
	Constant	0.117 (0.36)	0.059 (0.32)	0.088 (0.61)
	No. of Obs.	716	716	716
	Wald chi2(12)	29.32	16.17	18.94
Males	Gender information available	0.406 (0.61)	0.187 (0.35)	-0.0165 (0.42)
	Choose Hawkish	-0.335 (0.50)	-0.206 (0.36)	0.124 (0.40)
	Choose Dovish **Base: Choose Equal**	-1.613** (0.65)	-0.517 (0.51)	0.564 (0.41)
	Co-participant choose hawkish	0.385 (0.38)	0.351 (0.34)	-0.209 (0.33)
	Co-participant choose dovish **Base: Co-participant choose equal**	0.918** (0.42)	0.267 (0.39)	-0.054 (0.35)
	Coordination Achieved	-1.832*** (0.48)	-0.985** (0.39)	-0.527* (0.29)
	South-East Asian	-0.653 (0.87)	-0.619 (0.52)	0.616 (0.53)
	Western European	-0.556 (0.82)	-0.597 (0.48)	0.074 (0.52)
	Undergraduates	0.498 (0.86)	0.496 (0.51)	-0.141 (0.42)
	Social Sciences Students	0.413 (0.67)	0.407 (0.43)	-0.259 (0.49)
	Humanities Students **Base: Medicine and science students**	-0.108 (0.76)	0.941 (0.43)	-0.030 (0.52)
	Constant	-2.036** (0.94)	-2.013*** (0.60)	-2.080*** (0.72)
	No. of Obs.	360	360	360
	Wald chi2(11)	17.75	10.54	13.00
Females	Gender information available	0.098 (0.44)	0.263 (0.42)	-0.381 (0.839)
	Choose Hawkish	-0.230 (0.40)	0.124 (0.40)	-0.769 (0.882)
	Choose Dovish **Base: Choose Equal**	0.153 (0.39)	0.564 (0.41)	-1.085 (0.873)
	Co-participant choose hawkish	-0.432 (0.34)	-0.209 (0.33)	-0.612 (0.951)
	Co-participant choose dovish **Base: Co-participant choose equal**	0.105 (0.34)	-0.054 (0.35)	0.901 (0.692)
	Coordination Achieved	-0.942*** (0.30)	-0.527* (0.29)	n/a
	South-East Asian	0.505 (0.58)	0.616 (0.53)	-1.156 (1.304)
	Western European	0.131 (0.57)	0.074 (0.52)	0.077 (1.08)
	Undergraduates	-0.174 (0.46)	-0.141 (0.42)	-0.938 (1.027)
	Social Sciences Students	-0.184 (0.53)	-0.259 (0.49)	0.297 (1.162)
	Humanities Students **Base: Medicine and science students**	0.352 (0.56)	-0.030 (0.52)	1.479 (1.366)
	Constant	-1.693** (0.73)	-2.080*** (0.72)	-3.146 (1.761)
	No. of Obs.	356	356	356
	Wald chi2(11)	12.87	8.41	3.76

Table 5.2.2.3(b). The effects of gender information on punishment decisions - NG-P-C (male subjects) v. G-P-C (MM Subjects)

	All punishment	**"Slap on the wrist"**	**"Full Monty"**
Gender information present	1.192* (0.65)	0.500 (0.40)	1.444 (1.02)
Chose hawkish	-0.297 (0.51)	-0.104 (0.39)	-0.294 (0.81)
Chose dovish **Base: Chose equal**	-1.316** (0.67)	-0.349 (0.53)	-1.459 (0.96)
Co-participant chose hawkish	0.347 (0.40)	0.255 (0.39)	0.390 (0.57)
Co-participant chose dovish **Base: Co-participant chose equal**	0.955** (0.45)	0.269 (0.42)	1.289** (0.64)
Coordination achieved in previous period	-1.357*** (0.49)	-0.679 (0.43)	-1.394** (0.63)
South/ South East Asian	-0.841* (0.48)[64]	-0.846 (0.56)	-1.575 (1.40)
Western European	-1.575 (0.87)	-0.921 (0.56)	-0.954 (1.32)
Undergraduates	-0.004 (0.82)	0.282 (0.53)	-0.206 (1.26)
Social Science students	-0.063 (0.72)	0.032 (0.47)	n/a
Humanities Students **Base: Science and medicine students**	-0.658 (0.80)	0.712 (0.44)	n/a
Constant	-0.542 (0.97)	-1.581** (0.63)	-1.951 (1.72)
No. of Obs.	240	240	240
Wald chi2(11)	13.65	7.98	9.57

We also find that successful coordination decreases use of punishment for males and females (Table 5.2.2.3(a)). This is to be expected: Upon learning that coordination has been achieved subjects have had their expectations of a co-participant's behaviour realised. There is thus no reason to punish. Therefore we conclude with result 12 below:

> ***Result 12:*** *With the compromise option available, successful coordination decreases punishment*

We therefore accept hypothesis 1a. Successful coordination does indeed reduce punishment behaviours. It is interesting that Dreber et al. (2008) conclude that "winners don't punish" in the prisoner's dilemma game. Here we find that those who have their behavioural expectations met and therefore coordinate with a co-participant are less likely to punish. It is not only winners that don't punish but also those who "win" in the sense of having expectations met and securing an outcome that was aimed for.

Due to this strong result suggesting that coordination does indeed reduce punishment rates we also test if this result is driven by coordination on an equal or unequal outcome. Due to a lack of observations in each of these coordination categories we run these regressions only

[64] Due to significance on this on the South/ South East Asian variable we also run robustness checks using only the relevant sub samples to compare coefficients. When we restrict the sample to South/ South East Asians only the regression would not converge. However when we restrict it to non-South/ South East Asians only we find that the magnitude of the treatment variable does not change significantly and remains significant.
Non South/ South East Asians: Coefficient $_{\text{(All Punishment)}}$ = 1.188162*, p = 0.4707

with all punishment decisions pooled. We observe a number of interesting phenomenon. We note that for all subjects pooled, as well as males and females separately, if subjects achieve coordination on an equal outcome, punishment decisions are reduced. However for females, coordination on the BOS section of the game leads to an increased in punishment decisions (β = 2.101).

Table 5.2.2.3(c). The effects of gender information on punishment decisions (Punishment type pooled)

	All Subjects	**Males**	**Females**
Gender information available	-0.085 (0.36)	0.224 (0.60)	-0.409 (0.48)
Choose Hawkish	-1.466*** (0.44)	-1.329*(0.69)	-1.595***(0.58)
Choose Dovish **Base: Choose Equal**	-1.936*** (0.53)	-2.069** (0.87)	-1.792*** (0.67)
Co-participant choose hawkish	-0.325 (0.40)	-0.295 (0.63)	-0.228 (0.54)
Co-participant choose dovish **Base: Co-participant choose equal**	-1.892*** (0.51)	-2.115*** (0.81)	-1.613** (0.66)
Coordination on BOS section achieved	1.750*** (0.51)	1.069 (0.88)	2.101*** (0.68)
Coordination on equal achieved	-3.138*** (0.56)	-2.944*** (0.84)	-3.277*** (0.76)
South-East Asian	0.145 (0.49)	-0.451 (0.89)	0.482 (0.62)
Western European	-0.117 (0.48)	-0.246 (0.82)	-0.216 (0.61)
Males	-0.103 (0.34)	n/a	n/a
Undergraduates	0.082 (0.43)	0.654 (0.88)	-0.031 (0.50)
Social Sciences Students	0.090 (0.41)	0.242 (0.66)	-0.120 (0.57)
Humanities Students **Base: Medicine and science students**	0.256 (0.47)	0.167 (0.72)	0.299 (0.62)
Constant	-0.482 (0.72)	-1.191 (1.11)	-0.192 (0.93)
No. of Obs.	895	450	445
Wald chi2(13)/ Wald chi2(12)[65]	61.04	25.70 (12)	37.89 (12)

However without the compromise option available, we find that successful coordination in no longer universally a reducer of punishment behaviours for males and females. In this case successful coordination only reduces "Slap on the Wrist" behaviours when we pool both genders (β = -0.332). (see table 5.2.2.4 below – results for males and females separately at shown in the appendix in Table 5.2.2.4.(a))

[65] First value is for all students, the second value is for males/ females

Result 13: *Without the compromise option available, coordination only reduces "Slap on the Wrist" behaviours (subjects pooled) but does not reduce overall punishment or "Full Monty" punishment*

We therefore have partial evidence to support hypothesis 1a in the game without compromise.

Combining both the results from the comparisons of treatments with the compromise option and without, it is striking that successful coordination only reduces punishment universally for both genders if subjects had three strategies options available – i.e. subjects who had the compromise option available. When subjects were only playing two strategy options – i.e. the pure battle of the sexes game without the compromise option – we find that the decision to punish "Full Monty" is not effected by successful coordination but that "Slap on the Wrist" is effected (β= -0.332*) when we pool subjects.

Table 5.2.2.4. The effects of gender information on punishment decisions - NG-P-NC v. G-P-NC

		All Punishment	**"Slap on the Wrist"**	**"Full Monty"**
All subjects	Gender information present	-0.024 (0.35)	0.064 (0.30)	-0.083 (0.22)
	Chose hawkish **Base: Chose dovish**	0.080 (0.22)	-0.062 (0.22)	0.247 (0.23)
	Co-participant chose hawkish **Base: Co-participant chose dovish**	-0.190 (0.20)	-0.170 (0.20)	0.038 (0.21)
	Coordination achieved	-0.254 (0.19)	-0.332* (0.20)	0.049 (0.20)
	South/ South East Asian	-0.248 (0.44)	-0.420 (0.37)	0.270 (0.30)
	Western European	-1.034** (0.47)[66]	-0.921** (0.40)	-0.331 (0.32
	Males	-0.036 (0.35)	-0.129 (0.31)	0.112 (0.23)
	Undergraduates	-0.163 (0.37)	-0.150 (0.32)	0.020 (0.24)
	Social science students	-0.254 (0.38)	-0.202 (0.32)	-0.130 (0.25)
	Humanities students **Base: Science & medicine students**	-0.609 (0.50)	-0.487 (0.43)	-0.165 (0.32
	Constant	-1.093* (0.57)	-1.000** (0.50)	-2.089*** (0.46)
	No. of Obs.	716	716	716
	Wald chi2(10)	11.32	11.43	6.05

[66] Again in order to check the robustness of the insignificance of our treatment variable in this regression we run the same regression with Western European and non-Western European sub set of the data respectively for the dependent variables *All Punishment* and "*Slap on the Wrist*". We find no significant differences between the coefficients on our treatment variable – "Gender information present" – when we examine these two subgroups compared to when we examine the whole population. We see this as evidence of the robustness of our results
Western Europeans: $\text{Coefficient}_{(\text{All Punishment})}$ = -0.069633, p = 0.9923, $\text{Coefficient}_{(\text{Slap on the Wrist''})}$ = 0.1613337, p = 0.6430
Non Western European. $\text{Coefficient}_{(\text{All Punishment})}$ = 0.0644476, p = 0.6747, $\text{Coefficient}_{(\text{Slap on the Wrist})}$ = 0.0239556, p = 0.7359

5.3. Effects of punishment on expected payoffs

We now consider the effects of punishment on subjects expected payoffs. When we are not considering losses incurred due to punishment we calculate these in the same way as detailed in chapter one. When we consider the expected payoffs incorporating losses from punishment (both from infliction of punishment itself and costs incurred inflicting punishment) we use the same method but also subtract from the expected payoffs the observed probability of being punished/ having punishment inflicted multiplied by the cost incurred. In the table below we present expected payoffs in the game and also the effect that the presence of a punishment technology has on payoffs. In the final column we present the percentage difference when punishment costs are factored into the calculation of final expected payoffs and in the penultimate column we present expected payoff differences without punishment expenditures being considered.

If we don’t consider punishment expenditures, we note that in all treatment comparisons apart from those with gender information and without compromise, payoffs are higher when punishment is present. The increase in payoffs is also most striking in the treatment where the compromise option was present (12.7% with gender information and 10.49% without gender information). However when we factor in the costs of punishment the results show that subjects consistently achieve much lower payoffs in the punishment treatment. Again the decrease in expected payoffs is particularly high in the treatments with compromise (-66.24% and -46.7% with and without gender information respectively). These results appear to correspond to results found by Abbink et al. (2010) that whilst the presence of punishment increases payoffs when punishment expenditures are not considered, when punishment expenditures are considered the positive effects of this technology are eroded.

Table 5.3.1. Effects of the presence of punishment on expected payoffs

	Expected Payoffs (not including costs of punishment)	Expected Payoffs (including costs of punishment)	% difference (not including costs of punishment)[67]	% difference (including costs of punishment)[68]
G-NP-NC	12.40	n/a	-0.64%	-25.65%
G-P-NC	12.32	9.58		
G-NP-C	6.76	n/a	12.7%	-66.24%
G-P-C	7.68	3.40		
NG-NP-NC	11.97	n/a	1.55%	-27.50%
NG-P-NC	12.15	9.07		
NG-NP-C	6.82	n/a	10.49%	-46.7%
NG-P-C	7.57	4.24		

6. Conclusion and Discussion

Through a unique experimental design we examine at the intersection between gender information, punishment and payoffs structure and observe some interesting patterns of behaviour. We find that individual choices and behaviours not only depend on the presence of punishment or but also on strategy options available to subjects.

With regard to individual choices in the games we find some interesting effects of the treatment variables that we vary. We find differences in choice behaviour between treatments both with and without the compromise option available. We also find that the effects of the threat of punishment on behaviour are not realised without the presence of gender information and vice versa. With regard to the effects of punishment technology we find that it is when a subject plays against a member of the opposite gender that the effects of the punishment technology are realised. Both males and females playing against someone of the opposite sex (in the dynamic model) move towards using the equal strategy and clearly see the threat of punishment as motivation to choose the equal outcome. In a human resources setting this could suggest that the threat of punishment is only effective in bringing about equitable outcomes if interactions are between those of the opposite gender.

With regard to punishment decisions we find that in the first period it is only males playing against males who increase rates of punishment rates compared to their male counterparts in the presence of the compromise option. Investigating this further in the dynamic

[67] This column indicates the % difference in payoffs between the NP and P treatments when we do not consider punishment expenditure in the P treatment
[68] This column indicates the % difference in payoffs between the NP and P treatments when we do consider punishment expenditure in the P treatment

model we find that it is males who are more aggressive in their punishment decisions than females. Gender is clearly an important element in punishment decisions with males exhibiting more aggressive behaviour than females.

Finally, we find multiple evidence that the compromise option is important in how decisions are made as evidenced by the fact that results in comparable treatments both with and without compromise are found to be different with different variables found to impact on individual decisions in the experiment.

We hope that this experiment has provided some interesting insights into the interaction between gender, punishment and game structure in the coordination game and can motivate further research into the relevant areas. For example it would be interesting to further investigate the effects of repeated games and also to investigate how punishment will affect behaviour with difference payoffs in the coordination game.

Chapter 3

Pre-Play Communication and the Efficiency-Equality Trade-Off in Coordination Situations: An Experiment*

Zoë C. Bett[a] and Anders Poulsen[b]

[a]School of Economics, and Centre for Behavioural and Experimental Social Science, University of East Anglia, Norwich NR4 7TJ, UK

[b]School of Economics and Centre for Behavioural and Experimental Social Science, University of East Anglia, Norwich NR4 7TJ, UK

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1. Introduction and literature review

When faced with a coordination problem in everyday life we are often able to communicate with the person with whom we are trying to coordinate our behaviour. However, we may not know the people we are coordinating with and have no prior knowledge of their beliefs, expectations or behavioural patterns. For example many of us shop on classified ad sites (for example gumtree or freeads). In these situations we are often faced with a state of affairs in which we must bargain with a person of whom we have no prior knowledge. Barter also often takes place in a similar context. We report data from an economic bargaining experiment in which communication with an unknown and anonymous person is allowed in order to further investigate this. An additional important motivation of this paper is to understand the nature of an efficiency-equality trade-off. Using an experimental methodology we investigate, in various configurations, if subjects coordinate on an equal split of resources because they have a preference for it or, because it serves as a coordination device in the absence of communication.

In the economics literature communication has been studied in a number of contexts and using a number of forms of communication technology. In these experiments communication can take a number of forms: for example in some experiments written free-form communication between subjects is permitted (for example in Charness & Dufwenberg (2006) using a trust game, Cooper & Kühn (2014) using a collusion game, Feltovich & Swierzbinski (2011) using a Nash demand game). In others studies subjects are only given restricted opportunities to communicate. For example Cooper & Lightle (2013) use a bilateral exchange game and only allow one way communication, Vanberg (2008) use a dictator game and allow each subject to send only two messages to a co-participant with a maximum of 90 characters each, Isoni et al. (2014) restrict communication to mouse clicking whilst Xiao & Houser (2005) and Xiao & Houser (2009) use an ultimatum game and dictator game respectively and allow the recipient to send one message to express an emotion regarding an offer received.

We now consider in more detail the literature combining elements of communication and coordination which offer some interesting results. For example, Bornstein & Gilula (2003) use communication both within and between groups in both a stag-hunt game and a chicken game and find that communication is only effective in achieving efficient outcomes in the stag hunt game but not in the chicken game. They conclude that communication is effective in inducing effective coordination if fear is a motivating factor (stag-hunt game) and not if the motivating factor is greed (chicken game). Duffy & Feltovich (2002) also find the same result using one way communication, finding that cheap talk increases payoffs and efficiency but that relative increases are dependent on game structure. Brandts & Cooper (2007) use a weak-link game and find that communication (as opposed to incentives) by a "manager" is the most effective way to remove coordination failure. Moreno & Wooders (1998) find that the assumptions of Nash equilibrium (in particular individualistic and independent behaviour) are violated when subjects are able to communicate freely before the game in a matching pennies game.

Our experiment uses coordination games and, with regard to game type, our experiments are most closely linked to those of Farrell (1987) and Cooper et al. (1989) who study battle of the sexes games with one-way communication. However our experiments provide greater insights into how the payoff structure of the game and unrestricted communication affects behaviour. A key prediction of the model proposed by Farrell (1987) is that communication raises overall coordination, but does not change the relative probability that a certain equilibrium coordination outcome will be achieved. His model predicts that in a battle of the sexes type game cheap talk will increase coordination, but not to 100%. We observe that cheap talk increases coordination to almost 100% (94.44%) in a simple battle of the sexes type game. Similarly, Cooper at al. (1989) use a one-shot battle of sexes game and allow either one or both subjects in a pairing to send a message to a co-participant stating their intended action. They find that one way communication is the most effective way of increasing coordination but that two way communication was also effective. We find coordination rates similar to Cooper et al. (1989) in their one-sided communication treatment but increased coordination compared to their two-sided communication treatment.

In our experiment we use free form communication between pairs of participants. Of course, our decision to use free form communication does leave us with a trade-off between obtaining a rich source of conversations and conversational patterns (as free communication naturally gives us) and the ease with which conversations can be classified for statistical analysis. For example, if we would have provided subjects with a limited number of fixed type messages which they could send to a co-participant (e.g. *"I am going to take the higher amount", "I think we should go equal"* etc.) then we would have had a "ready-made" dataset from our conversations but would have sacrificed the rich, varied and natural types of conversations we are able to observe here. We felt that this was a trade-off worth making and will describe in more detail in the relevant section below how we went about coding the free form conversations in preparation for analysis. The following papers also provide us with the motivation to analyse and look deeper into the content of conversations: Ben-Ner et al. (2011)

find that free communication increases trust and trustworthiness in a trust game, but also find that the content, and not just availability per se, of chat is important to outcomes. Zultan (2012) also finds the content of conversations is important: He finds that responders' strategies in the ultimatum game are only affected when subjects are free to talk about strategies but not when talk of strategies is restricted. In the investment game Buchan et al. (2006) find that communication increases other regarding preferences and that even strategy irrelevant conversations change behaviour. In addition McGinn et al. (2012) use a collusion game and only allow subjects restricted chat from one of two menus/treatments – one menu contains fairness type messages e.g. "I would rather be fair"/ "Split or quit!" and the other contains competitive reasoning type chat e.g. "The stronger subjects ought to have the larger piece of the pie"/ "I just would like to make more money"[69] They find that in the treatment where restricted fairness talk was permitted, equally divided but off-equilibrium payoffs were the norm. However in the competitive reasoning treatment subjects tend not to go for equitable payoffs.

This paper proceeds as follows: In section two we look at the theoretical predictions of the effects of communication and the games we used in this experiment. In section three we describe the experimental design, in section four we examine our hypotheses and treatment comparisons and finally in section five we report the results from our experiment both with regards to choices/ outcomes and conversational content. We conclude with a discussion in section six.

2. Theoretical background

2.1. Cheap talk

Cheap talk has received some attention in the economics literature (For a review see Farrell & Rabin, 1996). In games where subjects may have trouble predicting what their co-participant with do (for example in asymmetric coordination games where no outcome is considered focal) cheap talk may be particularly effective in bridging this gap in knowledge and expectations. Therefore if cheap talk leads to agreement on an alternative equilibrium as compared to when no communication is available, and in this case participants believe it is both in their own interest and the interest of a co-participant to proceed as they specified during cheap talk, then this alternative equilibrium should be achieved. In this case the Nash equilibrium is self-fulfilling after cheap talk has been completed as it is enforced by subjects wanting to

[69] A full list of the menus available in each treatment can be found in McGinn et al. (2012), p.282

coordinate in order to achieve higher earnings as defecting may lead to lower earnings since mis-coordination leads to zero earnings from the game. Therefore if subjects are rational and profit-maximising we would expect that communication in the game will be both credible and truthful and expected to be as such by all subjects playing the game. We will investigate the effects of cheap talk further through our experimental design which will be described in the next section.

2.2. The Games

We use four games in this experiment for which we use the following abbreviations: BOS, BOS-E1, BOS-E2 and BOS-E3. Also, in order to differentiate between treatments using the same game but with and without communication we prefix the game abbreviations with C for games with communication and NC for games without communication.

We will now describe the games in more specific detail and will compute both the Pure Strategy Nash Equilibrium (PSNE) and Mixed Strategy Nash Equilibrium (MSNE) with a more detailed calculation of the MSNE provided in the appendix. The amounts below were presented to subjects in pounds sterling (£). Therefore whilst payoffs shown here are subjective payoffs, if subjects are self-interested and risk neutral, then payoffs can be represented by the money amounts in sterling since expected utility in not affected by linear transformations.

Our baseline (BOS) game takes the following form:

Table 2.2.1. Battle of the Sexes (BOS)

		Subject 2	
		Hawkish (α_2)	Dovish ($1-\alpha_2$)
Subject 1	Hawkish (α_1)	(0, 0)	(8, 6)
	Dovish ($1-\alpha_1$)	(6, 8)	(0, 0)

The BOS game has two pure strategy Nash equilibria namely {Hawkish, Dovish}{Dovish, Hawkish}.

There is another symmetric Nash equilibrium, where each player chooses Hawkish with probability $\frac{4}{7}$ and Dovish with probability $\frac{3}{7}$. In this mixed equilibrium each player earns expected payoffs of £3.429.

Our second game, BOS-E1 has three pure strategy Nash equilibria namely {Hawkish, Dovish} {Dovish, Hawkish} {Equal, Equal}.

Table 2.2.2. Battle of the Sexes with a Pareto dominated equal split (BOS-E1)

		Subject 2		
		Hawkish (α_2)	Dovish (β_2)	Equal ($1-\alpha_2-\beta_2$)
Subject 1	Hawkish (α_1)	(0, 0)	(8, 6)	(0, 0)
	Dovish (β_1)	(6, 8)	(0, 0)	(0, 0)
	Equal ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(5, 5)

There are other Nash equilibria, where each player chooses Hawkish with probability $\frac{20}{59}$, Dovish with probability $\frac{15}{59}$ and Equal with probability $\frac{24}{59}$. In this mixed equilibrium each player earns expected payoffs of £2.034. There is another symmetric Nash equilibrium – the one in which the players mix Dovish and Hawkish, as in the BOS, without playing Equal - for which the probabilities are given above in the analysis. There also exists an MSNE where subject 1 mixes between a strategy of choosing hawkish and equal and subject 2 mixes between a strategy of choosing dovish and equal. Here player 1 plays hawkish with probability $\frac{5}{11}$ and equal with probability $\frac{6}{11}$ and player 2 plays dovish with probability $\frac{5}{13}$ and equal with probability $\frac{8}{13}$. The value of expected payoffs from playing this MSNE is £3.077 for subject 1 and £2.727 for subject 2.

Our third game, BOS-E2 has, as in BOS-E1, three pure strategy Nash equilibria specifically {Hawkish, Dovish}{Dovish, Hawkish}{Equal, Equal}.

Table 2.2.3. Battle of the Sexes with a weakly Pareto dominated equal split (BOS-E2)

		Subject 2		
		Hawkish (α_2)	Dovish (β_2)	Equal $(1-\alpha_2-\beta_2)$
Subject 1	Hawkish (α_1)	(0, 0)	(8, 5)	(0, 0)
	Dovish (β_1)	(5, 8)	(0, 0)	(0, 0)
	Equal $(1-\alpha_1-\beta_1)$	(0, 0)	(0, 0)	(5, 5)

There is another symmetric Nash equilibrium, where each player chooses Hawkish with probability $\frac{8}{21}$, Dovish with probability $\frac{5}{21}$ and Equal with probability $\frac{8}{21}$. In this mixed equilibrium each player earns expected payoffs of £1.905. There is another symmetric Nash equilibrium – the one in which the players mix Dovish and Hawkish, as in the BOS, without playing Equal - where each player chooses Hawkish with probability $\frac{8}{13}$ and Dovish with probability $\frac{5}{13}$. In this mixed equilibrium each player earns expected payoffs of £3.07. There also exists an MSNE where subject 1 mixes between a strategy of choosing hawkish and equal and subject 2 mixes between a strategy of choosing dovish and equal. Here player 1 plays hawkish with probability $\frac{1}{2}$ and equal with probability $\frac{1}{2}$ and player 2 plays dovish with probability $\frac{5}{13}$ and equal with probability $\frac{8}{13}$. The value of expected payoffs from playing this MSNE is £3.077 for subject 1 and £2.692 for subject 2.

Our fourth game, BOS-E3 has, as in BOS-E1, three pure strategy Nash equilibria specifically {Hawkish, Dovish}{Dovish, Hawkish}{Equal, Equal}.

Table 2.2.4. Battle of the Sexes with a Pareto dominated equal split (BOS-E3)

		Subject 2		
		Hawkish (α_2)	Dovish (β_2)	Equal ($1-\alpha_2-\beta_2$)
Subject 1	Hawkish (α_1)	(0, 0)	(18, 6)	(0, 0)
	Dovish (β_1)	(6, 18)	(0, 0)	(0, 0)
	Equal ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(5, 5)

There are other Nash equilibria, where each player chooses Hawkish with probability $\frac{15}{38}$, Dovish with probability $\frac{5}{38}$ and Equal with probability $\frac{18}{38}$. In this mixed equilibrium each player earns expected payoffs of £2.368. There is another symmetric Nash equilibrium – the one in which the players mix Dovish and Hawkish, as in the BOS, without playing Equal - where each player chooses Hawkish with probability $\frac{3}{4}$ and Dovish with probability $\frac{1}{4}$. In this mixed equilibrium each player earns expected payoffs of £4.50. There also exists an MSNE where subject 1 mixes between a strategy of choosing hawkish and equal and subject 2 mixes between a strategy of choosing dovish and equal. Here player 1 plays hawkish with probability $\frac{5}{11}$ and equal with probability $\frac{6}{11}$ and player 2 plays dovish with probability $\frac{5}{23}$ and equal with probability $\frac{18}{23}$. The value of expected payoffs from playing this MSNE is £3.913 for subject 1 and £2.727 for subject 2.

It should be noted that in all games with a possible equal split the expected payoffs from playing a MSNE are less than those which can be achieved through achieving coordination on an equal spilt of earnings. Therefore if subjects in the tacit (non-communication) games are able to use these equal splits as a focal point in the game we would expect them to achieve higher expected payoffs than otherwise. This would also suggest that if communication allows subjects to break symmetry in the game (thus allowing them to coordinate on one of the asymmetric pure strategy Nash equilibria) we will see much higher payoffs for subjects in the communication games as compared to those without communication.

The games are related in the following ways. In the BOS (Battle of the Sexes) game subjects can only coordinate on an inequitable payoff outcome (apart from the equitable outcome from mis-coordination (0,0)). In BOS-E1 we add one payoff option: an inefficient yet equitable (hence the E prefix) split. We will show in more detail below how the unequal part of the distribution strictly Pareto dominates the equitable part of the game. In the BOS-E2 game the unequal part of the distribution only weakly Pareto dominates the equitable portion. In BOS-E3 we increase the inequality of the unequal split.

The ways in which the games differ and are related to one another are also shown in the flow diagram here:

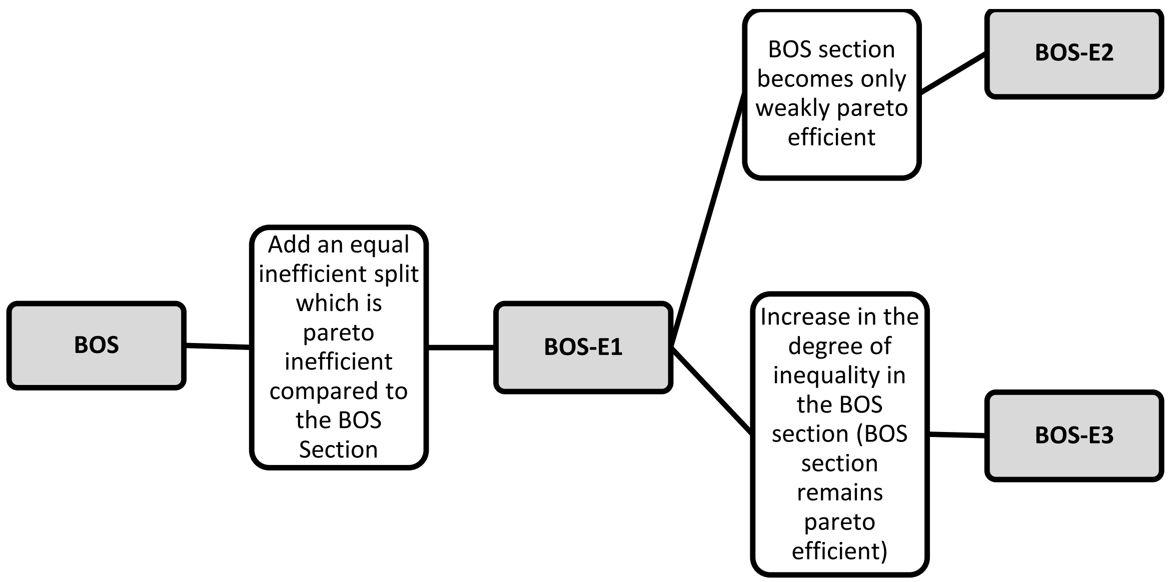

Figure 2.2.1. The relationship between the games

A graphic representation of the games is also shown here. It illustrates how the combined value of the highest possible coordination payoffs (i.e. coordination on the BOS section of each game) changes between games with higher financial gains available represented by lines closer to the top right of the grid. It also shows how the dispersion of the payoffs available through coordination on the BOS section changes as illustrated by the distance between the two points on each line. The difference between these payoffs in comparison with the potential equitable outcome (5, 5) is also illustrated by the distance of the lines from this point:

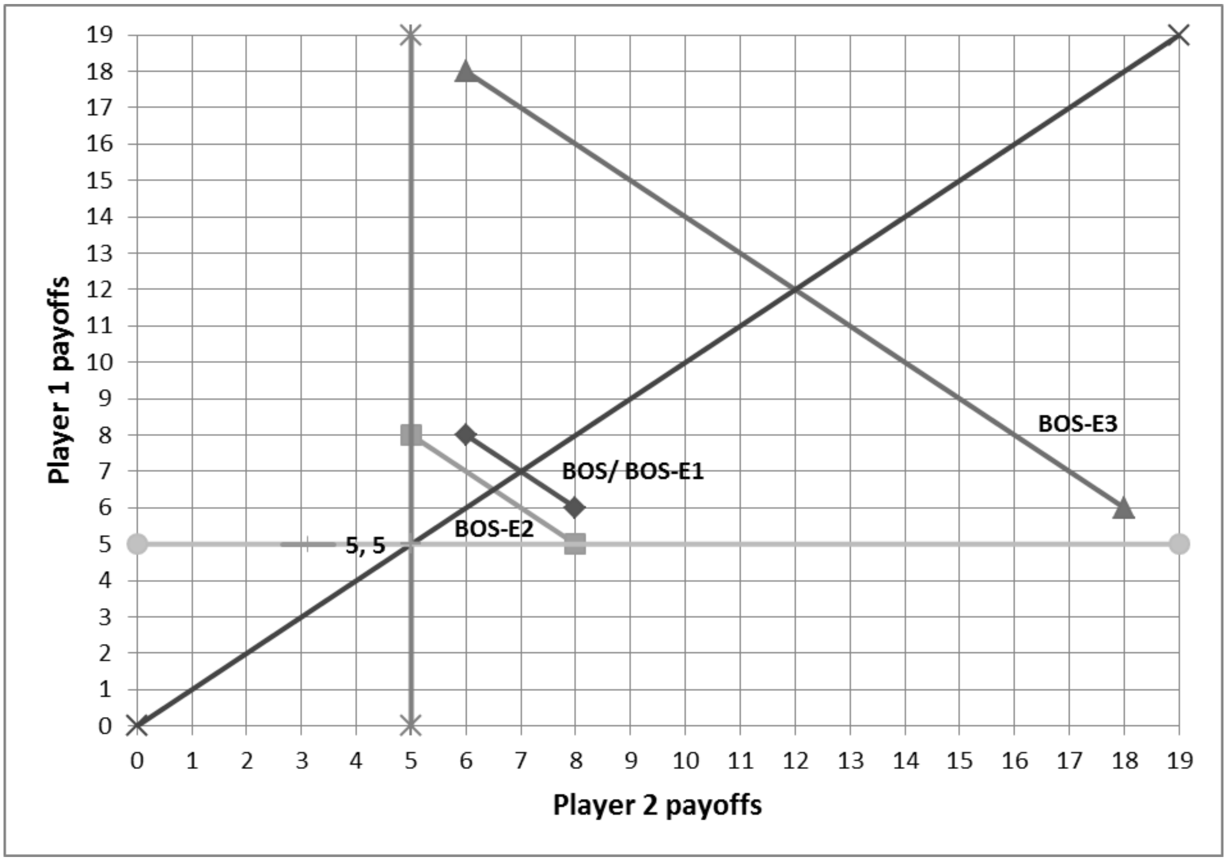

Figure 2.2.2. Graphic representation of payoff differences

Throughout this paper we will use the notation introduced above to describe the games. We will also describe the strategies used in the games as "Dovish", "Hawkish" and "Equal" in the results section. Therefore if, for example, a subject is described as choosing a "Dovish" strategy, when the subject chose the lower of the two unequal options, "Hawkish" when the subject chooses the higher of the two unequal options and "Equal" when the subject chooses an equitable option. In addition we will describe the battle of the sexes portion of each game (i.e. the section which incorporates the Hawkish and Dovish Strategy) as the "BOS section".

An interesting finding that we can glean from using the coordination games above is to investigate how, not only own payoffs, but also the payoffs of others affect behaviour (See for example Charness & Rabin, 2002, Fehr and Schmidt, 1999). It is also worth noting here that whilst the gap between inequitable payoff outcomes is consistent between BOS and BOS-E1, it is increasing between these games and the BOS-E2 and BOS-E3 games. Therefore the total amount of money available to subjects is changing, as well as the degree of inequality in payoffs, with these two games. We would aim to further disentangle these effects in future treatments. If players do have such a high level of inequality aversion (Fehr & Schmidt, 1999) in partnerships then we would expect that, regardless of the magnitude of combined gains to be made from coordinating on an inequitable outcome, inequitable strategy options would remain unpopular. However if subjects are concerned with ”social-welfare preferences” (Charness & Rabin, 2002) we would expect to see subjects using the inequitable outcomes regardless of the magnitude of inequality, if this inequality is able to bring about a Pareto improvement in payoffs for both parties. We would not expect to see Pareto damaging behaviours in order to bring about inequality.

We also choose these games since most other coordination games do not have an equal earnings outcome (apart from the degenerate zero earnings from coordination failure). However in previous experiments without communication it has been found that an outcome that efficiently equates money earnings (where this is available) is very often selected by subjects in tacit coordination and bargaining situations. (See for example van Huyck et al., 1992, Nydegger & Owen, 1974, Holm, 2000, Bett et al., 2013, Isoni et al., 2013, Isoni et al., 2014).

By a comparison of the games described above we will be able to see if these different distributions and payoff asymmetries affect behaviours in different ways and, more specifically, they allow us to investigate in some detail the interplay between Pareto domination and equality, and subsequently the interaction with the ability to communicate. To our knowledge there are only limited studies where communication and the possibility of an equal split in a coordination game are studied. One paper which does look at the effects of an equal spilt is that of Herreiner & Puppe (2010). They allow subjects to communicate proposals to each other in an allocation game and find that splitting money equally is favoured even if this is Pareto dominated and that subjects tend to use equality as a starting point for bargaining. An unequal outcome is only considered as viable if there is not “too much” inequality. Interestingly Herreiner & Puppe (2010) do not investigate further “how” inequitable Pareto improvements are bargained for. A comparison of our games above will allow us to investigate this further.

We also believe that the framing and structure of the payoffs in the games provides us with some interesting insights into subjects’ social preferences in the experiment: The nature of how subjects discuss and choose options means that in declaring a preferred division a subject is not only declaring what division of the “pie” he/she would like, but also the share of the “pie” which he/she believes a co-participant should receive. We represent games in a very clear “£… for you, £…for your co-participant” fashion and so the nature of this representation of the divisions should be clear to subjects. We also do not directly present the £0 outcomes to subjects from mis-coordination. However it was made very clear to subjects that mis-coordination or disagreement on distributions would lead to zero earnings from the game. We see our representation of the game as very different from, for example, that of Isoni et al. (2013) and Isoni et al. (2014), where graphic representations of bargaining type games are used. In these games subjects are instructed to select which "disc" (with each disc representing an amount of money for the subject) they would like to choose for themselves from a selection of discs. Subjects had to agree on a division of discs (i.e. such that each disc is chosen by one subject and no disc is in dispute) in order to receive the amount of money claimed for. Whilst this is also a bargaining type game, in the Isoni et al. (2013) design subjects are not explicitly suggesting a distribution between themselves and a co-participant. Our design, in contrast, allows us to examine the interlink between own entitlements and what a subject feels a co-participant should receive. It could be envisioned that there is a balance between our design and modelling many real bargaining problems since in real bargaining, each player often has very little information about the other's utility payoffs. We also believe that our design offers very interesting insights into the social preference literature since we are able to analyse the extent to which the conversations and the resulting agreements support social preference models e.g. inequality aversion. The rich communication protocol in our experiment also provides us with strong insights into social preferences as it allows us to gain insights into examining subjects' motivations and decision making processes. However, whilst the conversations allow for a "window" through which we can "directly" gauge people's motivations and social preferences it also important to see the limitations of this since allowing people to talk may change the social preferences themselves, since talking may reduce the "social distance" between people.

3. Experimental Design and Implementation

3.1. Practicalities

Subjects were recruited via ORSEE (Greiner, 2004) using a subject pool available through the Centre for Behavioural and Experimental Social Science at the University of East Anglia which, at the time of the experiment, provided a database of over 2000 potential subjects. Since our experiment involved free communication we only recruited subjects who had declared their country of origin as one where English is the primary official language. There are various studies in the field of linguistics which suggest that the ability to speak a language at native level can be used as a method of exerting verbal power over a non-native speaker of the language and that a native speaker is potentially more powerful in an interaction than a non-native speaker. For example Kramsch (1993) asserts that *"An individual who is communicating in a second language is 'in a position of uncommon subordination and powerlessness'"* (Kramsch, 1993, p.238). We thus control for communication ability and fluency (within reason) amongst subjects by only recruiting native speakers (See also Bower, 1966 and Byram, 1997 for further discussion of communication ability). As a secondary control we also asked all subjects if they were a native speaker of English at the end of the experiment, and all subjects reported that English was indeed their native language. Upon arrival subjects were asked to draw a random number out of a bag in order to determine the individual partitioned computer booth each would sit it and then pairings were randomly assigned by the computer. Once all subjects had arrived and settled, instructions were put on a computer screen in front of each subject and were also read aloud by an experimenter in order to ensure understanding and instructions were common knowledge amongst participants. The experimenter clearly explained how subjects could earn money and the one-shot nature of the game after which questions were encouraged and subsequently answered appropriately and publically. After the instructions had been completed subjects were shown a screen on which the game was displayed. The payoff options were presented in text form (£... for Person 1 and £… for Person 2) and the order in which the options were presented was randomised in order to control for order effects. However pairs of subjects always saw the options in the same order (and were aware of this) in order to facilitate ease of communication. Therefore, each subject had complete information about their own and a co-participant's possible payoffs. This is illustrated in the screen shot taken from the experiment (in this case from the BOS game treatment) below:

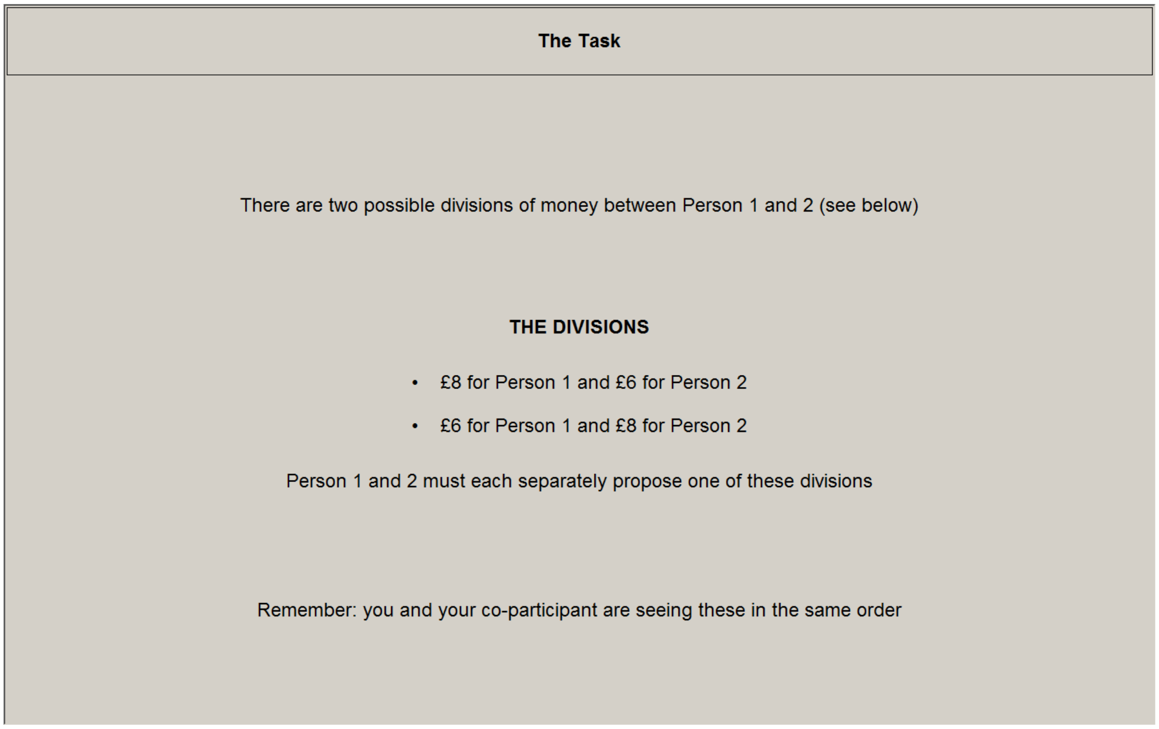

Figure 3.1.1. Screen shot from the game screen

In addition, in the communication treatments, we had to introduce subjects to the communication protocol. Since we allowed free form communication we allowed subjects to decide on the content of messages and to decide how many messages to write. Each matched pair of subjects had 120 seconds (as in Feltovich & Swierzbinski, 2011) to freely exchange as many written messages as they wished. There were no constraints on the content, except that subjects were not allowed to identify themselves or use abusive language. This was made clear in the instructions. (See Roth, 1995 for further discussion on the importance of anonymous communication in experiments, Buchan et al., 2006 for a discussion of the effect of personal identifying conversation on game play and Dawes et al., 1977 for evidence of how uncontrolled conversation can lead to threats and name calling). A screen shot of the chat screen (together with a theoretical conversation for illustration purposes only) is shown below:

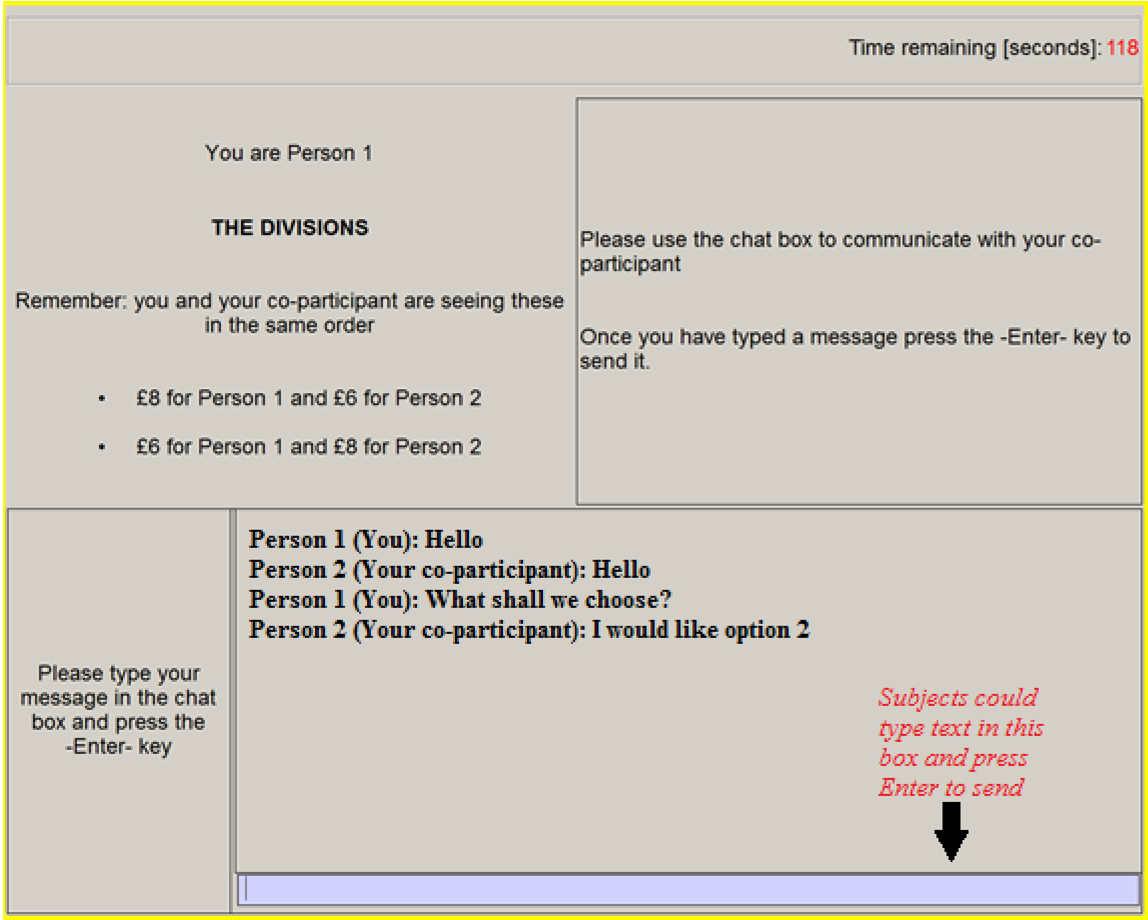

Figure 3.1.2. Screen shot for the chat screen

As can be seen from the figure above the chat box made it very clear to subjects how payoffs could be distributed with regard to payoffs. That is, on the top left subjects were again reminded which player number they were and also in the chat box subjects saw “you” in brackets next to their own person number when they entered and sent text. We felt that this was important to aid the flow of conversations and to ensure payoffs were clearly understood and indeed in the experiment subjects seemed very comfortable and clear about this (as can be evidenced by examining the full conversation scripts in the appendix of this paper). The timer in the top right of the screen also counted down the amount of time subjects had left in this stage. In the sessions without communication, subjects had 120 seconds to silently consider what to do but the layout of the screen remained exactly the same minus the chat elements of the screen shot above. In all treatments the screen automatically timed out after 120 seconds after which subjects’ screens were moved onto the pre-decision screen (a reminder of the game). After all decisions had been made subjects were shown the results of the game.

4. Treatments and Hypotheses

Our experiment thus consisted of a 2x4 factorial design with two communication types and four game types. These treatments allow us to assess how rich communication effects behaviour in the games described above and are presented together with subject numbers in table 4.1 below.

Table 4.1. Treatment table with subject numbers

	Game			
	BOS	**BOS-E1**	**BOS-E2**	**BOS-E3**
Without communication (NC-treatment)	36	38	34	40
With communication (C-treatment)	36	52	38	40

4.1. Treatment Comparisons

The following treatment comparisons can thus easily be made in either the communication or no communication treatments:

BOS v. BOS-E1 – *The effects of an equitable alternative*
By comparing these two treatments we can observe the effects of adding an inefficient yet equitable payoff option. If subjects are very inequality adverse (as in Fehr & Schmidt, 1999) we may expect that subjects will be attracted to an equitable outcome despite its inefficiency.

BOS-E1 v. BOS-E2 – *The effects of making the BOS only weakly Pareto dominant*
By comparing these two treatments we can observe differences in behaviour if only one subject can gain from moving onto the BOS section of the game as in BOS-E2

BOS-E1 v. BOS-E3 – *The effects of increased inequality in the BOS section*
By comparing these two treatments we can observe the effects of an increase in inequality of the BOS section.

It is also clear that a comparison of the effects of communication on all treatments individually between **C-BOS v. NC-BOS; C-BOS-E1 v. NC-BOS-E1; C-BOS-E2 v. NC-BOS-E2 and C-BOS-E3 v. NC-BOS-E3** is also possible.

4.2. Hypotheses

We will explore the following hypotheses in the results section.

Hypothesis 1: ***(Schelling Play)*** A focal outcome will be used more when there is no communication

> We hypothesise that in the game without communication subjects will seek a way in which to solve the coordination game successfully by choosing an outcome which is focal. In our games, subjects have a mutual interest in coordinating as coordination leads to greater financial gain than if mis-coordination occurs and thus subjects have an interest in identifying a coordinating strategy with a co-participant. We would hypothesise that this will be validated in situations where a symmetric and equitable outcome is available since the equitable properties of this outcome may make it focal to subjects, i.e. in BOS-E1, BOS-E2 and BOS-E3. We would therefore expect to see higher coordination on an equitable strategy in the game without communication as compared to games with communication since it serves as a focal yet inefficient coordination device relative to a non-focal inequitable outcome. To elaborate, a certain outcome may be deemed to be focal even in the absence of communication: Schelling illustrated this point in his seminal 1960 work “The Strategy of Conflict” in which he asserts that participants in a coordination game may be able to solve a coordination game even without communication if a coordination outcome seems “special” or “unique” to them and the participants believe that this “knowledge” will be salient to a co-participant as well.

Comparisons: NC-BOS v. C-BOS, NC-BOS-E1 v. C-BOS-E1, NC-BOS-E2 v. C-BOS-E2, NC-BOS v. C-BOS

Hypothesis 2: ***(Testing Conditional Pareto Improvement from Equal Split)***
Subjects will use an equitable strategy more when abandoning it leads to higher inequality

Herreiner & Puppe (2010) suggest that subjects will only abandon an equitable strategy if it does not induce too much inequality. Thus we would expect that we will see more coordination on the equitable outcome in BOS-E3 compared to BOS-E1 since, whilst the equitable coordination outcome remains the same in both games, the degree of inequality in the inequitable outcome increases substantially in BOS-E3.

Comparisons: NC-BOS-E1 v. NC-BOS-E3 and C-BOS-E1 v. C-BOS-E3

Hypothesis 3*: (Cheap talk)* The existence of communication will increase coordination.

Farrell (1987) show that cheap talk will increase coordination. Thus we would expect that in the communication treatments coordination (and as a result payoffs) will be higher.

Comparisons: C-BOS v. NC-BOS, C-BOS-E1 v. NC-BOS-E1, C-BOS-E2 v. NC-BOS-E2 and C-BOS-E3 v. NC-BOS-E3

5. Results

5.1. Summary

We first provide a summary of subject demographics in each treatment. Based on which demographic variables have sufficient variation across all treatments, in our probit analysis we will use dummies on males (54.78%), single subjects (51.02%), those who declared a religion (31.53%), and those aged 21 and over (37.58%).

Table 5.1.1. Summary of Demographic Data (Percentage/ average, *number of subjects*/ *Standard deviation*[70])

	BOS		BOS-E1		BOS-E2		BOS-E3	
	C	**NC**	**C**	**NC**	**C**	**NC**	**C**	**NC**
No of Subjects	36	36	52	38	38	34	40	40
United Kingdom[71]	100% *(36)*	94.44% *(34)*	86.54% *(45)*	86.84% *(33)*	97.37% *(37)*	91.18% *(31)*	80% *(32)*	95% *(38)*
Male	58.33% *(21)*	50% *(18)*	69.23% *(36)*	36.84% *(14)*	52.63% *(20)*	44.12% *(15)*	57.5% *(23)*	62.5% *(25)*
Average age	20.64(3.44)	21.08(7.63)	21.2(3.14)	20.79(2.18)	21.37(4.28)	20.79(2.74)	21.45(4.62)	19.95(2.4)
Economics	16.67% *(6)*	8.33% *(3)*	15.39% *(8)*	5.26% *(2)*	13.16% *(5)*	11.77% *(4)*	5% *(2)*	12.5% *(5)*
Postgraduate	2.78% *(1)*	5.56% *(2)*	19.23% *(10)*	7.9% *(3)*	7.9% *(3)*	8.82% *(3)*	17.5% *(7)*	5% *(2)*
Undergraduate	97.22% *(35)*	94.44% *(34)*	80.77% *(42)*	92.11% *(35)*	92.11% *(35)*	91.18% *(31)*	82.5% *(33)*	95% *(38)*
Caucasian[72]	94.44% *(34)*	94.44% *(34)*	90.39% *(47)*	86.11% *(31)*	89.47% *(34)*	94.12% *(32)*	87.18% *(34)*	94.87% *(37)*
Any religion[73]	27.78% *(10)*	30.55% *(11)*	28.85% *(15)*	34.21% *(13)*	26.32% *(10)*	32.35% *(11)*	37.5% *(15)*	35% *(14)*
Facebook users	97.22% *(35)*	97.22% *(35)*	98.08% *(51)*	100% *(38)*	100% *(38)*	100% *(34)*	95% *(38)*	92.5% *(37)*
Smokers	19.44% *(7)*	27.78% *(10)*	9.62% *(5)*	18.42% *(7)*	7.9% *(3)*	8.82% *(3)*	15% *(6)*	10% *(4)*
In a relationship	50% *(18)*	38.89% *(14)*	50% *(26)*	50% *(19)*	65.79% *(25)*	52.94% *(18)*	37.5% *(15)*	37.5% *(15)*
Single	50% *(18)*	61.11% *(22)*	50% *(26)*	50% *(19)*	34.21% *(13)*	47.06% *(16)*	62.5% *(25)*	62.5% *(25)*

[70] Where % are reported we include the number of subjects present in each category. Where we report averages we include the standard deviation in brackets.
[71] Other nationalities were Australian, Nepalese, American (USA), Irish, Tanzanian and Canadian
[72] Other declared ethnicities were Other Asian Background, Asian British-Nepalese, Black or Black British-Caribbean, Chinese, Mixed-White and Asian, Guatemalan, Mixed-White and Black Caribbean, Asian or Asian British-Indian, Other Ethnic Background, Hispanic, Black or Black British-African, Middle Eastern, Asian or Asian British-Pakistani
[73] The following religions were declared: Christian, Buddhist, Hindu, Other, Jewish, Catholic, Muslim and Pagan. Subjects who declared themselves as Atheist, No Religion and Agnostic were coded as having no religion.

We now also provide a similar summary of choice and outcome data from the experiment. A more detailed analysis of the data is provided in the next section.

Table 5.1.2. Summary of Outcomes and Choices (Percentage, *number of subjects*)[74, 75]

	BOS		**BOS-E1**		**BOS-E2**		**BOS-E3**	
	C	**NC**	**C**	**NC**	**C**	**NC**	**C**	**NC**
No of Subjects	36	36	52	38	38	34	40	40
Total Coordination	94.44% *(34)*[*]	44.44% *(16)*	92.31% *(48)*[*#]	68.42% *(26)*	100% *(38)*	88.24% *(30)*	85% *(34)*[#]	45% *(18)*
Coordination on (5, 5)	n/a	n/a	7.69% *(4)*[¶]	57.9% *(22)*	47.37% *(18)*[¶]	88.24% *(30)*	0% *(0)*	30% *(12)*
Coordination on BOS Section	94.44% *(34)*	44.44% *(16)*	84.62% *(44)*	10.53% *(4)*	52.63% *(20)*	0% *(0)*	85% *(34)*	15% *(6)*
Coordination on higher amount	47.22% *(17)*	22.22% *(8)*	42.31% *(22)*	5.26% *(2)*	26.32% *(10)*	0% *(0)*	42.5% *(17)*	7.5% *(3)*
Coordination on lower amount	47.22% *(17)*	22.22% *(8)*	42.31% *(22)*	5.26% *(2)*	26.32% *(10)*	0% *(0)*	42.5% *(17)*	7.5% *(3)*
Chose Hawkish	52.78% *(19)*	44.44% *(16)*[†]	42.31% *(22)*	18.42% *(7)*[†]	26.32% *(10)*	5.88% *(2)*	57.5% *(23)*	20% *(8)*
Chose Dovish	47.22% *(17)*	55.56% *(20)*[‡]	46.15% *(24)*	10.53% *(4)*[‡]	26.32% *(10)*	0% *(0)*	42.5% *(17)*	25% *(10)*
Chose Equal	n/a	n/a	11.54% *(6)*	71.05% *(27)*[§Δ]	47.37% *(18)*	94.12% *(32)*[§]	0% *(0)*	55% *(22)*[Δ]

[74] Coordination rates reported in this table are *actual* coordination rates. We report these as a guide. However in the analysis below we will look at *expected* coordination rates in the games without communication

[75] Pairs of symbols placed next to values in this table indicate that (non)significant differences were found between these two values in the analysis which follows. All pairs are significant aside from those indicated by a * and a #.

5.2. Main results

5.2.1. A note on data presented

Before we present our findings it is important to note that although subjects were randomly labelled as person 1 and person 2 in the experiment we find no effect of these labels on choices or coordination outcomes[76, 77]. We thus pool individual choices and outcomes regardless of player labels. This is similar to the result obtained by Cooper et al. (1989) who also pooled row and column subject results from their experiment. It should also therefore be noted when reading the results section of this paper that, for example, the outcome "Coordination on BOS section" describes the percentage of subject pairs who coordinated on the BOS section of the game and naturally it follows that within this outcome half of individuals left with the dovish payoff and half with the hawkish payoff.

Furthermore, we need to consider choices in a slightly different way when looking at treatments with communication as compared to those without communication. In the games with communication, we describe the joint distribution of outcomes, since behaviour is highly correlated and as such, the marginal distributions (individual decisions) are not as informative since they ignore this correlation. That is, normally (in a coordination game without communication), the probability that a subject makes a certain decision is independent of his/ her co-participant's choice. However this is no longer true when communication is present as there is now a correlation between a subject's choice of strategy and their co-participant's choice of strategy. For example, the probability that a subject chooses "Dovish" is higher if a co-participant announces their intention to choose "Hawkish" than if the co-participant announced an intention to choose "Equal". In other words, the probability that a communicated signal of intended strategy choice takes a certain value determines the payoff to the subject from the strategies that the subjects choose conditional on that signal. Furthermore, due to the same issues of correlated behaviour described above we are not able to calculate the expected coordination rates (ECRs) in the usual way in the communication treatments. Thus in the games

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[76] In the communication treatments (see discussion of why we use outcomes in the communication treatment results in the following sections)

[77] Results of tests for this are shown in the appendix. Due to the correlation of behaviour which is bound to occur in the communication we test both differences in individual choice behaviour and final combined outcomes between persons 1 and 2.
We do find some order effects on behaviour. However due to low subject numbers in each of the 6 possible orderings (in games with 3 strategy options) we believe this is a subject for future research where more subjects are available in each ordering. We discuss this further in the appendix.

with communication we will use actual coordination rates (ACRs). Also in our probit analysis of game with communication we cluster standard errors on pairs of subjects for the same reason. Doing this relaxes the independence assumption as required by the probit estimator to instead imply independence between clusters.

5.2.2. Coordination, Payoffs and Communication

We first consider the effects of communication on coordination outcomes. Following Farrell's (1987) predictions we would expect that cheap talk will aid and increase coordination and as expected, the large difference in coordination and, correspondingly, expected payoffs are distinctive. In general, we find that the presence of communication is very effective in raising total coordination rates, and does so dramatically, in the BOS, BOS-E1 and BOS-E3 games. Communication increases coordination in BOS by 45.06 percentage points, in BOS-E3 by 44.75 percentage points, in BOS-E1 by 37.94 percentage points but by only 11.42 percentage points in BOS-E2.

Result 1: *Communication increases coordination rates in all game types*

Table 5.2.2.1. Coordination rates and difference (ACR-ECR) with and without communication

		Total Coordination	Coordination on equal	Coordination on BOS section	Coordination on high[78]	Coordination on low
BOS	With Comm (C)[79] (ACR)	94.44%	n/a[80]	94.44%	47.22%	47.22%
	Without Comm (NC)[81] (ECR)	49.38%	n/a	49.38%	24.69%	24.69%
	Difference	***45.06%***	n/a	*45.06%*	*22.53%*	*22.53%*
BOS-E1	With Comm (C) (ACR)	92.31%	7.69%	84.62%	42.31%	42.31%
	Without Comm (NC) (ECR)	54.36%	50.48%	3.88%	1.94%	1.94%
	Difference	***37.94%***	*-42.79%*	*80.74%*	*40.37%*	*40.37%*
BOS-E2	With Comm (C) (ACR)	100%	47.37%	52.63%	26.32%	26.32%
	Without Comm (NC) (ECR)	88.58%	88.58%	0%	0%	0%
	Difference	***11.42%***	*-41.21%*	*52.63%*	*26.32%*	*26.32%*
BOS-E3	With Comm (C) (ACR)	85.00%	0%	85.00%	42.50%	42.50%
	Without Comm (NC) (ECR)	40.25%	30.25%	10%	5%	5%
	Difference	***44.75%***	*-30.25%*	*75.00%*	*37.50%*	*37.50%*

This increase in coordination outcomes is also reflected in the expected payoffs that subjects receive, with subjects in the communication treatments receiving higher expected payoffs on average than those in the treatments without communication. It is interesting to note that increases in expected payoffs are much higher than increases in coordination outcomes overall when communication is available reflecting that it is not just coordination per se which increases with communication but also that coordination on higher payoff outcomes is achieved with communication. Thus we can conclude, that particularly in games with an equal but strictly Pareto-dominated outcome (BOS-E1 and BOS-E3), communication not only raises the overall

[78] *Coordination on high* implies that this reported % of subjects left with the "hawkish" payoff from successful coordination. The percentage reported is therefore the same as the percentage of subject who left with the dovish payoffs (i.e. *coordination on low*) and half of the total percentage of those in "*coordination on BOS section*".
[79] With communication – the chat window was available to subjects and they were able to feely coordinate with a co-participant.
[80] Data on *Coordination on equal* is not available in the BOS game since an equitable coordination outcome was not available here.
[81] Without communication – the chat window was not available to subjects and they were unable to coordinate with a co-participant.

coordination rate, but also strongly changes the probability with which an equilibria comes about.

Looking at table 5.2.2.2 below we notice a counter intuitive result: In the tacit game, when asymmetric equilibria payoffs are at their highest (i.e. in NC-BOS-E3) expected payoffs are the lowest, whilst when asymmetries are at their lowest (i.e. in NC-BOS-E2) expected payoffs are the highest. Thus, whilst in chapter 1 we kept the inequitable outcome constant and varied the rate of inefficiency in the equal outcome, in this comparison we keep the equal outcome constant and vary the "financial distance" between the equal outcome and the inequitable outcome. Whilst in chapter 1 this resulted in the subjects largely abandoning the equal outcome when "financial distance" was high (and therefore achieving higher expected payoffs in these games), in this chapter increasing the "financial distance" between inequitable and equitable outcome via increasing the inequitable outcome has had the opposite effect. This can be explained by looking at choice rates between the three strategies: In NC-BOS-E2 the vast majority of subjects (94.12%) choose equal leading the high levels of coordination (88.24%) whilst in the NC-BOS-E3 far fewer subjects use this option (55%) leading the subsequent low coordination rates (45%). We are however unable to establish any statistical significant difference between the two payoffs (p = 0.3). These individual behaviours will be discussed in more detail in a later section.

Table 5.2.2.2. Observed expected payoffs from the game

		Expected Payoffs
BOS	**C**	£6.61
	NC	£3.46
	Diff.	62.66%
BOS-E1	**C**	£6.31
	NC	£2.80
	Diff.	77.16%
BOS-E2	**C**	£5.79
	NC	£4.43
	Diff.	26.63%
BOS-E3	**C**	£10.20
	NC	£2.71
	Diff.	115.97%

Let us now look at each of the individual games in more detail. In the BOS game it seems natural that communication should greatly increase coordination and expected payoffs since in the game without communication subjects are faced with a situation in which a focal outcome is not present. Thus we might expect that subjects return with lower payoffs than if an outcome had been focal as explained above. If communication is able to make one outcome more focal or allows subjects to come to an agreement of a mutually acceptable coordination outcome then we would naturally expect subjects to earn more in the game with communication. Indeed, we observe an increase of 45.06% in coordination and 62.56% in expected payoffs. Actually our 94.44% coordination rate comes very close to the 95% coordination rates found by Cooper et al. (1989) when the using one way communication in the Battle of the Sexes game. This result also corresponds to Farrell's suggestion that, even with communication, subjects will still experience some degree of mis-coordination in a Battle of Sexes type game due to too many subjects choosing to use the hawkish strategy option.

> ***Result 2:*** *Communication increases coordination and payoffs in the BOS game where there is no focal outcome. We can accept Hypothesis 3 in the BOS game.*

However since we also observe the same phenomenon in the BOS-E1 and BOS-E3 games we can conclude that the effect of communication availability endures even when there is a focal outcome which in Pareto dominated by a non-focal outcome.

> ***Result 3:*** *Communication increases coordination and payoffs in the BOS-E1 and BOS-E3 games where the BOS section Pareto dominates the equitable/focal outcome. We can accept Hypothesis 3 in the BOS-E1 and BOS-E3 game*

Finally, we notice that whilst there is a large increase in expected payoffs and coordination in BOS-E1, there is only a relatively small increase in the same measures in BOS-E2. It appears that the inability of subjects to coordinate on the equitable outcome in the C-BOS-E1 game when communication is available (Only 7.69% of subjects coordinate on this outcome compared to 84.62% on the BOS section of the game) is shown in the increase in expected payoffs in this treatment compared to BOS-E2 (where, with communication, 47.37% coordinate on the equitable outcome, compared to 52.63% on the BOS section)**.**

> ***Result 4:*** *In the BOS-E2 game the equitable outcome remains popular in both the communication and non-communication treatments and thus expected payoff differences between treatments are not as severe. Coordination is only 11.42 percentage points higher and payoffs 26.63 percentage points higher with communication. Therefore, although we can also accept Hypothesis 3 in the BOS-E2 game the evidence is much weaker in this game.*

Thus summing up the last three results, we find that payoff structure is important with regards to the effects that communication has on outcomes. This supports the findings of Bornstein & Gilula (2003) who also conclude that the effectiveness of communication in improving outcomes is dependent on game structure. We also note that our results are very different from those obtained by Cooper et al. (1989). They observe 95% coordination rates in a treatment where only one-sided communication is permitted with this falling to 80% (similar to the figure predicted by Farrel, 1987) in a treatment with 2-sided communication. We observe coordination rates more similar to those obtained by Cooper et al. (1989) in their one-way communication treatments despite using two-way communication. We conjecture that this is due to rich communication protocol that we allow whereas Cooper et al. (1989) only allow for one simple announcement to be made.

Additionally, Herreiner & Puppe (2010) find that Pareto damaging behaviour is observed systemically in the treatment in which payoffs to a subject and their co-participant are commonly known. We however only observe this in the treatments without communication. Without communication, the equitable and Pareto dominated outcome becomes salient and thus Pareto damaging behaviour occurs. However with communication subjects are largely able to coordinate on a Pareto dominant outcome.

Let us now have a closer look at the theoretical predications we gleaned from the calculations of MSNE in the context of our observed results in the games. Firstly in the BOS game we notice that in the game with communication, rates of choosing hawkish are slightly lower than predicted by the MSNE (Observed: 52.78%, Predicted: 57.14%). This is contrary to Farrell (1987) who predicts inflated use of the hawkish option (compared to the MSNE) in the battle of the sexes game. We also notice that, in the tacit (NC-BOS) game, observed use of the hawkish option is less than would have been predicted by the MSNE (Observed: 44.44%). This is line with the findings of Cooper et al. (1989). Furthermore when we consider all the other tacit games (NC-BOS-E1, NC-BOS-E2, NC-BOS-E3) we notice that use of the hawkish option is lower in all of the tacit games compared to the MSNE prediction when mixing over all strategies (observed: 18.42%, 5.88%, 20%, & predicted: 33.9%, 38.1%, 39.47% respectively for BOS-E1, BOS-E2, BOS-E3). Additionally, in all games with an equal split play of the equal split option is higher than the MSNE All (mixing over all 3 strategies) predicts (Observed: 71.05%, 94.12%, 55%; Predicted: 40.68%, 40.68%, 47.37% respectively for BOS-E1, BOS-E2, BOS-E3). The equal split is clearly providing a focal point in the game without communication.

We now test if the strategy choices we observe are accurately predicted by the MSNEs we calculated previously as a whole we notice a number of interesting results. P-values calculated from the chi squared tests are show in the two tables which follow. If we consider significant at a 5% level, a p-value of greater than 0.05 (as shaded in grey) represents observed play significantly similar to that predicted by a particular MSNE. Unsurprising the MSNE All is not a good predictor of play in games with 3 strategy options. This is presumably because of the high use of the focal equal outcome in these games, in the absence of communication. However in the absence of a focal outcome (NC-BOS) we find that an MSNE where subjects mix between a strategy of choosing dovish and equal is a good predictor of behaviour. This seems intuitive – in the absence of any method of coordinating (either player label, communication or a focal outcome) subjects resort to mixing between the strategy options.

Table 5.2.2.3(a). Comparison of observed behaviour to MSNEs – No Communication

	BOS	BOS-E1	BOS-E2	BOS-E3
MSNE All	n/a	0.00	0.00	0.01
MSNE DH	0.31	0.00	0.00	0.00
MSNE HE (P1)	n/a	0.02	0.00	0.06
MSNE DE (P2)	n/a	0.02	0.00	0.23

If we consider the calculated MSNE in the context of games with communication we find that the MSNE DH continues to be good predictor of behaviour in the C-BOS game. This outcome reflects the small degree of mis-coordination we observe in this game and also follows on from Farrell's prediction that even in the presence of communication subjects will be "too" hawkish to achieve full coordination. We also notice that in BOS-E2 use of the Equal option has fallen to a level which makes it compatible with the MSNE All but that in BOS-E1 and BOS-E3 incidences of choosing the Equal strategy option have fallen to levels below those compatible with this MSNE. However in C-BOS-E1 those who mix between dovish and hawkish only do so at levels significantly similar to MSNE DH. This finding combined with the finding that the same MSNE does not accurately predict behaviour in C-BOS-E3 reflect the high rate of hawkish behaviour predicted by the MSNE DH for this game (75%). Therefore although observed levels of hawkish behaviour are only 57.5% in this game, they do not drop to levels required for full coordination on an inequitable outcome leading to some mis-coordination (equal is not used at all in this game).

Table 5.2.2.3(b). Comparison of observed behaviour to MSNEs – Communication

	BOS	BOS-E1	BOS-E2	BOS-E3
MSNE All	n/a	0.00	0.06	0.00
MSNE DH	0.87	0.34	0.01	0.04
MSNE HE (P1)	n/a	0.00	0.12	0.00
MSNE DE (P2)	n/a	0.00	0.26	0.00

It is also interesting to note here that expected payoffs in the games without communication appear very close to those predicted by the MSNE play over all strategies available in the game. When we test for significant differences we find that payoffs in NC-BOS, NC-BOS-E1 and NC-BOS-E3 are all statistically similar to the payoffs predicted by the MSNE. Under a null hypothesis that payoffs are statistically the same we find p-values of 0.99, 0.59 and 0.83 respectively. We are therefore able to accept the null hypothesis. When we consider games with communication, expected payoffs certainly do not appear similar to those predicted by the MSNE. Our tests confirm this with p values of 0.09, 0.00, 0.00 and 0.00 respectively. We saw above that the MSNE where subjects mix over dovish and hawkish in the BOS game (both with and without communication) are statistically the same as behaviour which is observed in our treatments. Whilst we note that, as a result, the expected payoffs are indeed also shown to be statistically similar in this game without communication (NC-BOS), we can only conclude this in the game with communication (C-BOS) if we consider results at a 5% level (p = 0.09). More surprising is that since the MSNE where subjects mix over all three strategy options does not accurately predict behaviour in the NC-BOS-E1 or NC-BOS-E3 games, expected payoffs do appear to be statistically similar. Looking at the observed choice data we can observe that the reason for this similarity in payoffs is purely coincidental: Whilst play of the MSNE would have predicted a 16.55% and 22.44% coordination rate on the equitable option in the NC-BOS-E1 and NC-BOS-E3 games respectively we observed a 57.9% and 30% rate in reality. However in the NC-BOS-E1 the predicted rate of coordination on the BOS section of game would be 17.24% but in reality only 10.53% of subjects manage to coordination on an asymmetric outcome. This increase in coordination on an equal outcome and decrease in coordination on an inequitable outcome compare to the prediction appear to balance each other out to reach an expected payoff similar to the predicted one. The story seems a little more complicated with the NC-BOS-E3 game. Actual coordination on both an equal outcome and on the BOS section of the game (15%) are higher than what would have been predicted by the MSNE (10.39% on the BOS section for BOS-E3). However these deviations from the predicted coordination rates of the MSNE are not as high as those found in the NC-BOS-E1 perhaps reflecting the lack for change from predicted the MSNE and that calculated in reality.

Table 5.2.2.4. MSNE Expected payoffs v. Observed Expected payoffs

		Expected Payoffs (EP) in the experiment	Expected payoffs from MSNE play (Over all strategies)
BOS	**C**	£6.61	£3.43
	NC	£3.46	
BOS-E1	**C**	£6.31	£2.03
	NC	£2.8	
BOS-E2	**C**	£5.79	£1.91
	NC	£4.43	
BOS-E3	**C**	£10.20	£2.37
	NC	£2.71	

5.2.3. Focality and Communication

We notice the large differences in both use of the equal strategy option and subsequently (and naturally) coordination on the equitable outcome between the treatments with and without communication.

Table 5.2.3.1. The equal strategy between treatments

		Coordination on Equal	**Choose Equal**
BOS-E1	With Comm (C)	7.69%	11.54%
	Without Comm (NC)	50.48%	71.05%
	Difference	*-42.79%*	*-53.85%*
BOS-E2	With Comm (C)	47.37%	47.37%
	Without Comm (NC)	88.58%	94.12%
	Difference	*-41.21%*	*-63.12%*
BOS-E3	With Comm (C)	0%	0%
	Without Comm (NC)	30.25%	55%
	Difference	*-30.25%*	*-55%*

In the treatments with communication we notice that use of the equal strategy is far lower than in the corresponding treatment without communication in the BOS-E1, BOS-E2 and BOS-E3 games. (Reductions of 42.79%, 41.21% and 30.25% respectively in coordination and 53.85%, 63.12% and 55% respectively in choices). We therefore accept hypothesis 1.

> ***Result 5:*** *Subjects are more likely to choose and coordinate on an equal outcome when there is no communication available compared to when there is. We see evidence of "Schelling Play" when there is no communication available with subjects more likely to choose the focal outcome.*

5.2.4. Inequality Aversion

In this section we wish to examine if the addition of an equitable but Pareto dominated outcome affects behaviour, and more specially coordination, on the BOS section of two comparable games. For this we consider a comparison of the proportion of subjects coordinating on the BOS section of the game in the C-BOS-E1 and C-BOS games. We notice a 9.82% increase in coordination on the BOS section in C-BOS as compared to C-BOS-E1 when referring the table 5.2.4.1 below. This difference is however not significant using a chi-squared test – ($\beta_{(1)} = 2.0404$, $p = 0.153$).

Table 5.2.4.1. Coordination Outcomes (C-BOS v. C-BOS-E1)

	Coordination on BOS section	Coordination on Equal section
BOS	94.44%	n/a[82]
BOS-E1	84.62%	7.69%

This is further reinforced by the probit analysis where we also find no significant difference in coordination on the BOS section of the game. It should be noted that we present marginal probabilities in all probit tables that follow:

Table 5.2.4.2. Coordination outcomes (C-BOS v. C-BOS-E1) – Probit analysis

Variable	Coordination on BOS section
C-BOS-E1 (Base: C-BOS)	-0.648 (0.57)
Male (Base: Females)	0.196 (0.39)
Single (Base: In a relationship)	-0.674 (0.36)
Any religion declared (Base: Non-religious)	-0.260 (0.36)
Age over 20 years (Base: Age 20 years & under)	0.422 (0.38)
Constant	1.887*** (0.70)
Number of Obs.	88
Pseudo R-Squared	0.1272

[82] No equal split was available in the BOS game

Result 6: *The addition of an equitable outcome in the C-BOS-E1 is not affecting coordination behaviour compared to the C-BOS game when communication is available.*

However we notice a very different result when there is no communication available.

Table 5.2.4.3. Choices Made (NC-BOS v. NC-BOS-E1)

	Choose Hawkish	**Choose Dovish**	**Choose Equal**
NC-BOS	44.44%	55.56%	n/a
NC-BOS-E1	18.42%	10.53%	71.05%

We notice that the proportion of subjects making strategy choices within the BOS section (i.e. hawkish or dovish) is very different between NC-BOS and NC-BOS-E1. Differences in subjects choosing a hawkish or a dovish strategy between the two games is also significant (Hawkish: $\beta_{(1)} = 5.8445$, $p = 0.016$; Dovish: $\beta_{(1)} = 17.1051$, $p = 0.000$). We can further confirm this result with a probit analysis below. We therefore find that the marginal probability of an individual choosing hawkish is reduced by 78.6% for those in the NC-BOS-E1 game compared to the NC-BOS game. Similarly the marginal probability of an individual choosing dovish is reduced by 180.9% for those in the NC-BOS-E1 game compared to the NC-BOS game. This interpretation can be applied to all the probit results which follow:

Table 5.2.4.4. Choices made (NC-BOS v. NC-BOS-E1)[83]– Probit analysis

Variable	Chose Hawkish	Chose Dovish
NC-BOS-E1 (Base: NC-BOS)	-0.786** (0.35)	-1.809*** (0.43)
Male (Base: Females)	0.023 (0.35)	-0.391 (0.38)
Single (Base: In a relationship)	-0.807** (0.37)	0.133 (0.37)
Any religion declared (Base: Non-religious)	-0.149 (0.36)	0.439 (0.38)
Age over 20 years (Base: Age 20 years & under)	-0.884** (0.39)	0.915** (0.41)
Constant	0.602 (0.39)	-0.105 (0.39)
Number of Obs.	74	74
Pseudo R-Squared	0.1647	0.2721

Since we also observe significance on some of the demographic variable in this analysis we perform a robustness check on this data. We therefore also run the same regressions those age over 20 years and those 20 years and under, as well as those who were single and in a relationship repressively and do not find that the magnitude or significance of these coefficients changes significantly[84]. We thus have further evidence for the robustness of our results.

[83] Throughout this paper we will use the following code to denote the significance level at which a coefficient is significant: * 10%, ** 5%, *** 1%

[84] Due to the significance on "Age over 20 years" and "single" in this regression we also report here, coefficients on the NC-BOS-E1 variable when we examine each of the following subgroups in turn. Significance and chi-squared statistics indicating the probability of difference between coefficients on this variable with all subjects included (as in the main text) and in each of the subgroups are shown after each reported coefficient. We note that no significance difference in coefficient magnitude is found. Coefficients also remain significant. We view this as a further robustness check of our result :

Age over 20 years (Coefficient$_{(Hawkish)}$ = -0.45*, p = 0.34, Coefficient$_{(Dovish)}$ = -2.584447***, p = 0.3493)
20 years and under (Coefficient$_{(Hawkish)}$ = -1.200477***, p = 0.3322, Coefficient$_{(Dovish)}$ = -1.231968**, p = 0.2517)
Single: Coefficient$_{(Hawkish)}$ = -1.543834**, p = 0.2249,
In a relationship: Coefficient$_{(Hawkish)}$ = -0.5034857*, p = 0.34

Result 7: *The addition of an equitable outcome in the NC-BOS-E1 is affecting behaviour compared to the NC-BOS game when communication is not available.*

Combining these two results we see that the addition of an equitable outcome has very different effects depending on if communication is available or not. With communication we see very similar proportions of subjects coordinating on the BOS section in both games suggesting that, with communication, subjects largely dismiss the equitable outcome in C-BOS-E1 despite its equitable properties. However when we compare the same two treatments with no communication subjects largely choose the equal/ focal outcome whilst abandoning the BOS section of the game when this option is available (NC-BOS-E1). Thus we conclude that it is not a preference for equality that is driving subjects to choose the equitable outcome when there is no communication available, but instead the fact that the equal allocation serves as a focal coordination device. We conclude that it is merely the focality of this outcome as a coordination device which is appealing to subjects and not its inherent equality.

5.2.5. Weak v. Strong Pareto domination

In this section we examine if the salience of the equitable outcome is affected if the BOS section of the game weakly or strictly dominates it. Thus we examine a comparison of BOS-E1 and BOS-E2.

First we provide a summary of choices made in the experiment with no communication. In the table below we present a measure of choices as a percentage of total choices made.

Table 5.2.5.1. Choices Made (NC-BOS-E1 v. NC-BOS-E2)

	Choose Hawkish	**Choose Dovish**	**Choose Equal**
NC-BOS-E1	18.42%	10.53%	71.05%
NC-BOS-E2	5.88%	0.00%	94.12%

We notice how the form of the game is changing behaviour: In the NC-BOS-E2 game 94.12% of subjects chose the equal outcome whereas this falls to only 71.05% in the NC-BOS-E1 game. This difference is significant using a chi-squared test ($\beta = 6.45$, $p = 0.011$) showing that the small change in the form of the game is making an equitable outcome much less focal. This result is also supported by the probit analysis:

Table 5.2.5.2. Choices Made (NC-BOS-E1 v. NC-BOS-E2) – Probit analysis

Variable	**Choose Equal**
NC-BOS-E2 (Base: NC-BOS-E1)	1.001** (0.42)
Male (Base: Females)	0.364 (0.43)
Single (Base: In a relationship)	0.774* (0.41)
Any religion declared (Base: Non-religious)	-0.210 (0.43)
Age over 20 years (Base: Age 20 years & under)	0.199 (0.41)
Constant	0.092 (0.41)
Number of Obs.	72
Pseudo R-Squared	0.1899

> ***Result 8:*** *If no communication is available and only one member of a partnership could benefit from abandoning equality then subjects are less willing to do so than if both could gain.*

However, we have some evidence to doubt the robustness of this result: As in previous analysis, due to the significance on the “Single” dummy in the table above we run separate regressions were we only include single subjects and subject who declared themselves in a relationship in the experiment. We find that when the sample is restricted to singles only the coefficient on NC-BOS-E1 becomes non-significant at β = 0.306 which is found to be significantly different from 1.001 at a 10% level (p = 0.052). Furthermore when we run the same regression with only the non-single subjects the coefficient on NC-BOS-E1 becomes positive and significant at a 1% level. (β = 1.631***). This coefficient is found to be significantly different from 1.001 at a 1% level (p = 0.0000).

However, the difference in coordinating on an equal outcome is significant between the same two games (C-BOS-E1 - 7.69% and C-BOS-E2 - 47.37%) in treatments with communication (β = 18.71, p = 0.000). The probit analysis also supports this result and this result remains robust to demographic variables:

Table 5.2.5.3. Coordination outcomes (C-BOS-E1 v. C-BOS-E2) – Probit analysis

Variable	**Coordination on equal outcome**
C-BOS-E2 (Base: C-BOS-E1)	1.303*** (0.46)
Male (Base: Females)	-0.518 (0.38)
Single (Base: In a relationship)	-0.085 (0.34)
Any religion declared (Base: Non-religious)	-0.336 (0.35)
Age over 20 years (Base: Age 20 years & under)	-0.092 (0.23)
Constant	-0.931** (0.38)
Number of Obs.	90
Pseudo R-Squared	0.2199

Result 9: *As in the game without communication, if communication is available and only one member of a partnership could benefit from abandoning equality then subjects are less willing to do so than if both could gain.*

It is also interesting to note that the addition of communication appears to be having the same magnitude of effect in the BOS-E1 game and BOS-E2 game with, as already previously noted, communication largely decreasing the use of the equal payoff outcome in both games (In both the BOS-E1 game and the BOS-E2 game not having communication available increases coordination on the equal outcome by about 40 percentage points compared to the treatments with communication).

Table 5.2.5.4. Coordination rates on an equal outcome (BOS-E1 v. BOS-E2)

	C	**NC**
BOS-E1	7.69%	50.48%
BOS-E2	47.37%	88.58%

Therefore, combining this with the two results above, we sum this up in the result below:

Result 10: *Although we see significant increases in the use of an equal division of payoffs as a focal coordination device in the no communication treatment in both the BOS-E1 and BOS-E2 treatments as compared to with communication, coordination on an equitable outcome is significantly higher in both the communication and no communication treatments in BOS-E2 in a comparison with BOS-E1.*

We provide the following interpretation of this result: We believe that subjects are working on a commonly held norm: “If we both can benefit from abandoning an equal outcome, then we should do so. If only one of us benefits, this is not so good, so we should perhaps not abandon the equal outcome“. In other words, when both subjects can strictly gain from abandoning equality, subjects are willing to do so, even if the other subject benefits more than them. But when only one subject can benefit from moving away from an equal outcome, subjects are less willing to do so. So subjects are jointly willing to sacrifice equality for higher payoffs, especially when both can benefit (when equality is strictly Pareto-dominated as in BOS-E1), but less so when inequality only benefits one person (as in BOS-E2). We will see later in this chapter, when discussing the chat transcripts that this interpretation is supported by the chat data in that proposal to choose the equal split are much higher in the BOS-E2 game whilst suggestion to take part of the asymmetric split as much higher in the BOS-E1 game.

These two findings show there is a difference in how communication affects the salience of an inefficient equal option depending on whether the equal outcome is weakly or strictly dominated. Whilst communication decreases the use of these options in both BOS-E1 and BOS-E2, in BOS-E2 the equal outcome remains robustly more popular than in the BOS-E1 both with and without communication.

We depict this behavioural process in figure 5.1.5.1 below:

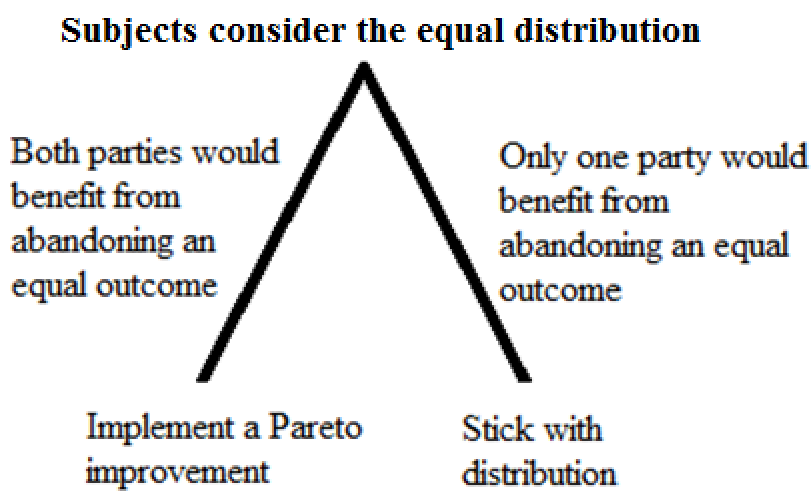

Figure 5.2.5.1. Behavioural processes in games with a possible equal outcome (with communication)

5.2.6. Varying the extent of inequality

We now wish to examine if the extent of inequality in the BOS section of the game effects behaviour. Herreiner & Puppe (2010) hypothesise that subjects will not be prepared to try to coordinate on an unequal outcome if the inequality present in that outcome is too high. We would thus expect that use of the equal outcome will increase as inequality in the BOS section increases.

Table 5.2.6.1. Choices Made (NC-BOS-E1 v. NC-BOS-E3)

	Choose Hawkish	Choose Dovish	Choose Equal
NC-BOS-E1	18.42%	10.53%	71.05%
NC-BOS-E3	20.00%	25.00%	55.00%

First we compare NC-BOS-E1 and NC-BOS-E3 and see that subjects actually move away from the equitable outcome as the inequality between the unequal outcomes increases: 71.05% choose this option in NC-BOS-E1 but only 55% in NC-BOS-E3. This result is just beyond the bounds of significance when we consider the non-parametric test ($\beta_{(1)} = 2.1500$, $p = 0.143$). However in a probit analysis we do find significance on the result that use of the equal outcome is significantly higher in the NC-BOS-E1 game compared to the BOS-E3 game.

Table 5.2.6.2. Choices Made (NC-BOS-E1 v. NC-BOS-E3) – Probit analysis

Variable	Choose Hawkish	Choose Dovish	Choose Equal
NC-BOS-E1 (Base: NC-BOS-E3)	-0.217 (0.38)	-0.603 (0.40)	0.564* (0.34)
Male (Base: Females)	-0.432 (0.39)	0.030 (0.39)	0.317 (0.35)
Single (Base: In a relationship)	-0.894**[85] (0.38)	-0.244 (0.36)	0.871*** (0.33)
Any religion declared (Base: Non-religious)	-0.081 (0.37)	0.673* (0.35)	-0.462 (0.32)
Age over 20 years (Base: Age 20 years & under)	-0.453 (0.42)	-0.168 (0.43)	0.507 (0.37)
Constant	0.009 (0.40)	-0.780* (0.42)	-0.547 (0.38)
Number of Obs.	78	78	78
Pseudo R-Squared	0.1205	0.1005	0.1374

Thus in NC-BOS-E1 a strategy of choosing the hawkish or dovish option is largely abandoned (only 28.93% of subjects choose these options), just under half (45%) choose a hawkish or dovish strategy in the NC-BOS-E3 game and we have some evidence that this is significantly effecting choices. The extent of inequality is making subjects change their behaviour.

Result 11: *The larger the inequality (and consequently the potential gains in overall earnings appear to be) the more subjects appear to see*

[85] Again due to significance on the "single" demographic variable in this table we also run the same regression with the "single" sub-group. The numbers reported below are coefficients on the NC-BOS-E1. Significance and probability of difference between these coefficients and the ones reported above as shown as previously. No significant difference in magnitude or significance of the coefficient on the treatment variable are found. We view this as a robustness check of our findings.

Single ($Coefficient_{(Hawkish)}$ = -0.359684, p = 0.8338 , $Coefficient_{(Equal)}$ = .9611468*, p = 0.4354)

In a relationship ($Coefficient_{(Hawkish)}$ = -0.1390809, p = 0.4754, $Coefficient_{(Equal)}$ = 0.2737685, p = 0.5508) *choosing an inequitable strategy as "worth the risk" due to the possible large financial gains which could be made.*

We also note another interesting coefficient which become significant when we consider only subjects with and without a declared religion respectively. With dovish as the dependent variable we find that for subjects who did declare a religion the coefficient on NC-BOS-E1 does not change significantly in magnitude from the regression where we include all participants ($\beta = -1.054449$, $p = 0.4531$) but become significant at a 10% level. . However the coefficient on equal is robust. All coefficients on NC-BOS-E1 are however robust to the result above when we consider only those who declared a religion.

Now let us consider a comparison of C-BOS-E1 and C-BOS-E3 to consider how the degree of inequality affects behaviour in the presence of communication. A summary is provided in the table below:

Table 5.2.6.3. Coordination outcomes (C-BOS-E1 v. C-BOS-E3)

	Coordination on BOS Section	**Coordination on Equal**
BOS-E1	84.62%	7.69%
BOS-E3	85%	0%

We see that coordination on the BOS section is very similar in C-BOS-E1 and C-BOS-E3 (84.62% and 85.00% respectively which is found to be an insignificant difference - $\beta_{(1)} = 0.0026$, $p = 0.959$). Furthermore we observe no difference in coordination outcomes[86] using a probit model.

[86] We only examine coordination on the BOS section here as 0% of subjects coordinated on an equal outcome in the BOS-E3 game.

Table 5.2.6.4. Coordination outcomes (C-BOS-E1 v. C-BOS-E3) – Probit analysis

Variable	**Coordination on BOS Section**
C-BOS-E1 (Base: C-BOS-E3)	-0.028 (0.46)
Male (Base: Females)	0.291 (0.29)
Single (Base: In a relationship)	-0.003 (0.38)
Any religion declared (Base: Non-religious)	0.217 (0.38)
Age over 20 years (Base: Age 20 years & under)	0.411 (0.27)
Constant	0.648 (0.43)
Number of Obs.	92
Pseudo R-Squared	0.0259

We thus draw the following conclusion.

> ***Result 12:*** *Coordination outcomes are very similar between C-BOS-E1 and C-BOS-E3 where there is communication available.*

We can reject Hypothesis 2 in the game in which communication is available. The degree of inequality in the BOS section does not affect behaviour when subjects can communicate. If we consider this in the context of the result found in the previous section on individual choices in the NC treatments we see the differences in behaviour dependent on the presence of communication.

Let us consider this result further in the context of Herreiner & Puppe (2010). They state the following principle which they name a "Conditional Pareto Improvement from Equal Split (CPIES)":

> *First, determine the most equal distribution of rewards. If this allocation is Pareto optimal, then choose it. Otherwise, if there is the possibility to make everyone better off, implement such a Pareto improvement provided that this does not create "too much" inequality* (Herreiner & Puppe, 2010, p.239)

We also illustrate this important principle in the figure below:

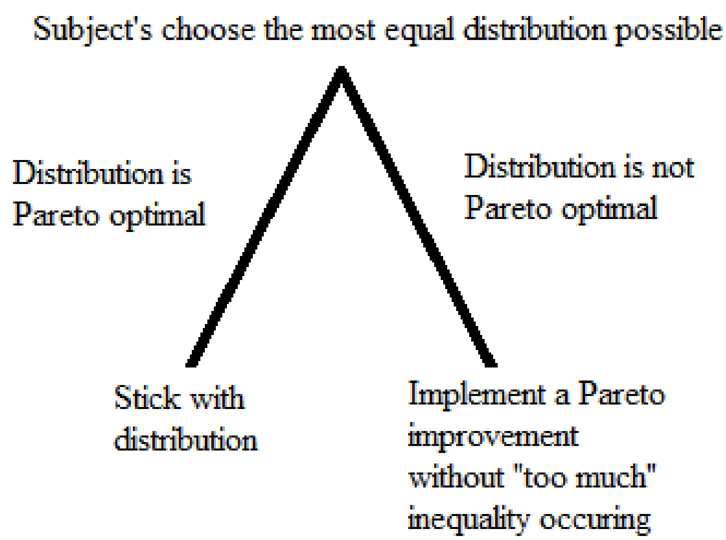

Figure 5.2.6.1. Conditional Pareto Improvement from Equal Split (CPIES)

We find a different result to the one depicted above by Herreiner & Puppe (2010) with communication. With communication the vast majority of subjects stick to the BOS game despite vast increases in inequality.

5.3. Analysis of chat data

The analysis of chat data which follows here is also a key element of the research presented in this paper. In this vein, and for the sake of brevity, we provide the full chat scripts in the appendix and here we only provide two types of chat data analysis: The first is to look at the numerical values relating to chat behaviour which are directly available. The second is to look more closely at the content of conversations.

With regard to the first category of analysis we provide averages of:

- The time at which conversations started
- The time at which conversations ended
- Average chat time
- Number of lines of chat used.

These initial categories of analysis are relevant because they provide us with some interesting initial insights into how conversations differ depending on game type. For example, the average time at which subjects started a conversation allows us to see if subjects were more hesitant or keen to start a conversation in one treatment compared to another i.e. if in one game type we were to observe that subjects are more hesitant to start then we might assume that subjects feel they could get a better outcome for themselves by not being the first mover[87]. Similarly, differences in time ended and started and consequently chat time give us insights into if subjects find it "easier" or are quicker to come to an agreement in certain games. The number of lines of chat could also give us insights into how "intensively" subjects chatted. This data is presented below, both in table and graphical form, together with the standard deviations in order to provide an indication of the dispersion of observations:

[87] In order to illustrate this point in the world outside the lab, we could imagine a situation in which a person was to delay offering to buy drink in a bar in the hope that someone else will be "generous" first and buy the drinks round!

Table 5.3.1. Summary of chat behaviour – averages *(standard deviation)*

	BOS (8, 6)(6, 8)	**BOS-E1 (8, 6)(6, 8) (5, 5)**	**BOS-E2 (8, 5)(5, 8) (5, 5)**	**BOS-E3 (18, 6)(6, 18) (5, 5)**
Average time started (secs)	10.78 *(8.50)*	11.12 *(9.20)*	12 *(9.9)*	9.45 *(10.23)*
Average time ended (secs)	99.83 *(25.99)*	106.81 *(19.32)*	94 *(27.48)*	115.65 *(3.89)*
Number of lines of conversation in total (in pairs)	10.22 *(4.67)*	11.62 *(6.08)*	9.89 *(4.89)*	17.93 *(15.31)*
Total Chat Time (secs)	89.06 *(27.0)*	95.69 *(24.3)*	82 *(31.85)*	103.98 *(19.69)*

It also seems natural to present this data in graphical form: The wide bars represent the averages whilst the vertical lines represent the dispersion of results and the vertical axis shows the number of seconds that each measure took on average.

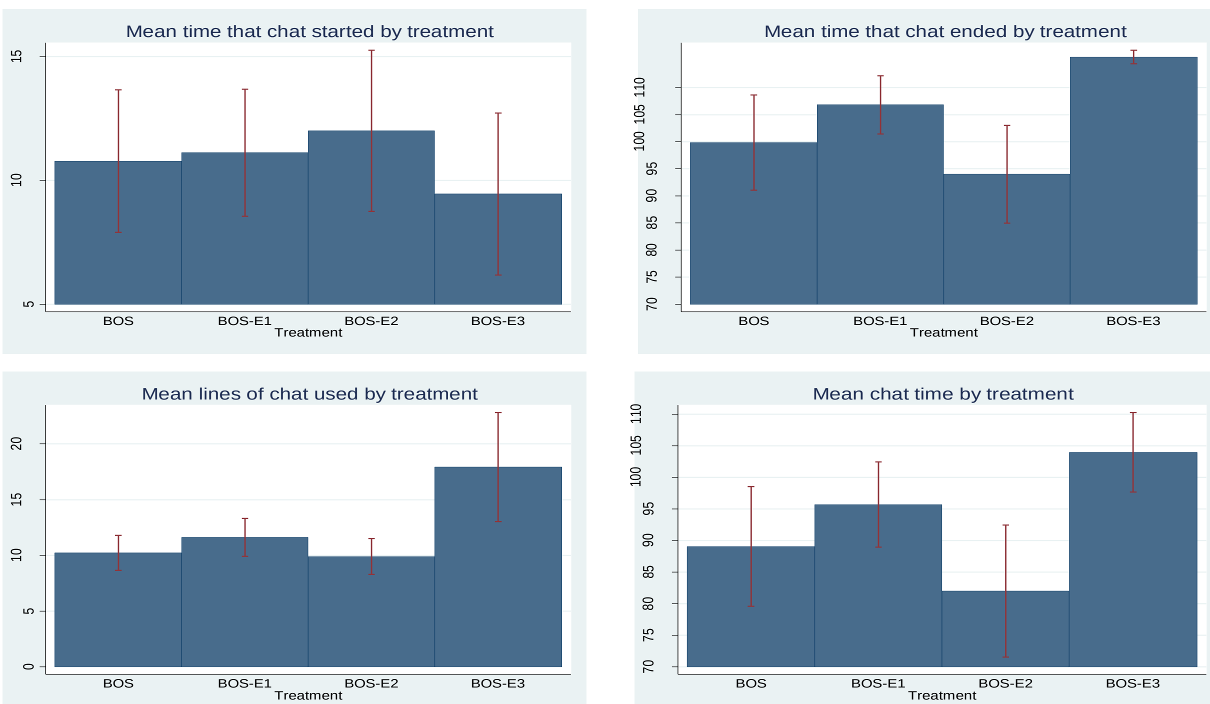

Figure 5.3.1. Graphical summary of chat behaviour

We notice the following main points in the conversations. Whilst in all games the average time taken to begin chatting is similar (between 9.45 and 12 seconds), the time which subjects used to chat varies widely between treatments (From almost the complete duration of chat time in BOS-E3 - 103.98 seconds – to only 82 seconds in BOS-E2). The quickest decisions are reached in the C-BOS-E2 game suggesting that subjects find it easier to come to a consensus in this game. The choice data above would suggest that this is because the equitable outcome remains relatively more focal in this game than in other games with an equitable outcome (C-BOS-E1 and C-BOS-E3) making coming to a consensus with a co-participant easier.

Also interesting is that whilst in the C-BOS-E2 game the lowest average end time, lowest number of lines of chat and lowest total chat time (supporting the assertion about this game made above) and the highest start time are observed, in C-BOS-E3 the complete opposite is observed with the highest average end time, highest number of lines of chat and highest total chat time and the lowest start time. These two game structures and the larger amounts of money at stake in C-BOS-E3 are clearly having opposite effects on chat behaviour. The greater inequality in the inequitable section of the C-BOS-E3 games seems to generate a lot more discussion and difficulties in reaching a decision. We also notice the low standard deviation in the average time ended in C-BOS-E3 showing that there is not much dispersion in end times and that most subjects are finishing conversations towards the later stages of the time available. The notable differences between the data obtained in these categories and analysis in C-BOS-E3 (aside from “Average time started”) and the rest of the games is in fact interesting in itself with these difference all being in the same direction, although the biggest differences are observed in a comparison with C-BOS-E2.

To continue our analysis of conversations into the second category of chat analysis, we test our hypothesis that is it not just the mere presence of communication which is causing changes in behaviour but that the content of conversations will also differ when we see behavioural differences. We will therefore now look more closely and specifically at the types of communication employed by our subjects in each of the games. In previous studies a number of different methods of coding have been used and there have been two main elements of the coding method which tend to vary: The first is the choice between whether experimenters directly involved in the experiment code chat protocols or if research assistants who have had no previous involvement in the experiment are used. The second is whether coding categories are fixed or if coders are free to combine and add categories as they wish during the coding process. The following table illustrates how previous studies have elected to code chat messages:

Table 5.3.2. Coding strategies

		Coders used	
		Experimenters	**Research Assistants**
Category types	**Fixed**	• Ben-Ner et al. (2011) • Brandts & Cooper (2007)[88] • Charness & Dufwenberg (2006) • Gneezy (2005)	• Cooper & Kagel (2013) • McGinn et al. (2012) • Vanberg (2008) • Xiao & Houser (2009) • Xiao & Houser (2005)
	Non Fixed	None[89]	• Cooper & Kühn (2014)

We decided to use the same protocol as Cooper & Kühn (2014) to code our data, i.e. categories were not fixed by the experimenters and research assistants were used to code the data. This was because we believe that using research assistants who have had no previous involvement with the experiments avoids problems of demand effects on coding outcomes as they had no notion of the aims or hypotheses of the experiment as opposed to if the experimenters themselves were to code the data (for a deeper discussion on the issue of demand effects in economics experiments see Zizzo, 2010). Also we wanted to let coders add or merge categories since this would give us the richest insights into the communication protocols and practices. Nevertheless we decided to designate a short section of the coding sheet as "compulsory" because we wanted to ensure that only one (and not zero) categories would apply in these cases in order to give us an initial board measure of conversation types. There were four compulsory and fixed categories from which subjects had to choose one for each conversation (including an "Other" category which subjects could use if they did not feel any of the three other possible compulsory categories were a good fit). However all other categories in a "non-compulsory" section which followed the "compulsory" could be merged and added to. These categories are described in more detail below.

Categories were decided upon using the following method which mimics that of Cooper & Kühn (2014): Two experimenters independently went through the conversations and wrote down categories that they felt fitted the data. The experimenters then met to discuss and agree on categories. Subsequently, two research assistants who had previously had no involvement in

[88] Fixed categories were agreed by 2 experiments and 2 RAs before coding

[89] It seems natural that we did not find any papers where the experimenters coded the data and where categories were unfixed. Since the experimenter are usually the ones to propose the original categories then it follows that if the same people code the conversations these categories should hold. In contrast if a research assistant codes conversations he/ she may provide a different perspective on the categories required to adequately code the data.

the experiment (either as experimenters or subjects) were hired as coders to categorise the conversations. We did not tell them anything about our research questions or hypotheses and told them to use their best judgment when coding. Coders were told that any given conversation could be put in one, several, or no categories in the non-compulsory section and must be put into one of the categories in the compulsory section. Each coder then classified all the conversations independently. Coders are not allowed to talk with each other[90] during this phase but were encouraged to ask the experimenters questions if there was anything they are not sure about. Coders were also encouraged to merge categories if they could not see the difference between some categories suggested by the experimenters and we did not require coders to agree on categorisation. After both coders had finished coding we combined the results from both and report the averages below.

In the compulsory section coders were asked to select a category that described how the majority of the conversation could be defined or how the conservation could be "summed up". It was compulsory to choose one of the following categories:

Table 5.3.3(a). Compulsory Coding Categories

1. Efficiency talk
    - Use this category if subjects recognise that although one person will get more than the other if the unequal outcome is chosen, both (or one participant in the case of BOS-E2) will get more in an unequal outcome compared to getting (5, 5) or nothing at all in the case of non-coordination
    - Example: "One of us can get 6 and the other 8, and that is better for each of thus than if we each get 5"
2. Fairness/equality talk
    - Use this category if people refer to the fairness and/or equality of the equal outcome, (5, 5). Example: "We can get the same, and that is fair"
3. Conflict
    - Use this category if subjects cannot agree on an outcome
4. Other (if possible please give brief explanation why you think none of 1,2,3 apply)

Below are the non-compulsory categories which coders received and of which coders could choose as many or as few (including zero) categories as they wished.

[90] Coders were not known to each other and were studying on different courses.

Table 5.3.3(b) Non-Compulsory Coding Categories

1. Greeting

2. Open first offer Question
   - e.g. “What shall we do?”. This category is used if no specific offer is made at the start of negotiations. There is merely an opening question such as the example.

Categories 3 and 4 relate to discussion purely based on deciding which of the two unequal allocations they should settle on.

3. First offer generous
   - The category is used if the person to open negotiations offers their co-participant the higher amount of the unequal outcome. Example: “You can get 8, I am happy to get 6.”

4. First offer non-generous
   - The category is used if the person to open negotiations offers their co-participant the lower amount of the unequal outcome. Example: “You can get 6, I then get 8.”

Category 5 relates to discussions such as those above but where the discussion also includes mentions of the fact that subjects will get more earnings in total if they coordinate on an unequal outcome.

5. “Better than nothing”
   - This category is used if a subject agrees on an outcome because coordinating is better than not coordinating. Example: “I am OK with this proposal, because it is gives something which is better than nothing (=0)”

6. First mover proposes equal outcome

7. Counter offer equal
   - Use this category if one person suggests an unequal outcome and the other person proposes the equal outcome instead.

8. Random
   - Use this category if people try to find a random way (a methods based on chance) to decide on an allocation
   - e.g. Rock, paper, scissors

9. Counter offer “no I want more”
   - This category is used if an offer made by a co-participant of a lower amount is not accepted Example: “No, I will not accept 6, I want 8.”

10. Counter offer “no you have more!”
    - This category is used if an offer made by a co-participant of a higher amount is not accepted Example: “No, I will not accept 8, I want 6. You have the 8”

11. Assurance of offer made or received
    - e.g. “Are you sure?” This category is used if a co-participant asks for confirmation of a previous offer.

12. Appealing to better nature (sympathy etc.)
    - e.g. “I’m a bit skint this weekend so can I have the higher amount?”

13. no firm agreement reached (ran out of time)
    - Use the category if it seems that subjects did not keep an eye on the time and ran out of time

14. no firm agreement reached (fighting for last word)
    - Use this category if subjects did not reach an explicit agreement but instead fought for the last word in the negotiations, e.g. a subject waits till the last second to claim an amount so that his/her partner couldn’t make a counter offer

15. Sticking to guns when disagreement
    - Use this category if a subject refuses to move on an offer despite disagreement.

16. One subject indifferent
    - when one subject "claim" they are happy to take either outcome, "I don't mind which we go for"
17. Both subjects indifferent
    - "I don't mind either!"
18. Necessity of Coordination
    - "We need to pick the same one in order to earn money" "Let's both agree to pick this option"

First we will summarise the data from the compulsory section. In general, we find that the game structure has some interesting effects on conversation content as shown in table 5.3.4 and figure 5.3.2 below:

Table 5.3.4. Results for Compulsory Coding Categories

	C-BOS	C-BOS-E1	C-BOS-E2	C-BOS-E3
Efficiency talk	50%	55.77%	18.42%	35.00%
Fairness/equality	n/a[91]	5.77%	34.21%	0.00%
Conflict	0.00%	11.54%	2.63%	17.5%
Other	50%	26.92%	44.74%	45%

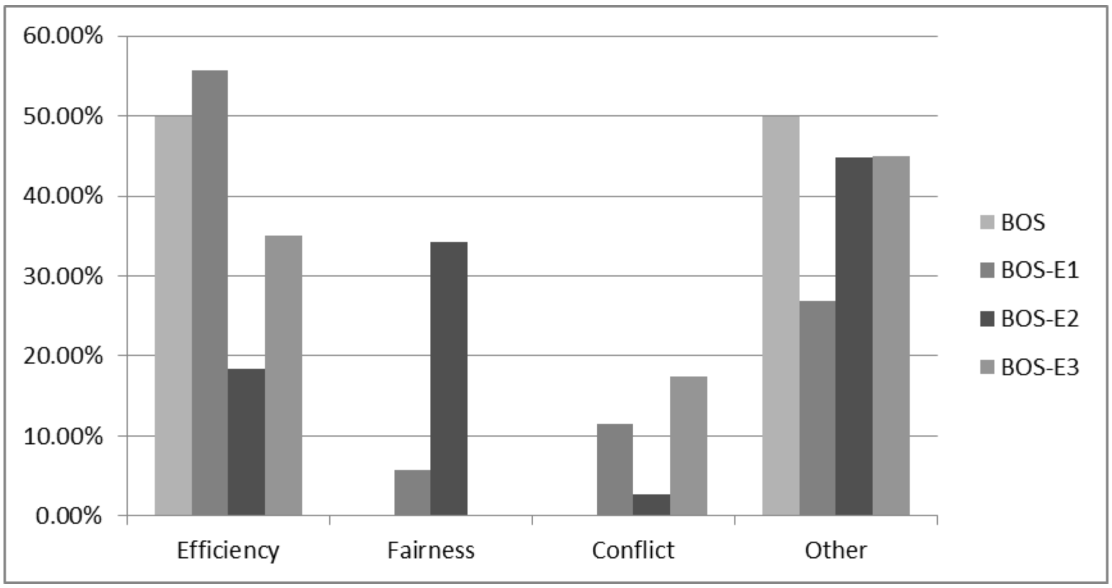

Figure 5.3.2. Compulsory Coding Categories

As may be naturally expected we find that conversational categories match closely with choice outcomes in the games which we observed above. In order to examine this further we will first provide a summary of these results and in the next section we will provide a more detailed and structured comparison between games.

Efficiency talk is much higher in C-BOS-E1 as compared to C-BOS-E2 reflecting the outcomes we observed above where the equal split was coordinated on significantly more frequently in the C-BOS-E2 game. This is also reflected in the high proportion of subjects discussing *fairness* in C-BOS-E2 as compared to C-BOS-E1. Clearly large proportions of conversations are being driven by some element of social preferences (in this case fairness) and

[91] An equitable coordination outcome was not available in the BOS game and so this type of conversation could not be observed here.

not just through a desire to coordinate and subjects are using social preferences to aid coordination. The percentage of conversations being coded as *other* is also interesting: Where the category *other* was chosen coders were encouraged to write a short comment on how they would sum up the conversational interaction between the subjects. In the vast majority of *other* cases, coders reported that conversations had been purely “we must find a way to coordinate in order to earn money” nature i.e. subjects had not mentioned efficiency or fairness but had simply come to an agreement that one subject would take one amount of money and the other subject the corresponding amount to achieve coordination. If we call this kind of behaviour “coordination talk” and interpret this as no expression of social preferences then we notice big differences between games. For example we see a lot of this kind of “Coordination talk” in C-BOS-E3. The higher proportion of subjects using this kind of strategy in C-BOS-E3 appears to suggest that subjects in these games are more “matter-of-fact” in their approach to coordination. Furthermore we notice that conflict arises most often in the C-BOS-E3 game suggesting that the larger amounts of money are causing conflicts to arise.

We now looked deeper into conversational content by providing coders with non-compulsory categories of which they could choose as many or as few categories as they wished. In this section of the coding sheet subjects could select as many or a few (including zero) categories as they liked per conversation.

Table 5.3.5. Results for Non-Compulsory Coding Categories

	C-BOS	C-BOS-E1	C-BOS-E2	C-BOS-E3
Greeting	44.44%	51.92%	55.26%	47.50%
Open first Question	36.11%	23.08%	28.95%	60.00%
First offer generous	69.44%	34.62%	18.42%	45.00%
First offer non-generous	19.44%	25.00%	13.16%	27.50%
"Better than nothing"	30.56%	0.00%	5.26%	0.00%
First mover proposes equal outcome	n/a	30.77%	63.16%	17.50%
Counter offer equal	n/a	5.77%	2.63%	5.00%
Random	11.11%	15.38%	5.26%	12.50%
Counter offer "no I want more"	5.56%	13.46%	5.26%	17.50%
Counter offer "no you have more!"	2.78%	3.85%	13.16%	10.00%
Assurance of offer made or received	16.67%	21.15%	7.89%	15.00%
Appealing to better nature (sympathy etc.)	11.11%	0.00%	0.00%	12.50%
no firm agreement reached (ran out of time)	5.56%	7.69%	0.00%	17.50%
no firm agreement reached (fighting for last word)	0.00%	7.69%	0.00%	17.50%
Sticking to guns when disagreement	0.00%	5.77%	2.63%	7.50%
One subject indifferent	16.67%	13.46%	0.00%	5.00%
Both subjects indifferent	11.11%	0.00%	0.00%	2.50%
Necessity of Coordination	47.22%	11.54%	10.53%	15.00%

We notice some interesting points here which give us more insights in the observations made in the compulsory categories above. Firstly we notice that in C-BOS-E3 the prevalence of *conflict* type conversations, as also observed in the compulsory categories above, is reflected in the relatively high percentage of subjects who make alternate counter offers as recorded in the categories *Counter offer "no I want more"* and *Counter offer "no you have more!"* above.

Particularly when these two categories are summed; the prevalence of this kind of conversation is much higher in BOS-E3 as compared to other games. Also interesting is how the prevalence of the use of a "random" method of choosing a division is different between games: Whilst this hovers around a similar percentage for BOS, BOS-E1 and BOS-E3 it is much lower in BOS-E2 suggesting that this method of decision making is not necessary in this game[92]. This could suggest that coordination outcomes in the BOS-E2 are much more focal and easy to agree upon than in the other games (particularly in a comparison with BOS-E1). Finally we notice that in all games with communication the probability that the first offer is a generous one (*"First offer generous"*) is higher than the probability of non-generous offers ("*First offer non-generous*") by 50%, 16.62% 5.26% and 17.5% in the BOS, BOS-E1, BOS-E2 and BOS-E3 games respectively. The fact that these levels differ so dramatically between games, particularly between those with and without an equal split (BOS v. all other games) and also between those with a weakly (BOS-E2) or strongly dominated equal split (BOS-E1 and BOS-E3), suggests that it is not only out of politeness that subjects take this course of action – otherwise we would have been fairly consistent behaviour between the games. Changes in potential payoffs clearly effect subject's methods of gaining payoffs and the subsequent willingness to engage in "you first" type of behaviours. However let us now consider an analysis between games in a more formal fashion.

5.3.1. Analysis between games

In this section we look at chat data in a similar fashion to the choice and outcome data we reported above. That is we will now examine conversational differences in a comparison of the following games: BOS v. BOS-E1, BOS-E1 v. BOS-E2, BOS-E1 v. BOS-E3: an explanation of why we compared these particular games is provided in a previous section. This will also provide us with a more scientific and systematic method of analysing some of the observations made of the chat data above. The following table shows where significant differences were found between incidences of behaviour described by that category between the two relevant

[92] This tended to involve subjects playing a form of "Rock, paper, scissors".

games using a chi squared test[93]. Where significant differences in conversation styles were found, the percentage of subjects using this kind of language in each game is reported[94]:

Table 5.3.1.1. Conversation content between games with compulsory categories

	C-BOS v. C-BOS-E1	C-BOS-E1 v. C-BOS-E2	C-BOS-E1 v. C-BOS-E3
Efficiency talk	β = 0.285, p = 0.594	**BOS-E1=55.77%** **BOS-E2=18.42%** β = 12.7606, p = 0.000	**BOS-E1=55.77%** **BOS-E3=35%** β = 3.92, p = 0.048
Fairness/equality	n/a[95]	**BOS-E1=5.77%** **BOS-E2=34.21%** Fisher's Exact = 0.001	Fisher's Exact = 0.255
Conflict	n/a (zero value) [96]	Fisher's Exact = 0.231	β = 0.66, p = 0.416
Other	**BOS=50%** **BOS-E1=26.92%** β = 4.90, p = 0.027	**BOS-E1=26.92%** **BOS-E2=44.74%** β = 3.09, p = 0.079	**BOS-E1=26.92%** **BOS-E3=45.00%** β = 3.26, p = 0.071

Let us first consider incidences of *efficiency talk*. The first thing we notice is that the prevalence of *efficiency talk* does not appear to be affected by the addition of an equitable outcome (C-BOS v. C-BOS-E1) but instead its prevalence is affected by the structure of the payoffs in the BOS section of the game (C-BOS-E1 v. C-BOS-E2 and C-BOS-E1 v. C-BOS-E3). This result also reflects the results achieved on coordination outcomes as reported above. There we find that coordination on the BOS section of the game is not significantly different between C-BOS and C-BOS-E1 and it appears that much of this similarity in outcomes is also reflected in similar conversational styles. It should also be noted that *efficiency talk* in the C-BOS game can only relate to a comparison of the C-BOS section of the game with a (0, 0) outcome from mis-coordination. However in the C-BOS-E1 game efficiency could refer to either a comparison of an efficient outcome with (0, 0) as a result of mis-coordination or

[93] Or, where there were less than seven observations, a Fisher's exact test as is standard in this type of statistical analysis.
[94] Due to the statistical limitations of the chi squared and Fishers exact tests, results obtained where zero observations were recorded in a category for one game cannot be compared with non-zero results obtained in a comparable game. We therefore do not report these comparisons but could potentially analyse this further in further work.
[95] As discussed previously we would not expect *fairness* talk to arise in BOS since there was no equitable outcome available (aside from zero earnings from mis-coordination) and thus we do not make the comparison between BOS and BOS-E1 (where an equitable outcome was available)
[96] Since a zero value was observed here in the BOS game the fishers exact test does not provide us with a valid result here.

coordination on (5, 5). The result that *efficiency talk* is used significantly more and *fairness/ equality* talk is used significantly less in C-BOS-E1 as compared to C-BOS-E2 is also unsurprising since we observe significantly greater coordination on the C-BOS section of the game in C-BOS-E1 than C-BOS-E2 above. Perhaps more surprising is the significant drop in *efficiency talk* in C-BOS-E3 as compared to C-BOS-E1. In the previous section relating to coordination outcomes we reported that coordination outcomes between C-BOS-E1 and C-BOS-E3 were very similar and not statistically significantly different. However the conversational methods by which subjects are agreeing on these very similar coordination outcomes are different with subjects in C-BOS-E1 being much more inclined toward *efficiency talk* than their C-BOS-E3 counterparts. Subjects' bargaining techniques are clearly changing depending on the payoffs structure of the BOS section.

Table 5.3.1.2. Conversation content between games with non-compulsory categories

	BOS v. BOS-E1	BOS-E1 v. BOS-E2	BOS-E1 v. BOS-E3
Greeting	β = 0.48, p = 0.490	β = 0.10, p = 0.754	β = 0.18, p = 0.674
Open first Question	β = 1.78, p = 0.183	β = 0.398, p = 0.528	**BOS-E1=23.08%** **BOS-E3=60.00%** β = 12.94, p = 0.000
First offer generous	**BOS=69.44%** **BOS-E1=34.62%** β = 10.33, p = 0.001	**BOS-E1=34.62%** **BOS-E2=18.42%** β = 2.87, p = 0.090	β = 1.024, p = 0.312
First offer non-generous	β = 0.374, p = 0.541	Fisher's Exact = 0.192	β = 0.073, p = 0.787
"Better than nothing"	n/a (zero value)[97]	n/a (zero value)	Not used in either game
First mover proposes equal outcome	n/a	**BOS-E1=30.77%** **BOS-E2=63.16%** β = 9.328, p = 0.002	β = 2.12, p = 0.145
Counter offer equal	n/a	Fisher's Exact = 0.635	Fisher's Exact = 1.000
Random	Fisher's Exact= 0.754	Fisher's Exact = 0.181	Fisher's Exact = 0.770
Counter offer "no I want more"	Fisher's Exact= 0.299	Fisher's Exact = 0.293	β =0.2858, p = 0.593
Counter offer "no you have more!"	Fisher's Exact= 1.000	Fisher's Exact = 0.128	Fisher's Exact = 0.398
Assurance of offer made or received	β = 0.27, p = 0.600	Fisher's Exact = 0.140	β = 0.57, p = 0.451
Appealing to better nature (sympathy etc.)	n/a (zero value)	Not used in either game	n/a (zero value)
no firm agreement reached (ran out of time)	Fisher's Exact=1.000	n/a (zero value)	Fisher's Exact = 0.199
no firm agreement reached (fighting for last word)	n/a (zero value)	n/a (zero value)	Fisher's Exact = 0.199
Sticking to guns when disagreement	n/a (zero value)	Fisher's Exact = 0.635	Fisher's Exact = 1.000
One subject indifferent	β = 0.17, p = 0.677	n/a (zero value)	Fisher's Exact = 0.290
Both subjects indifferent	n/a (zero value)	Not used in either game	n/a (zero value)
Necessity of Coordination	**BOS=47.22%** **BOS-E1=11.54%** β = 14.03, p = 0.000	Fisher's Exact = 1.000	β = 0.24, p = 0.625

Let us now again look at the conversations in more detail by examining a comparison of chat data between games in the non-compulsory categories. First we consider C-BOS-E1 and C-BOS-E2**.** It is unsurprising that given the choice results that in C-BOS-E2 a first mover is significantly more likely to propose the equal outcome (*First mover proposes equal outcome*). Is it however interesting to note just how opposed the frequency of incidences of this kind of chat behaviour are between C-BOS-E1 and C-BOS-E2. In C-BOS-E2 it would appear that it is

[97] See note regarding zero value and the viability of chi squared/ fisher tests above.

not discussion that is leading to the equal outcome being chosen but rather that the equal outcome is largely proposed from the outset of discussions. We also see significant differences in the opposite direction with regards to those first movers proposing that a co-participant received a greater share of a possible endowment than themselves (*First offer generous*).

In a comparison of C-BOS and C-BOS-E1 we see that the absence of the equitable option is making first movers more likely to propose that a co-participant gets the larger amount **(***First offer generous*). Perhaps the presence of the equal outcome makes subjects more willing to let a co-participant have the higher amount (£8) since the inefficient equitable amount makes the lower amount of the unequal distribution (in the case of BOS-E1 £6 as compared to £5) more attractive than if the unequal distribution was viewed in isolation (as in BOS). It is also interesting that although the presence of the equitable outcome is changing the prevalence of this kind of conversation, the difference in this type of conversation is not significant between BOS-E1 and BOS-E3. Clearly it is a comparison with an equitable outcome which affects this type of conversation and not an increase in inequality in the BOS section.

In conclusion of this overview of the types of conversation used by subjects in each of the games we observe that there are some interesting differences in how subjects approach negotiations in each game and that game structure appears to have some interesting effects. We also note that we appear to have evidence of social preferences being used. We believe that the rich communication protocol used gives us an excellent opportunity to examine this.

6. Discussion

In our experiment subjects are given the opportunity to play a one-shot coordination game in which the payoffs available to them and a co-participant and the availability of a communication technology are varied. We hypothesised that game type and whether communication is available or not should affect the behaviour of subjects.

We observe that communication has significant effects on behaviour contrary to basic theoretical models of cheap talk. Importantly, we also find that communication affects the relative salience of different equilibria. We also find that the payoff structure of the game can drastically change how, and to what degree, communication affects behaviour and find that the structure of the game also changes conversation content. More specifically, our results show that when there is no opportunity to communicate subjects use an equitable outcome as a coordination device rather than having an intrinsic preference for equality. We also show that equality is much more attractive to subjects if the alternative of inequality only benefits one subject financially. Finally we show that, conflicting with the hypothesis of Herreiner & Puppe (2010), subjects are not adverse to increasing inequality and that, on the contrary, they respond to a drastic increase in equality with a greater desire to attempt coordination on the inequitable outcome.

We believe that these results provide some interesting and stimulating insights into the effects of the interaction between payoff structures in coordination games and the presence or absence of communication. We hope that our research will stimulate further research into the interaction between game type and cheap talk. We believe that one extension of our research could for example be to increase the inequality of the payoffs. Also we would be interested in examining if our findings are primarily due to the richness of our communication or primarily due to the frequency with which messages can be sent. We would also like to consider elements of nationality and culture in bargaining and negotiating situations in future work. Also, with regard to game structure it would be interesting to see what happens if the compromise is efficient but still not total payoff maximizing.

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Appendices

Chapter 1

Coordination and Gender: An Experiment

Appendix

Zoë C. Bett*

*School of Economics, and Centre for Behavioural and Experimental Social Science,
University of East Anglia, Norwich NR4 7TJ, UK

1. Calculations of Mixed Strategy Nash Equilibria

1.1. The Simple Battle of the Sexes Game

Table 1.1.1. The Battle of the Sexes Game

		Player 2	
		Hawkish (α_2)	Dovish ($1-\alpha_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)
	Dovish ($1-\alpha_1$)	(20, 30)	(0, 0)

$U_{Hawkish2} = U_{Dovish2}$ (1)

$U_{Hawkish2} = (1-\alpha_1)*30+\alpha_1*0 \Rightarrow U_{Hawkish2} = 30-30\alpha_1 (2)$

$U_{Dovish2} = (1-\alpha_1)*0+\alpha_1*20 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$30-30\alpha_1 = 20\alpha_1 \Rightarrow \alpha_1 = \frac{3}{5}$$

$$\Rightarrow (1-\alpha_1) = \frac{2}{5}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{3}{5}$$

$$\Rightarrow (1-\alpha_2) = \frac{2}{5}$$

Expected payoffs

$$\frac{2}{5}*\frac{3}{5}*30+\frac{2}{5}*\frac{3}{5}*20 = 12$$

1.2. The Equal Split Game

Table 1.2.1. The Equal Split Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)	(0, 0)
	Dovish (β_1)	(20, 30)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(25, 25)

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise1}$ (1)

$U_{Hawkish2} = ß_1 * 30 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Hawkish2} = 30ß_1 (2)$

$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 20 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

$$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 25 \Rightarrow U_{Compromise2} = 25 - 25\alpha_1 - 25ß_1 (4)$$

From *(1)* and *(2)* and *(3)*

$30ß_1 = 20\alpha_1 \Rightarrow ß_1 = \frac{2}{3}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$20\alpha_1 = 25 - 25\alpha_1 - 25ß_1$ ($replace\ from$ (5))

$$\Rightarrow 20\alpha_1 = 25 - 25\alpha_1 - 25 * \frac{2}{3}\alpha_1$$

$$\Rightarrow \frac{185}{3}\alpha_1 = 25$$

$\Rightarrow \alpha_1 = \frac{15}{37}$ (6)

Replace *(6)* into *(5)*

$\Rightarrow ß_1 = \frac{2}{3} * \frac{15}{37}$

$\Rightarrow ß_1 = \frac{10}{37}$

$\Rightarrow 1 - \alpha_1 - ß_1 = \frac{12}{37}$

By symmetry

$\Rightarrow \quad \alpha_2 = \frac{15}{37}$

$\Rightarrow ß_2 = \frac{10}{37}$

$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{12}{37}$

Expected Payoffs

$$\frac{15}{37} * \frac{10}{37} * 30 + \frac{10}{37} * \frac{15}{37} * 20 + \frac{12}{37} * \frac{12}{37} * 25 = 8\frac{4}{37}$$

1.2.1. Alternative MSNE

Table 1.2.1.1. The Equal Split Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise (1-α_2)
Player 1	Hawkish (α_1)	(30, 20)	(0, 0)
	Compromise (1-α_1)	(0, 0)	(25, 25)

Equations

Player 2

$U_{Dovish2} = U_{Compromise2}$ (1)

$U_{Dovish2} = (1 - \alpha_1) * 0 + \alpha_1 * 20 \Rightarrow U_{Dovish2} = 20\alpha_1 (2)$

$U_{Compromise2} = (1 - \alpha_1) * 25 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = 25 - 25\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$25 - 25\alpha_1 = 20\alpha_1 \Rightarrow \alpha_1 = \frac{5}{9}$$

$$\Rightarrow (1 - \alpha_1) = \frac{4}{9}$$

Player 1

$U_{Hawkish1} = U_{Compromise1}$ (1)

$U_{Hawkish1} = (1 - \alpha_2) * 0 + \alpha_2 * 30 \Rightarrow U_{Hawkish1} = 30\alpha_2 (2)$

$U_{Compromise1} = (1 - \alpha_2) * 25 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = 25 - 25\alpha_2 (3)$

From *(1)* and *(2)* and *(3)*

$$25 - 25\alpha_2 = 30\alpha_2 \Rightarrow \alpha_2 = \frac{5}{11}$$

$$\Rightarrow (1 - \alpha_2) = \frac{6}{11}$$

Expected payoffs

$$EP_1 = \frac{5}{9} * \frac{5}{11} * 30 + \frac{4}{9} * \frac{6}{11} * 25 = 13.64$$

$$EP_2 = \frac{5}{9} * \frac{5}{11} * 20 + \frac{4}{9} * \frac{6}{11} * 25 = 11.11$$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

1.3. The High Compromise Game

Table 1.3.1. The High Compromise Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)	(0, 0)
	Dovish (β_1)	(20, 30)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(15, 15)

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise1}$ (1)

$U_{Hawkish2} = ß_1 * 30 + \alpha_1 \times 0 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Hawkish2} = 30ß_1 (2)$

$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 20 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

$$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 15 \Rightarrow U_{Compromise2}$$
$$= 15 - 15\alpha_1 - 15ß_1 (4)$$

From *(1)* and *(2)* and *(3)*

$30ß_1 = 20\alpha_1 \Rightarrow ß_1 = \frac{2}{3}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$20\alpha_1 = 15 - 15\alpha_1 - 15ß_1 \ (replace\ from\ (5))$

$$\Rightarrow 20\alpha_1 = 15 - 15\alpha_1 - 15 * \frac{2}{3}\alpha_1$$

$$\Rightarrow 45\alpha_1 = 5$$

$\Rightarrow \quad \alpha_1 = \frac{1}{3}$ (6)

Replace *(6)* into *(5)*

$$\Rightarrow ß_1 = \frac{2}{3} * \frac{1}{3}$$

$\Rightarrow ß_1 = \frac{2}{9}$

$\Rightarrow 1 - \alpha 1 - ß_1 = 1 - \frac{1}{3} - \frac{2}{9}$

$\Rightarrow 1 - \alpha_1 - ß_1 = \frac{4}{9}$

By symmetry

$\Rightarrow \quad \alpha_2 = \frac{1}{3}$

$\Rightarrow ß_2 = \frac{2}{9}$

$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{4}{9}$

Expected Payoffs

$\frac{1}{3} * \frac{2}{9} * 30 + \frac{1}{3} * \frac{2}{9} * 20 + \frac{4}{9} * \frac{4}{9} * 15 = 6\frac{2}{3}$

1.3.1. Alternative MSNE

Table 1.3.1.1. The High Compromise Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise (1-α_2)
Player 1	Hawkish (α_1)	(30, 20)	(0, 0)
	Compromise (1-α_1)	(0, 0)	(15, 15)

Equations

Player 2

$$U_{Dovish2} = U_{Compromise2}\ (1)$$

$$U_{Dovish2} = (1-\alpha_1) * 0 + \alpha_1 * 20 \Rightarrow U_{Dovish2} = 20\alpha_1 (2)$$
$$U_{Compromise2} = (1-\alpha_1) * 15 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = 15 - 15\alpha_1 (3)$$

From *(1)* and *(2)* and *(3)*

$$15 - 15\alpha_1 = 20\alpha_1 \Rightarrow \alpha_1 = \frac{3}{7}$$

$$\Rightarrow (1-\alpha_1) = \frac{4}{7}$$

Player 1

$$U_{Hawkish1} = U_{Compromise1}\ (1)$$

$$U_{Hawkish1} = (1-\alpha_2) * 0 + \alpha_2 * 30 \Rightarrow U_{Hawkish1} = 30\alpha_2 (2)$$

$$U_{Compromise1} = (1-\alpha_2) * 15 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = 15 - 15\alpha_2 (3)$$

From *(1)* and *(2)* and *(3)*

$$15 - 15\alpha_2 = 30\alpha_2 \Rightarrow \alpha_2 = \frac{1}{3}$$

$$\Rightarrow (1-\alpha_2) = \frac{2}{3}$$

Expected payoffs

$EP_1 = \frac{1}{3} * \frac{3}{7} * 30 + \frac{2}{3} * \frac{4}{7} * 15 = 10$

$EP_2 = \frac{1}{3} * \frac{3}{7} * 20 + \frac{2}{3} * \frac{4}{7} * 15 = 8.57$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

1.4. The Medium Compromise Game

Table 1.4.1. The Medium Compromise Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)	(0, 0)
	Dovish (β_1)	(20, 30)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(12, 12)

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise1}$ (1)

$U_{Hawkish2} = ß_1 * 30 + \alpha_1 * 0 + (1 - \alpha_1 - ß_1) * 0 \Rightarrow U_{Hawkish2} = 30ß_1 (2)$

$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 20 + (1 - \alpha_1 - ß_1) * 0 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1 - \alpha_1 - ß_1) * 12 \Rightarrow U_{Compromise2}$
$= 12 - 12\alpha_1 - 12ß_1 (4)$

From *(1)* and *(2)* and *(3)*

$30ß_1 = 20\alpha_1 \Rightarrow ß_1 = \frac{2}{3}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$20\alpha_1 = 12 - 12\alpha_1 - 12ß_1$ $(replace\ from\ (5))$

$\Rightarrow 20\alpha_1 = 12 - 12\alpha_1 - 12 * \frac{2}{3}\alpha_1$

$\Rightarrow 40\alpha_1 = 12$

$\Rightarrow \quad \alpha_1 = \frac{3}{10}$ (6)

Replace *(6)* into *(5)*

$\Rightarrow ß_1 = \frac{2}{3} * \frac{3}{10}$

$\Rightarrow ß_1 = \frac{1}{5}$

$\Rightarrow 1 - \alpha 1 - ß_1 = 1 - \frac{3}{10} - \frac{1}{5}$

$\Rightarrow 1 - \alpha_1 - ß_1 = \frac{1}{2}$

By symmetry

$\Rightarrow \quad \alpha_2 = \frac{3}{10}$

$\Rightarrow ß_2 = \frac{1}{5}$

$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{1}{2}$

Expected Payoffs

$$\frac{3}{10} * \frac{1}{5} * 30 + \frac{1}{5} * \frac{3}{10} * 20 + \frac{1}{2} * \frac{1}{2} * 12 = 6$$

1.4.1. Alternative MSNE

Table 1.4.1.1. The Medium Compromise Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise (1-α_2)
Player 1	Hawkish (α_1)	(30, 20)	(0, 0)
	Compromise (1-α_1)	(0, 0)	(12, 12)

Equations

Player 2

$U_{Dovish2} = U_{Compromise2}$ (1)

$U_{Dovish2} = (1-\alpha_1) * 0 + \alpha_1 * 20 \Rightarrow U_{Dovish2} = 20\alpha_1 (2)$

$U_{Compromise2} = (1-\alpha_1) * 12 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = 12 - 12\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$12 - 12\alpha_1 = 20\alpha_1 \Rightarrow \alpha_1 = \frac{3}{8}$$

$$\Rightarrow (1-\alpha_1) = \frac{5}{8}$$

Player 1

$U_{Hawkish1} = U_{Compromise1}$ (1)

$U_{Hawkish1} = (1-\alpha_2) * 0 + \alpha_2 * 30 \Rightarrow U_{Hawkish1} = 8\alpha_2 (2)$

$U_{Compromise1} = (1-\alpha_2) * 12 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_2 (3)$

From *(1)* and *(2)* and *(3)*

$$12 - 12\alpha_2 = 30\alpha_2 \Rightarrow \alpha_2 = \frac{6}{21}$$

$$\Rightarrow (1-\alpha_2) = \frac{15}{21}$$

Expected payoffs

$EP_1 = \frac{3}{8} * \frac{6}{21} * 30 + \frac{15}{21} * \frac{5}{8} * 12 = 8.57$

$EP_2 = \frac{3}{8} * \frac{6}{21} * 20 + \frac{15}{21} * \frac{5}{8} * 12 = 7.5$

1.5. The Low Compromise Game

Table 1.5.1. The Low Compromise Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)	(0, 0)
	Dovish (β_1)	(20, 30)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(5, 5)

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise1}$ (1)

$U_{Hawkish2} = ß_1 * 30 + \alpha_1 * 0 + (1 - \alpha_1 - ß_1) * 0 \Rightarrow U_{Hawkish2} = 30ß_1 (2)$

$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 20 + (1 - \alpha_1 - ß_1) * 0 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1 - \alpha_1 - ß_1) * 5 \Rightarrow U_{Compromise2} = 5 - 5\alpha_1 - 5ß_1 (4)$

From *(1)* and *(2)* and *(3)*

$30ß_1 = 20\alpha_1 \Rightarrow ß_1 = \frac{2}{3}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$20\alpha_1 = 5 - 5\alpha_1 - 5ß_1 \ (replace\ from\ (5))$

$\Rightarrow 20\alpha_1 = 5 - 5\alpha_1 - 5 * \frac{2}{3}\alpha_1$

$\Rightarrow \frac{85}{3}\alpha_1 = 5$

$\Rightarrow \alpha_1 = \frac{3}{17}$ (6)

Replace *(6)* into *(5)*

$\Rightarrow ß_1 = \frac{2}{3} * \frac{3}{17}$

$$\Rightarrow ß_1 = \frac{2}{17}$$

$$\Rightarrow 1 - \alpha 1 - ß_1 = 1 - \frac{3}{17} - \frac{2}{17}$$

$$\Rightarrow 1 - \alpha_1 - ß_1 = \frac{12}{17}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{3}{17}$$

$$\Rightarrow ß_2 = \frac{2}{17}$$

$$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{12}{17}$$

Expected Payoffs

$$\frac{3}{17} * \frac{2}{17} * 30 + \frac{2}{17} * \frac{3}{17} * 20 + \frac{12}{17} * \frac{12}{17} * 5 = 3\frac{9}{17}$$

1.5.1. Alternative MSNE

Table 1.5.1.1. The Low Compromise Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise ($1-\alpha_2$)
Player 1	Hawkish (α_1)	(30, 20)	(0, 0)
	Compromise ($1-\alpha_1$)	(0, 0)	(5, 5)

Equations

Player 2

$U_{Dovish2} = U_{Compromise2}$ (1)

$U_{Dovish2} = (1-\alpha_1) * 0 + \alpha_1 * 20 \Rightarrow U_{Dovish2} = 20\alpha_1 (2)$

$U_{Compromise2} = (1-\alpha_1) * 5 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$5 - 5\alpha_1 = 20\alpha_1 \Rightarrow \alpha_1 = \frac{1}{5}$$

$$\Rightarrow (1-\alpha_1) = \frac{4}{5}$$

Player 1

$U_{Hawkish1} = U_{Compromise1}$ (1)

$U_{Hawkish1} = (1-\alpha_2) * 0 + \alpha_2 * 30 \Rightarrow U_{Hawkish1} = 30\alpha_2 (2)$

$U_{Compromise1} = (1-\alpha_2) * 5 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_2 (3)$

From *(1)* and *(2)* and *(3)*

$$5 - 5\alpha_2 = 30\alpha_2 \Rightarrow \alpha_2 = \frac{1}{7}$$

$$\Rightarrow (1-\alpha_2) = \frac{6}{7}$$

Expected payoffs

$\text{EP}_1 = \frac{1}{7} * \frac{1}{5} * 30 + \frac{6}{7} * \frac{4}{5} * 5 = 4.29$

$\text{EP}_2 = \frac{1}{7} * \frac{1}{5} * 20 + \frac{6}{7} * \frac{4}{5} * 5 = 4$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

2. Instructions (Paper Based)

NB. These instructions were presented to subjects before the games were presented on the screen. Whilst subjects were reading these instructions and completing the practice question contained at the end, their computers were blank. Once everyone had completed the practice questions the games were presented to the subjects. The way in which the games were presented on the computer in shown in the next section of the appendix.

Instructions are based on the translation from Holm (2000).

2.1. Gender labelled (GL) treatment

Welcome to this experiment!

By looking at the slip of paper on your desk you will see the name that has been assigned to your co-participant. In order to protect anonymity this is not your co-participant's real name. However all male subjects have been given a male name and all female subjects a female name. Your co-participant has been given a similar slip of paper with a fake name for you so they will also be unable to identify you. Your co-participant has the same instructions as you have.

You will have the same co-participant throughout the experiment.

1. Please write the name of your co-participant in the space provided below

2. Please write your desk number in the space provided below.

3. Please read through the instructions and example questions on the following pages. Once you have finished reading through the example questions you should complete the practice questions on the last page.

3. Once you have completed the practice questions, the experimenter will come round and check your answers. Once everyone's answers have been checked you will be able to complete the tasks on your computer screen.

The Co-participant's "Name":	**Your desk number:**

Instructions

You have been paired with an anonymous co-participant. You will face four strategic situations, where your earnings (in terms of points) depend partly on your choices and partly on the co-participant's choices. If you and your co-participant are able to coordinate your choices, you will earn points in the experiment. However, the two of you will make your choices at the same time, so your co-participant's choices will be unknown to you and she/he will not know your choices.

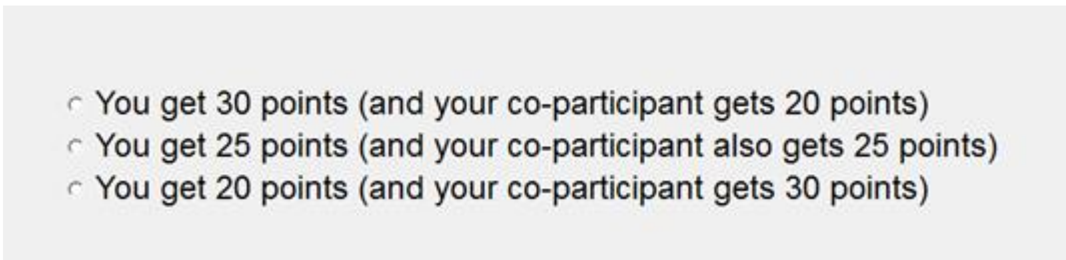
Based on your choices you collect points that will be exchanged at a rate of 6p per point. The result will be available as soon as your choices are combined with those of your co-participant after you have both completed all four strategic situations. You will be paid based on the number of points you have earned in the experiment and you will also receive a £5 show-up fee.

Below are two examples of the type of task you will see in the experiment. Please <u>read them through</u> and if you have any questions please raise your hand.

These tasks do not count towards your experimental earnings and you are not required to answer the questions.

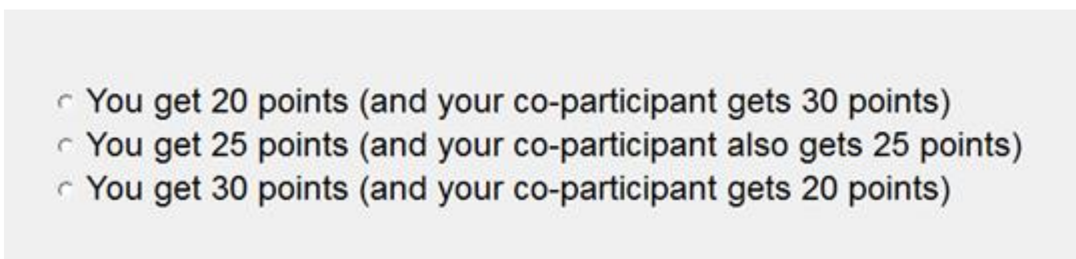
<u>Example one</u>

In some questions you will see a screen like this and you will be asked to share out 50 points:



If you see this screen, your co-participant is seeing a similar screen but with their payoffs shown first.

Like this:



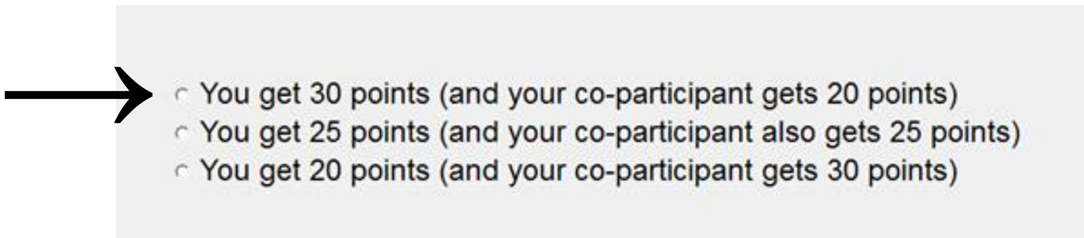
Using your mouse, you will be asked how you would like to share the 50 points.

Explanation and Examples: Notice that, for any option that you might choose, there is exactly one choice by your co-participant which leads to an agreement on how to share the money.

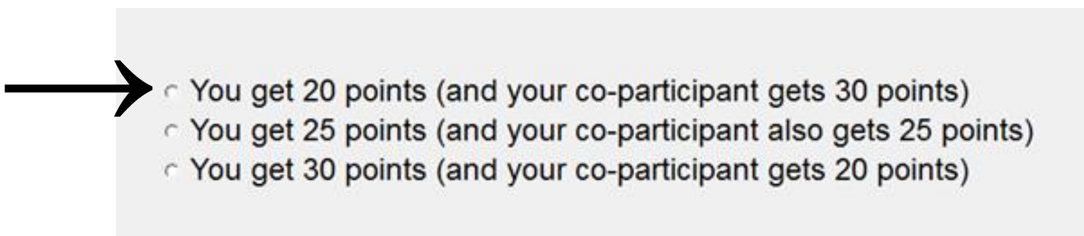
Example:

If you have chosen the top option, then agreement requires that your co-participant also chooses the top option. (In this case, you will get 30 points and your co-participant will get 20 points)

<u>Your screen</u>

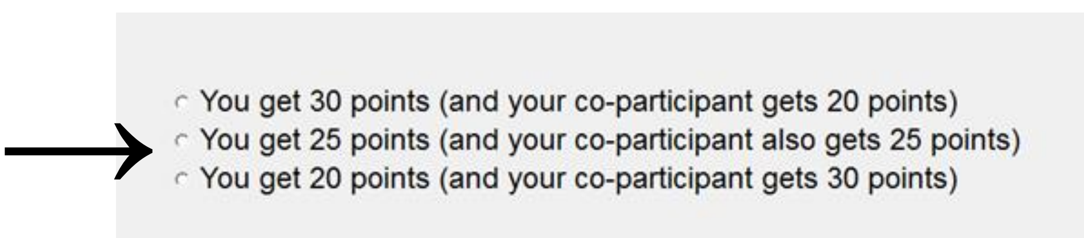


<u>Your co-participant's screen</u>

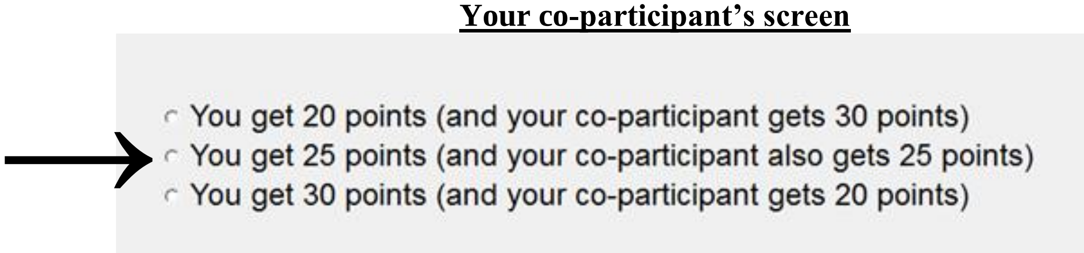


If you have chosen the middle option, then agreement requires that your co-participant has chosen the middle option. (In this case, you will both get 25 points.)

<u>Your screen</u>



<u>Your co-participant's screen</u>



If you have chosen the bottom option, then agreement requires that your co-participant also chooses the bottom option. (In this case, you will get 20 points and your co-participant will get 30 points.)

<u>Your screen</u>

- You get 30 points (and your co-participant gets 20 points)
- You get 25 points (and your co-participant also gets 25 points)
- You get 20 points (and your co-participant gets 30 points)

<u>Your co-participant's screen</u>

Y

- You get 20 points (and your co-participant gets 30 points)
- You get 25 points (and your co-participant also gets 25 points)
- You get 30 points (and your co-participant gets 20 points)

Now please turn the page for example 2

<u>Example 2</u>

<u>In some tasks you will have a choice over the number of points you can choose to share out. An example of this kind of task is shown here:</u>

As before if you see this screen:

- ○ You get 30 points (and your co-participant gets 20 points)
- ○ You get 15 points (and your co-participant also gets 15 points)
- ○ You get 20 points (and your co-participant gets 30 points)

....your co-participant is seeing a similar screen but with their payoffs shown first. Like this:

- ○ You get 20 points (and your co-participant gets 30 points)
- ○ You get 15 points (and your co-participant also gets 15 points)
- ○ You get 30 points (and your co-participant gets 20 points)

Using your mouse, you will again be asked how you would like to share the points.

Explanation and Examples: Again, notice that, for any option that you might choose, there is exactly one choice by your co-participant which leads to an agreement on how to share the money.

Example:
If you have chosen the top option, then agreement requires that your co-participant also chooses the top option. (In this case, you will get 30 points and your co-participant will get 20 points.)

Again, if you have chosen the middle option, then agreement requires that your co-participant has chosen the middle option. (In this case, you will both get 15 points.)

And again, if you have chosen the bottom option, then agreement requires that your co-participant also chooses the bottom option. (In this case, you will get 20 points and your co-participant will get 30 points.)

Now, please complete the practice questions

Practice Questions

1) **Please look at the task below and answer the question.**

If you and you anonymous co-participant both chose the bottom option how much will you both earn?

Your screen

- You get 30 points (and your co-participant gets 20 points)
- You get 15 points (and your co-participant also gets 15 points)
- You get 20 points (and your co-participant gets 30 points)

Your co-participant's screen

- You get 20 points (and your co-participant gets 30 points)
- You get 15 points (and your co-participant also gets 15 points)
- You get 30 points (and your co-participant gets 20 points)

☐ We will both get 20 points

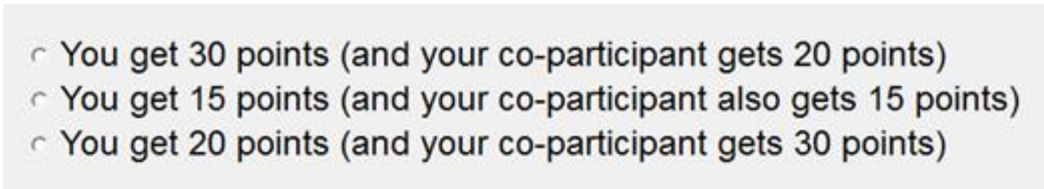
☐ We will both get zero points

☐ I will get 20 points and my co-participant will get 30 points.

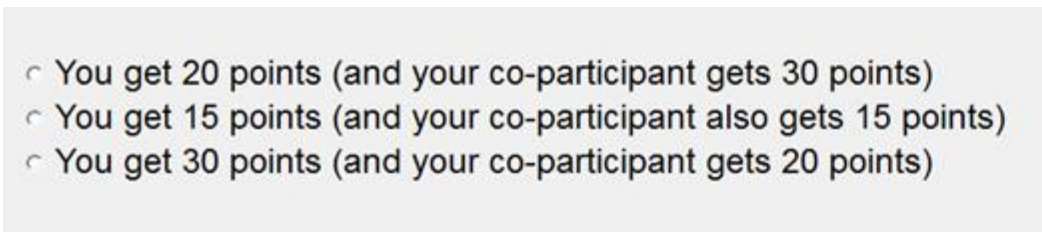
2) **Please look at the task below and answer the question.**

If you choose the top option and your anonymous co-participant chooses the bottom option how much will you both earn?

<u>Your screen</u>



<u>Your co-participant's screen</u>



☐ We will both get 30 points

☐ We will both get zero points

☐ I will get 30 points and my co-participant will get 20 points.

3) How do you earn points?

☐ By coordinating my answers with those of my anonymous co-participant

☐ By choosing the same answer as the majority of all co-participants

4) How much will I be paid?

☐ Nothing

☐ 5 pounds

☐ 5 pounds plus any earnings I earn as a result of decisions made by myself and my anonymous co-participant in the experiment.

Once you have finished answering the practice questions please wait quietly. We will come round and check your answers.

Once everyone has answered all the practice question correctly you will be asked to complete the tasks as shown on your computer screen. Please remain in your seat once you have finished.

At the end of the experiment you will receive your show-up fee as indicated and will also be paid based on your experimental earnings. Once you have received your payment you are free to leave.

2.2.Non Gender labelled (NGL) treatment

Welcome to this experiment!

Your co-participant has the same instructions as you have.

You will have the same co-participant throughout the experiment.

1. Please write your desk number in the space provided below.

2. Please read through the instructions and example questions on the following pages. Once you have finished reading through the example questions you should complete the practice questions on the last page.

3. Once you have completed the practice questions, the experimenter will come round and check your answers. Once everyone's answers have been checked you will be able to complete the tasks on your computer screen.

Your desk number:

Instructions

You have been paired with an anonymous co-participant. You will face four strategic situations, where your earnings (in terms of points) depend partly on your choices and partly on the co-participant's choices. If you and your co-participant are able to coordinate your choices, you will earn points in the experiment. However, the two of you will make your choices at the same time, so your co-participant's choices will be unknown to you and she/he will not know your choices.

Based on your choices you collect points that will be exchanged at a rate of 6p per point. The result will be available as soon as your choices are combined with those of your co-participant after you have both completed all four strategic situations. You will be paid based on the number of points you have earned in the experiment and you will also receive a £5 show-up fee.

Below are two examples of the type of task you will see in the experiment. Please <u>read them through</u> and if you have any questions please raise your hand.

These tasks do not count towards your experimental earnings and you are not required to answer the questions.

<u>Example one</u>

In some questions you will see a screen like this and you will be asked to share out 50 points:

- You get 30 points (and your co-participant gets 20 points)
- You get 25 points (and your co-participant also gets 25 points)
- You get 20 points (and your co-participant gets 30 points)

If you see this screen, your co-participant is seeing a similar screen but with their payoffs shown first.

Like this:

- You get 20 points (and your co-participant gets 30 points)
- You get 25 points (and your co-participant also gets 25 points)
- You get 30 points (and your co-participant gets 20 points)

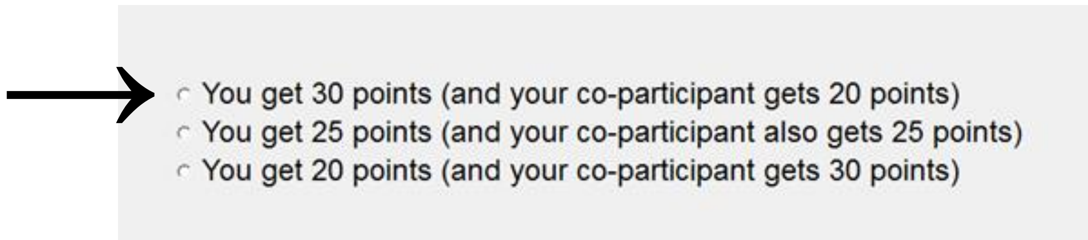
Using your mouse, you will be asked how you would like to share the 50 points.

Explanation and Examples: Notice that, for any option that you might choose, there is exactly one choice by your co-participant which leads to an agreement on how to share the money.

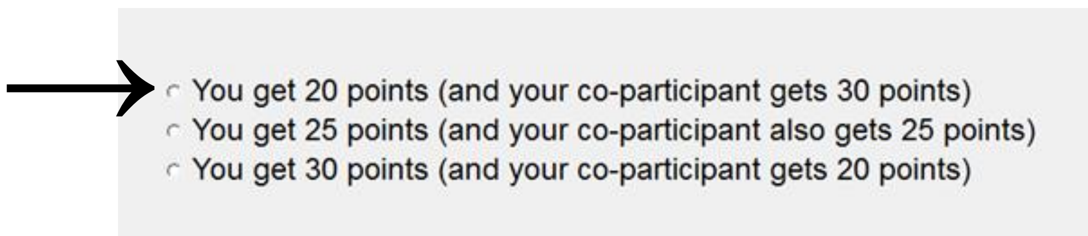
Example:

If you have chosen the top option, then agreement requires that your co-participant also chooses the top option. (In this case, you will get 30 points and your co-participant will get 20 points.)

<u>Your screen</u>

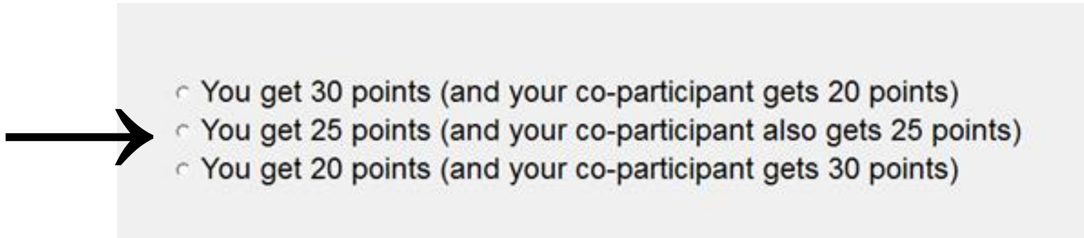


<u>Your co-participant's screen</u>

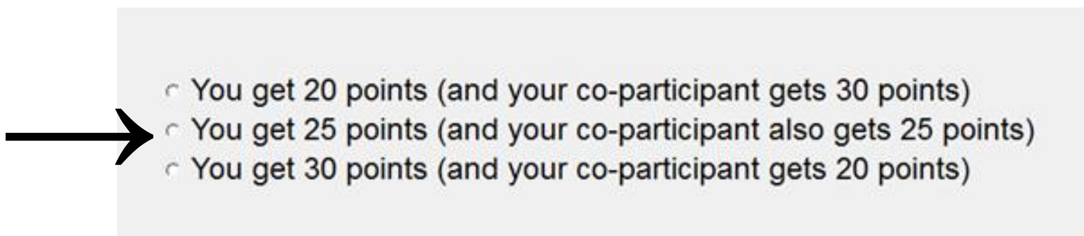


If you have chosen the middle option, then agreement requires that your co-participant has chosen the middle option. (In this case, you will both get 25 points.)

Your screen

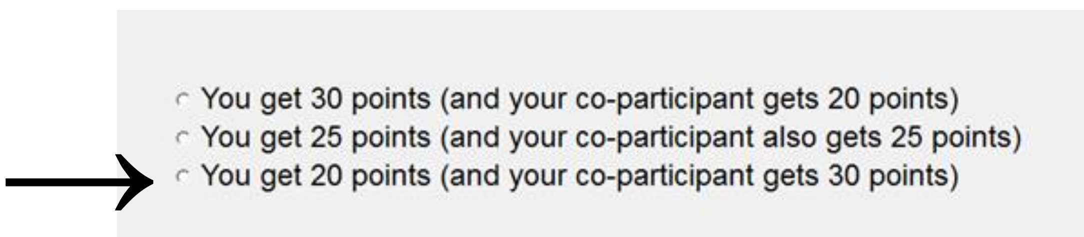


Your co-participant's screen

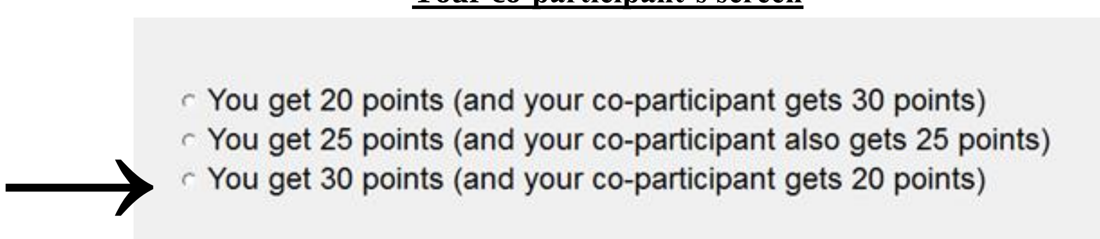


If you have chosen the bottom option, then agreement requires that your co-participant also chooses the bottom option. (In this case, you will get 20 points and your co-participant will get 30 points.)

Your screen



Your co-participant's screen



<u>Example 2</u>

<u>In some tasks you will have a choice over the number of points you can choose to share out. An example of this kind of task is shown here:</u>

As before If you see this screen:

- You get 30 points (and your co-participant gets 20 points)
- You get 15 points (and your co-participant also gets 15 points)
- You get 20 points (and your co-participant gets 30 points)

....your co-participant is seeing a similar screen but with their payoffs shown first.
Like this:

- You get 20 points (and your co-participant gets 30 points)
- You get 15 points (and your co-participant also gets 15 points)
- You get 30 points (and your co-participant gets 20 points)

Using your mouse, you will again be asked how you would like to share the points.

Explanation and Examples: Again, notice that, for any option that you might choose, there is exactly one choice by your co-participant which leads to an agreement on how to share the money.

Example:
If you have chosen the top option, then agreement requires that your co-participant also chooses the top option. (In this case, you will get 30 points and your co-participant will get 20 points.)

Again, if you have chosen the middle option, then agreement requires that your co-participant has chosen the middle option. (In this case, you will both get 15 points.)

And again, if you have chosen the bottom option, then agreement requires that your co-participant also chooses the bottom option. (In this case, you will get 20 points and your co-participant will get 30 points.)

Now, please complete the practice questions

Practice Questions

1) **Please look at the task below and answer the question.**

If you and you anonymous co-participant both chose the bottom option how much will you both earn?

Your screen

- ○ You get 30 points (and your co-participant gets 20 points)
- ○ You get 15 points (and your co-participant also gets 15 points)
- ○ You get 20 points (and your co-participant gets 30 points)

Your co-participant's screen

- ○ You get 20 points (and your co-participant gets 30 points)
- ○ You get 15 points (and your co-participant also gets 15 points)
- ○ You get 30 points (and your co-participant gets 20 points)

☐ We will both get 20 points

☐ We will both get zero points

☐ I will get 20 points and my co-participant will get 30 points.

2) **Please look at the task below and answer the question.**

If you choose the top option and your anonymous co-participant chooses the bottom option how much will you both earn?

<u>Your screen</u>

- ○ You get 30 points (and your co-participant gets 20 points)
- ○ You get 15 points (and your co-participant also gets 15 points)
- ○ You get 20 points (and your co-participant gets 30 points)

<u>Your co-participant's screen</u>

- ○ You get 20 points (and your co-participant gets 30 points)
- ○ You get 15 points (and your co-participant also gets 15 points)
- ○ You get 30 points (and your co-participant gets 20 points)

☐ We will both get 30 points

☐ We will both get zero points

☐ I will get 30 points and my co-participant will get 20 points.

3) How do you earn points?

☐ By coordinating my answers with those of my anonymous co-participant

☐ By choosing the same answer as the majority of all co-participants

4) How much will I be paid?

☐ Nothing

☐ 5 pounds

☐ 5 pounds plus any earnings I earn as a result of decisions made by myself and my anonymous co-participant in the experiment.

Once you have finished answering the practice questions please wait quietly. We will come round and check your answers.

Once everyone has answered all the practice questions correctly you will be asked to complete the tasks as shown on your computer screen. Please remain in your seat once you have finished.

At the end of the experiment you will receive your show-up fee as indicated and will also be paid based on your experimental earnings. Once you have received your payment you are free to leave.

3. Screen Shots

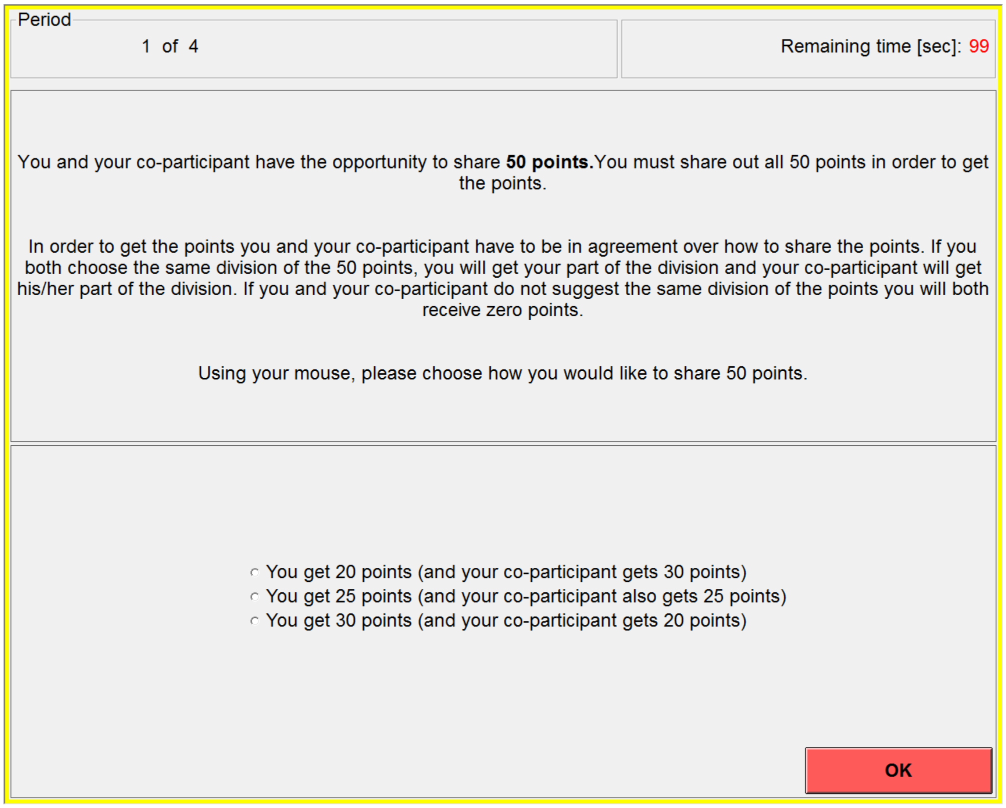


Figure 3.1. Presentation of the Equal Split Game

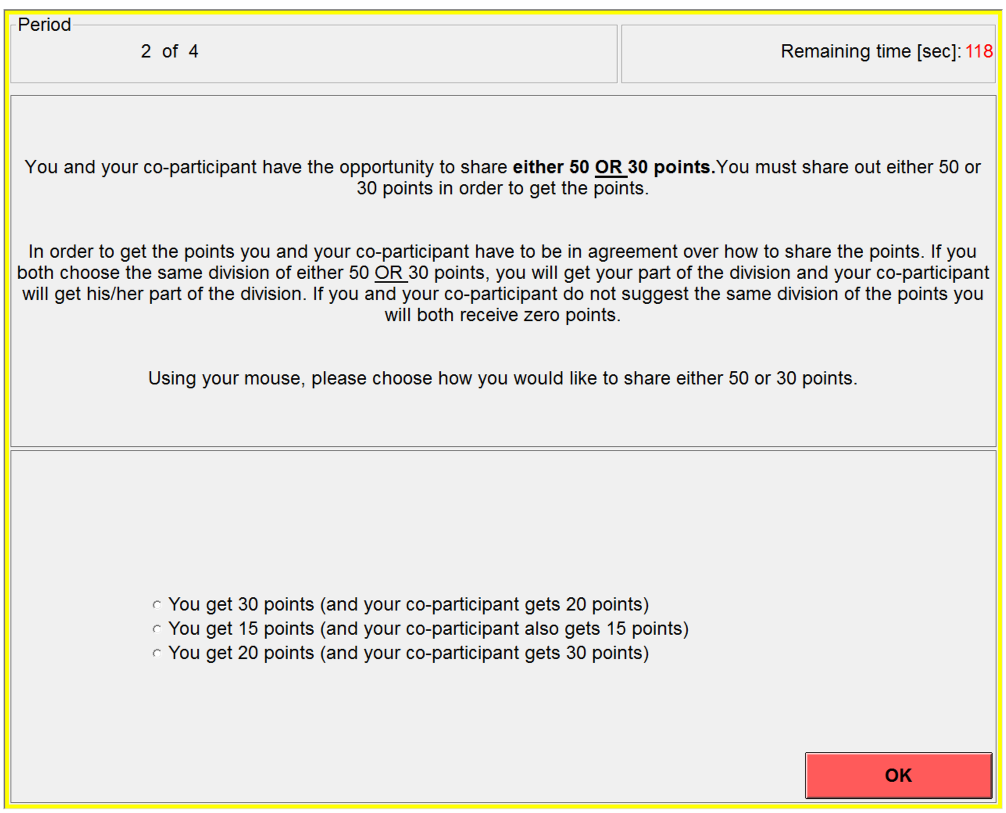


Figure 3.2. Presentation of the High Compromise Game

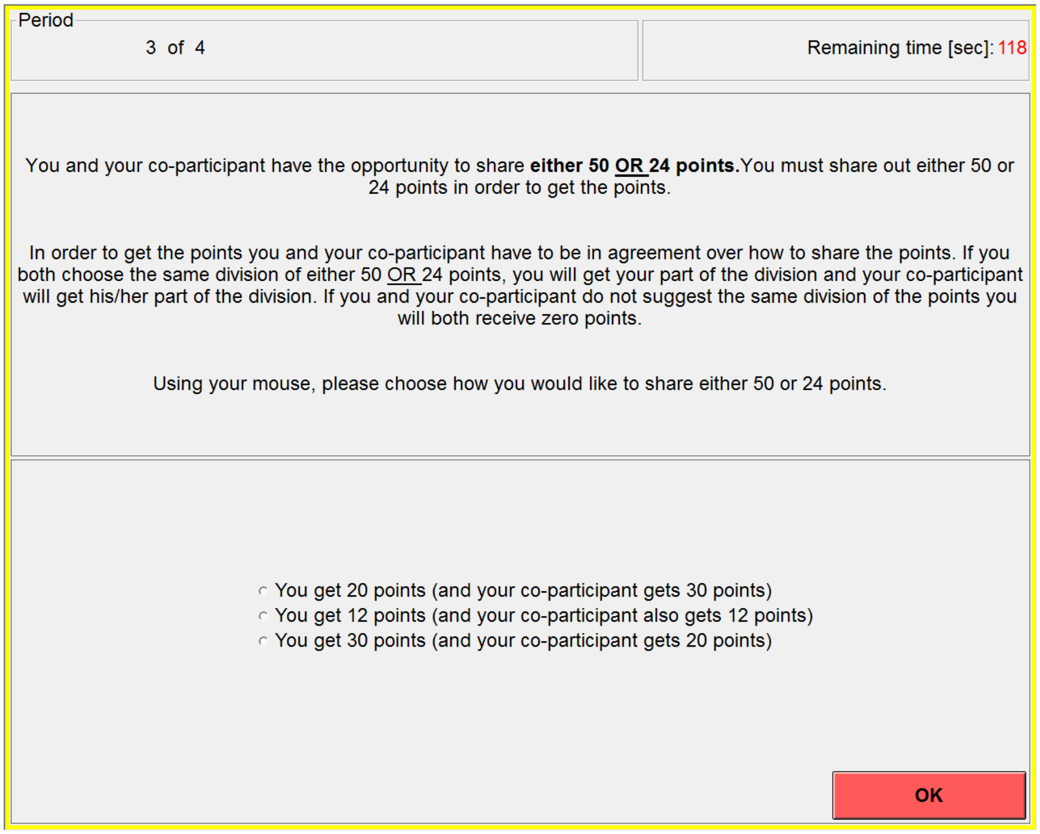


Figure 3.3. Presentation of the Medium Compromise Game

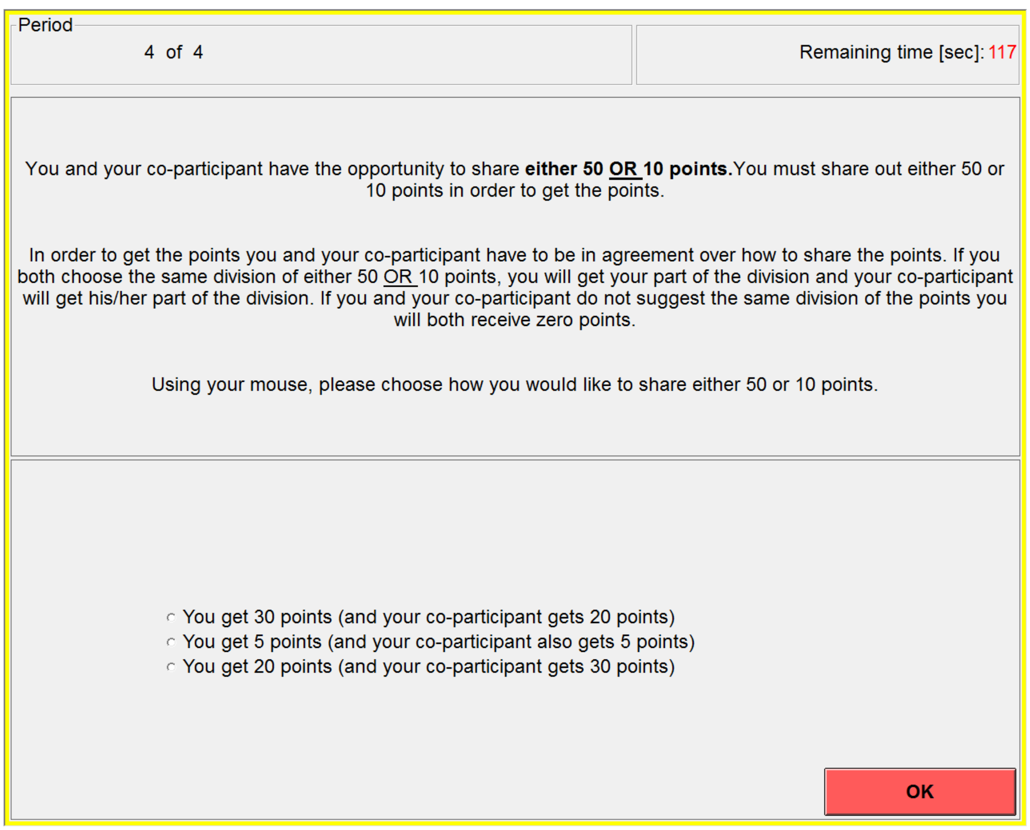


Figure 3.4. Presentation of the Low Compromise Game

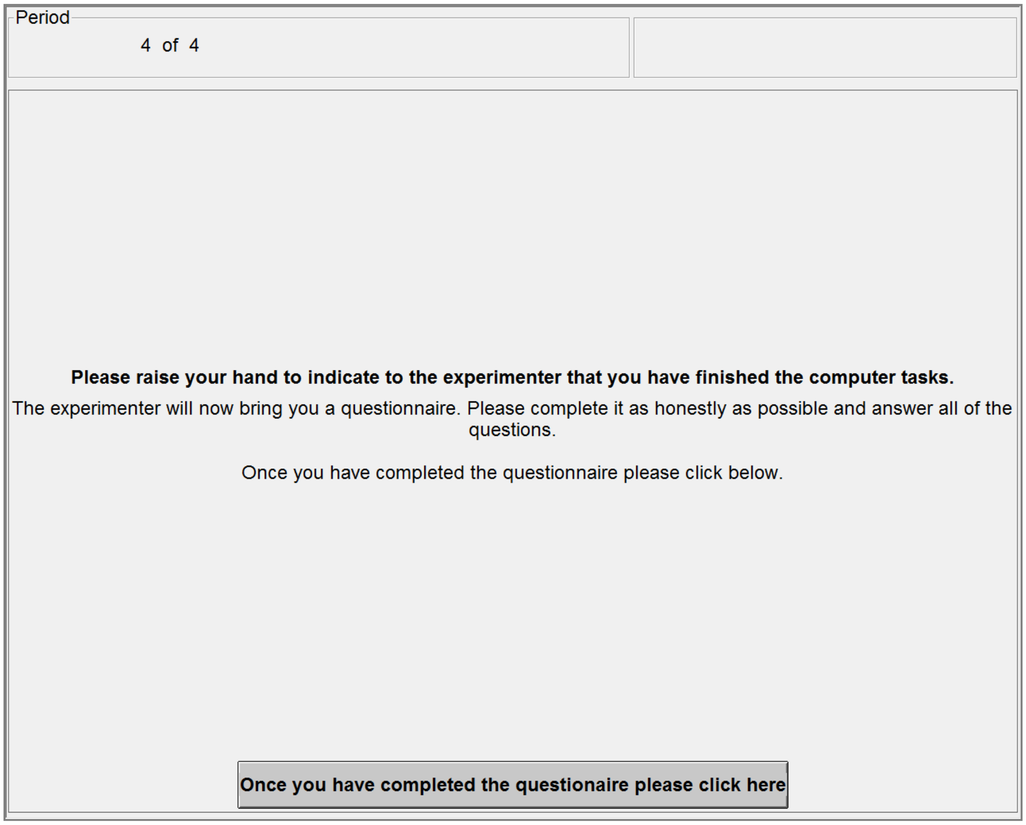


Figure 3.5. Screen seen by subjects upon completion of the games

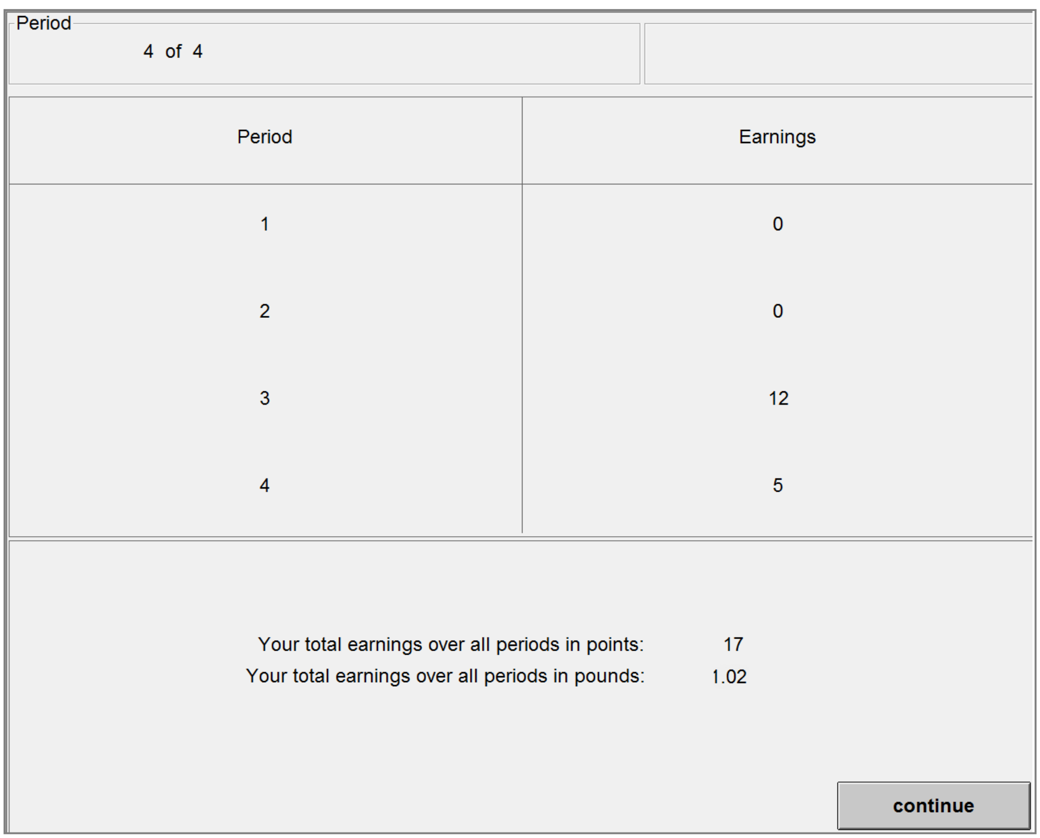


Figure 3.6. The results screen

Chapter 2

Gender Identity and Punishment in Coordination Games

Appendix

Zoë C. Bett[a] and Subhasish M. Chowdhury[b]

[a]School of Economics, and Centre for Behavioural and Experimental Social Science, University of East Anglia, Norwich NR4 7TJ, UK

[b]School of Economics, Centre for Behavioural and Experimental Social Science, and the ESRC Centre for Competition Policy, University of East Anglia, Norwich NR4 7TJ, UK

1. Paper instructions

NB. These paper instructions were placed on subjects desks before they arrived at the experiment. Once all subjects had read the instructions and completed the practice questions games were displayed on computer screens.

NB. Text in italics was only included in the treatments where punishment was available and game screen shots were tailored to the game used in that treatment

Welcome to this experiment!

Please read through the instructions and example questions on the following pages. Once you have finished reading through the example questions you should complete the practice questions on the last page.

Once you have completed the practice questions, you will be able to complete the tasks on your computer screen.

Instructions

In each period you will be paired with a different anonymous co-participant.

You will face a strategic situation, where your earnings (in terms of points) depend partly on your choices and partly on your co-participant's choices. If you and your co-participant are able to coordinate your choices, you will earn points in the experiment. However, the two of you will make your choices at the same time, so your co-participant's choices will be unknown to you and she/he will not know your choices.

Based on your choices you collect points that will be exchanged at a rate of 6p per point. The result will be available as soon as your choices are combined with those of your co-participant in each period after you have both completed the strategic situation.

Each participant will also receive a lump-sum payment of 84 experimental points at the beginning each period. *This lump-sum payment can be used to pay for any eventual losses in the experiment.*

There will be 5 periods in this experiment.

At the end of the experiment you will be paid based on the number of points you have earned in a randomly selected period.

On the next page is an example of the type of task you will see in the experiment. Please <u>read it through</u> and if you have any questions please raise your hand.

This task does not count towards your experimental earnings and you are not required to answer the questions.

<u>Example</u>

You will see a screen like this and you will be asked to share out 50 points:

- You get 30 points (and your co-participant gets 20 points)
- You get 20 points (and your co-participant gets 30 points)

If you see this screen, your co-participant is seeing a similar screen but with their payoffs shown first. Like this:

- You get 20 points (and your co-participant gets 30 points)
- You get 30 points (and your co-participant gets 20 points)

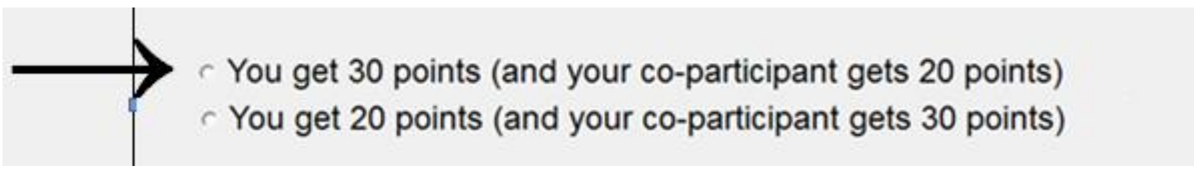
Using your mouse, you will be asked how you would like to share the 50 points.

Explanation and Examples: Notice that, for any option that you might choose, there is exactly one choice by your co-participant which leads to an agreement on how to share the money.

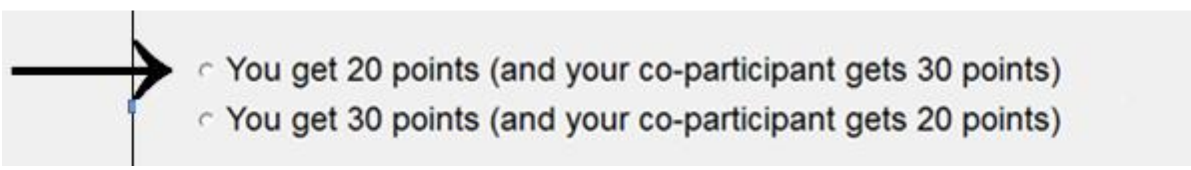
Example:

If you have chosen the top option, then agreement requires that your co-participant also chooses the top option. (In this case, you will get 30 points and your co-participant will get 20 points.)

<u>Your screen</u>

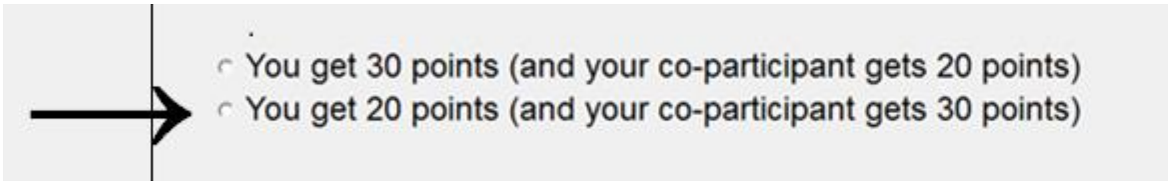


<u>Your co-participant's screen</u>

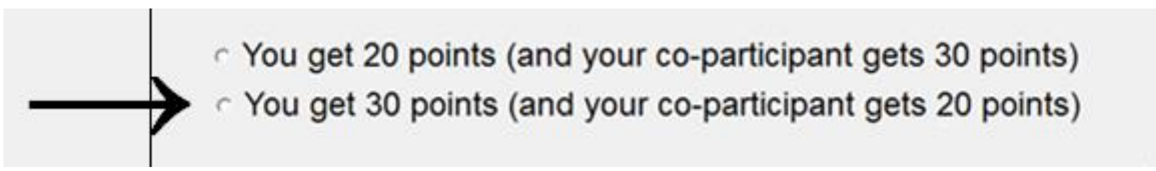


If you have chosen the bottom option, then agreement requires that your co-participant also chooses the bottom option. (In this case, you will get 20 points and your co-participant will get 30 points.)

<u>Your screen</u>



<u>Your co-participant's screen</u>



If you do not coordinate your answers with your co-participant you and your co-participant will both earn zero.

In the start of the second stage of each period you will see if you and your co-participant have coordinated and how many points you won in the previous stage.

You then have to decide whether to reduce your partner's earnings or to leave it as it is. Reducing your co-participant's earnings will cost you either 2 or 10 experimental points. By paying 10 experimental points, you can reduce your co-participant's earnings by 50 experimental points. By paying 2 experimental points, you can reduce your co-participant's earnings by 10 experimental points. Your co-participant makes this decision at the same time as you do. He/ she can also choose between leaving your earnings unaltered, reducing them by 50 experimental points or reducing them by 10 experimental points. Your co-participant will incur the same cost – 10 or 2 experimental points respectively – if he or she chooses to reduce your earnings.

Now, please complete the practice questions

Practice Questions

3) Please look at the task below and answer the question.

If you and you anonymous co-participant both chose the bottom option how much will you both earn?

Your screen

- You get 30 points (and your co-participant gets 20 points)
- You get 20 points (and your co-participant gets 30 points)

Your co-participant's screen

- You get 20 points (and your co-participant gets 30 points)
- You get 30 points (and your co-participant gets 20 points)

☐ We will both get 20 points

☐ We will both get zero points

☐ I will get 20 points and my co-participant will get 30 points.

4) Please look at the task below and answer the question.

If you choose the top option and your anonymous co-participant chooses the bottom option how much will you both earn?

<u>Your screen</u>

○ You get 30 points (and your co-participant gets 20 points)
○ You get 20 points (and your co-participant gets 30 points)

<u>Your co-participant's screen</u>

○ You get 20 points (and your co-participant gets 30 points)
○ You get 30 points (and your co-participant gets 20 points)

☐ We will both get 30 points

☐ We will both get zero points

☐ I will get 30 points and my co-participant will get 20 points.

3) How much would it cost you to reduce your co-participant's earnings by 50 points?

☐ *0 points*

☐ *10 points*

4) If you allocate 2 points to your co-participant, how many points will it reduce his/her earnings by?

☐ *10 points*

☐ *50 points*

5) If YOU allocate 10 points to your co-participant, how many points will it reduce YOUR earnings by?

☐ *10 points*

☐ *50 points*

6) How do you earn points?

☐ By coordinating my answers with those of my anonymous co-participant

☐ By choosing the same answer as the majority of all co-participants

7) Which period will the amount you are paid at the end of the experiment be based on?

☐ The sum of earnings from all periods

☐ A randomly selected period

8) How much will I be paid?

☐ Nothing

☐ The lump-sum (84 points)

☐ Anything remaining from my initial lump-sum plus any earnings I earn as a result of decisions made by myself and my anonymous co-participant in the experiment.

9) Does your anonymous co-participant change in every period?

☐ Yes – I will be partnered with a different co-participant every period.

☐ No – I will be partnered with the same co-participant every period.

☐ Yes – But I may be partnered with the same co-participant again in later periods.

Once you have finished answering the practice questions please turn to the next page and check your answers. If you have any questions please raise your hand.

<u>**Answers to Practice Questions**</u>

1) If you and you anonymous co-participant both chose the bottom option how much will you both earn?

The correct answer is: I will get 20 points and my co-participant will get 30 points

2) If you choose the top option and your anonymous co-participant chooses the bottom option how much will you both earn?

The correct answer is: We will both get zero points

3) How much would it cost you to reduce your co-participant's earnings by 50 points?

The correct answer is: 10 points

4) If you allocate 2 points to your co-participant, how many points will it reduce his/her earnings by?

The correct answer is: 10 points

5) If YOU allocate 10 points to your co-participant, how many points will it reduce YOUR earnings by?

The correct answer is: 10 points

6) How do you earn points?

The correct answer is: By coordinating my answers with those of my anonymous co-participant

7) Which period will the amount you are paid at the end of the experiment be based on?

The correct answer is: A randomly selected period

8) How much will I be paid?

The correct answer is: Anything remaining from my initial lump-sum plus any earnings I earn as a result of decisions made by myself and my anonymous co-participant in the experiment.

9) Does your anonymous co-participant change in every period?

The correct answer is: Yes – I will be partnered with a different co-participant every period.

Once everyone has answered all the practice questions you will be asked to complete the tasks as shown on your computer screen. Please remain in your seat once you have finished.

At the end of the experiment you will receive your experimental earnings as indicated.

2. Screen Shots

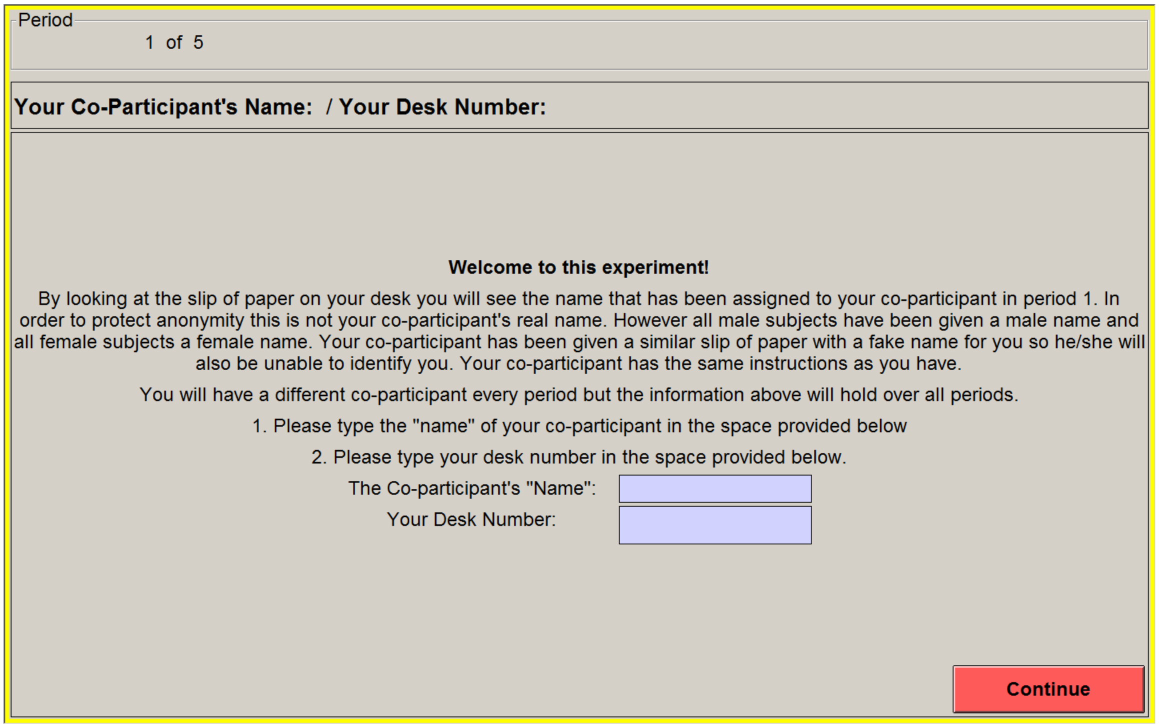


Figure 2.1. The Welcome Screen

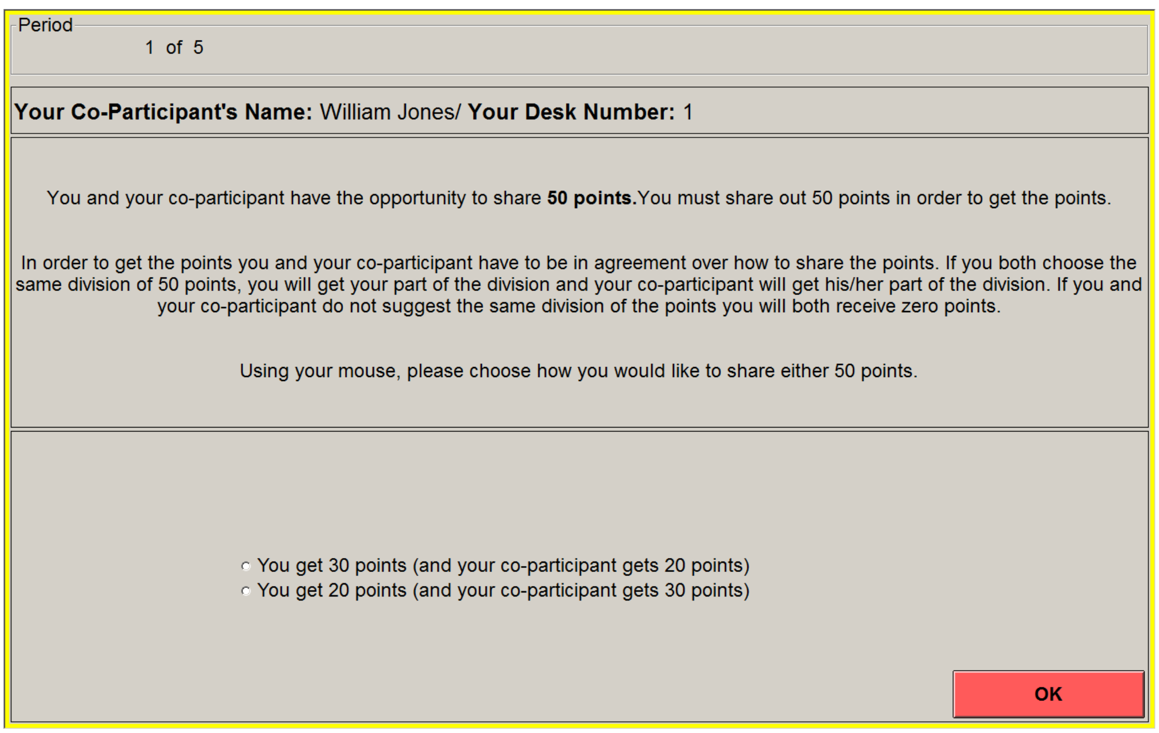


Figure 2.2 The Game/ Decision Screen

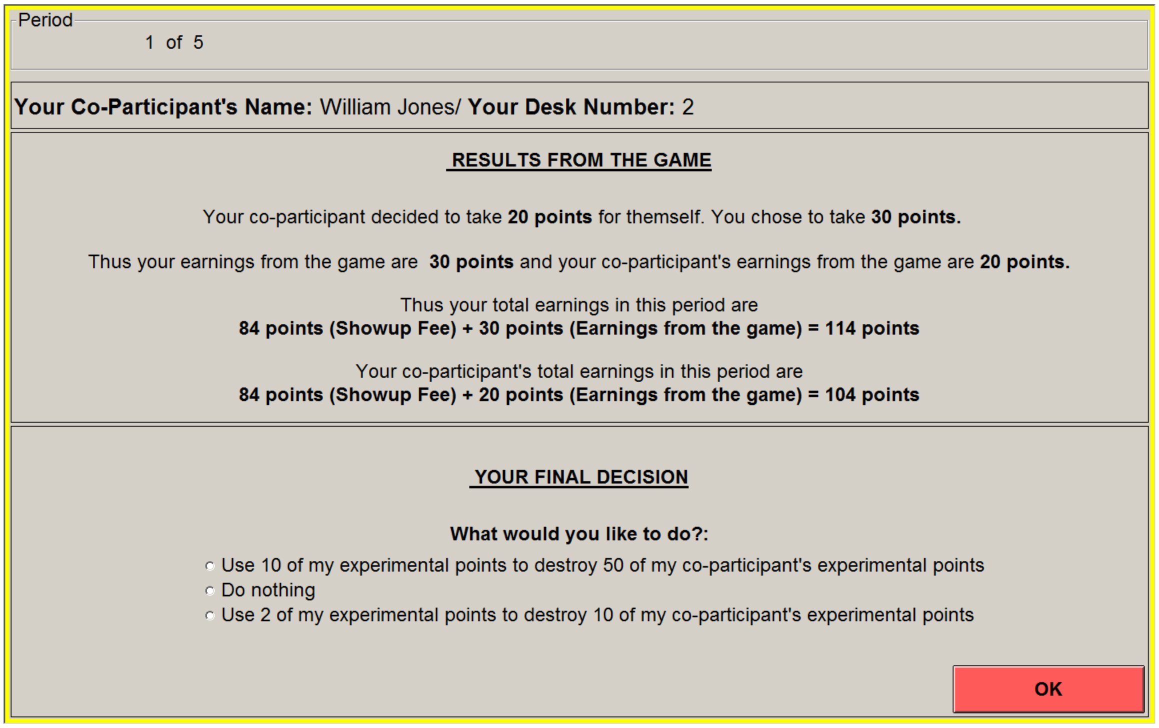


Figure 2.3. Results from Game and Punishment Decision Screen

OR

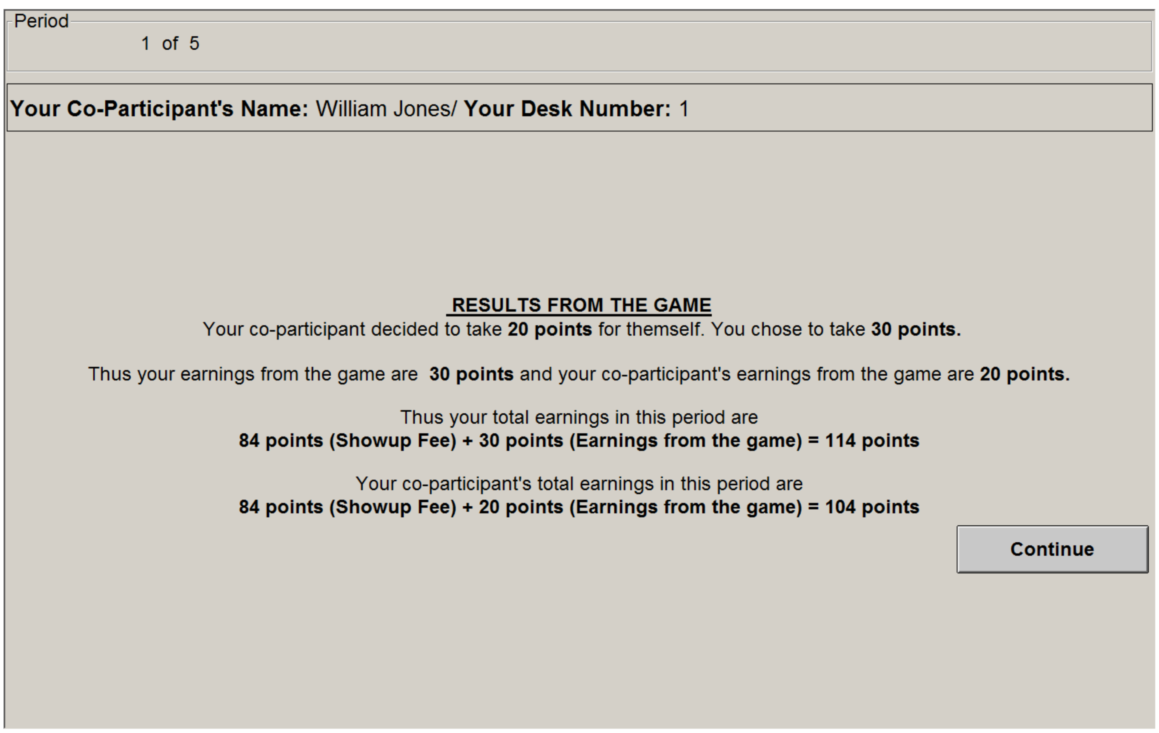


Figure 2.4. Results from Game (without Punishment Decision) Screen

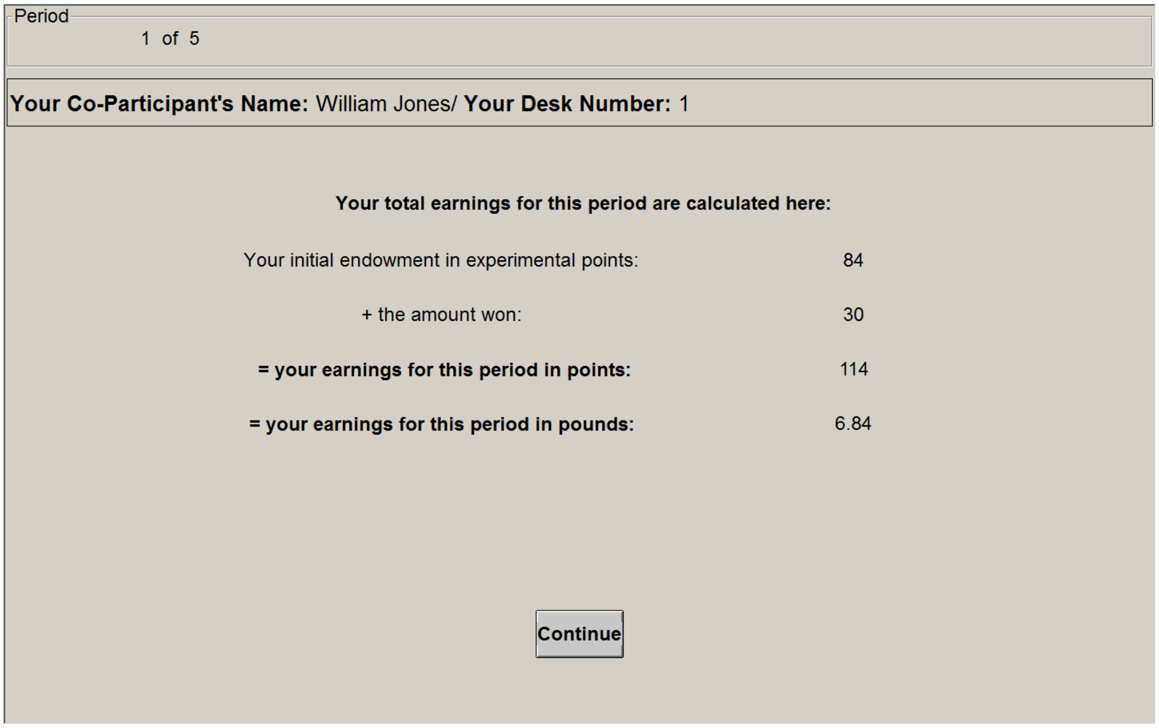


Figure 2.5. Calculation of earnings screen (without Punishment)

<u>OR</u>

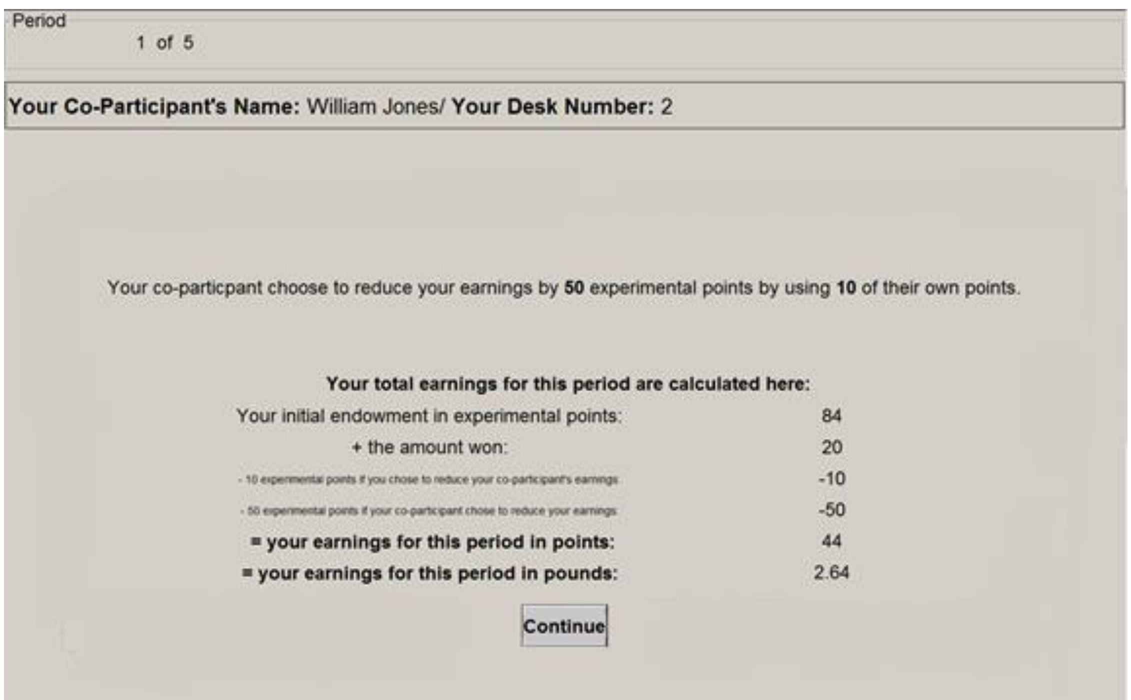
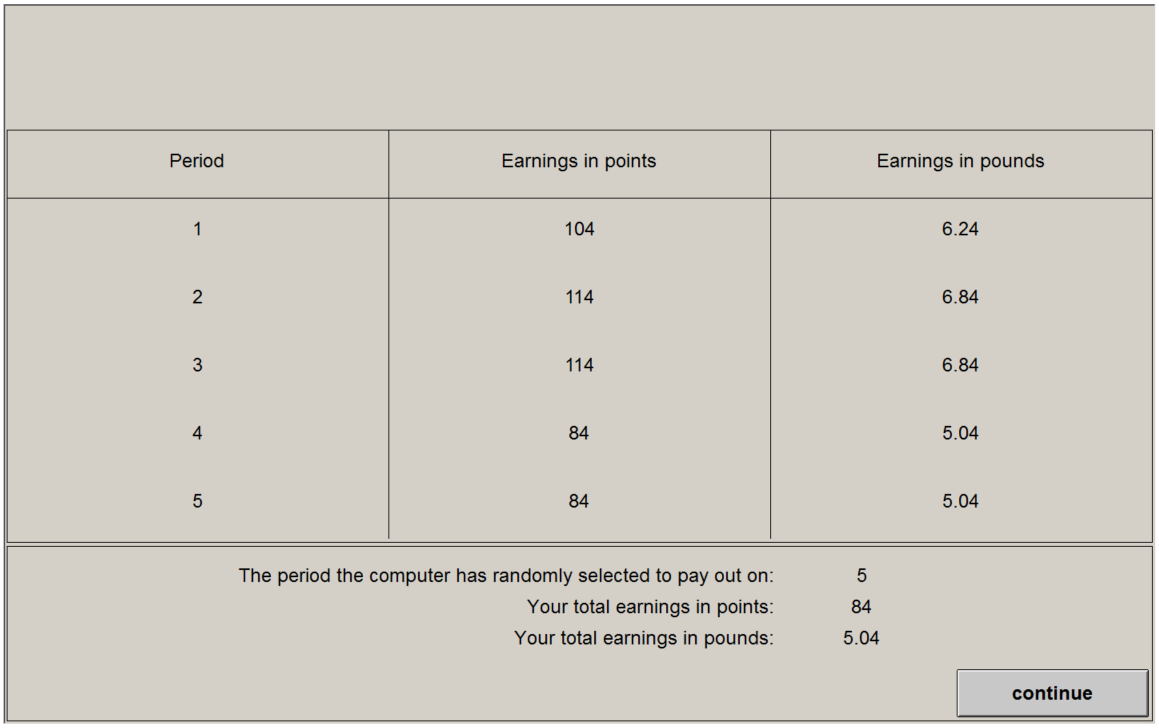


Figure 2.6. Calculation of earnings screen



Period	Earnings in points	Earnings in pounds
1	104	6.24
2	114	6.84
3	114	6.84
4	84	5.04
5	84	5.04

The period the computer has randomly selected to pay out on: 5
Your total earnings in points: 84
Your total earnings in pounds: 5.04

continue

Figure 2.7. Summary of Period Earnings and Period Selection Screen

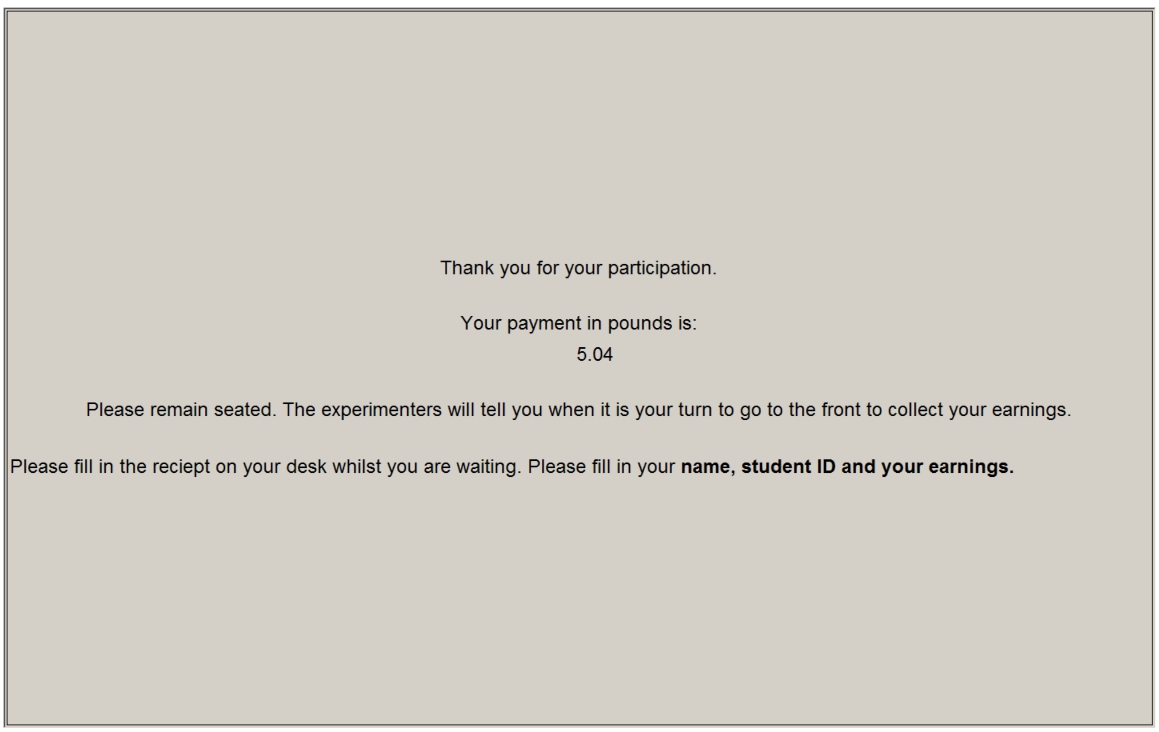


Figure 2.8. Final Earnings Screen

3. Calculation of Mixed Strategy Nash Equilibrium

3.1. Battle of the Sexes with Compromise

Table 3.1.1. The Battle of the Sexes Game with Compromise

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)	(0, 0)
	Dovish (β_1)	(20, 30)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(15, 15)

Equations

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise2}$ (1)

$U_{Hawkish2} = ß_1 * 30 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Hawkish2} = 30ß_1 (2)$

$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 20 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 15$

$\Rightarrow U_{Compromise2} = 15 - 15\alpha_1 - 15ß_1 (4)$

From *(1)* and *(2)* and *(3)*

$30ß_1 = 20\alpha_1 \Rightarrow ß_1 = \frac{2}{3}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$20\alpha_1 = 15 - 15\alpha_1 - 15ß_1\ (replace\ from\ (5))$

$\Rightarrow 20\alpha_1 = 15 - 15\alpha_1 - 15 * \frac{2}{3}\alpha_1$

$\Rightarrow 45\alpha_1 = 15$

$\Rightarrow \alpha_1 = \frac{1}{3}$ (6)

Replace *(6)* into *(5)*

$$\Rightarrow ß_1 = \frac{2}{3} * \frac{1}{3}$$

$$\Rightarrow ß_1 = \frac{2}{9}$$

$$\Rightarrow 1 - \alpha_1 - ß_1 = 1 - \frac{1}{3} - \frac{2}{9}$$

$$\Rightarrow 1 - \alpha_1 - ß_1 = \frac{4}{9}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{1}{3}$$

$$\Rightarrow ß_2 = \frac{2}{9}$$

$$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{4}{9}$$

Expected Payoffs

$$\frac{1}{3} * \frac{2}{9} * 30 + \frac{1}{3} * \frac{2}{9} * 20 + \frac{4}{9} * \frac{4}{9} * 15 = 6\frac{2}{3}$$

3.1.1. Alternative MSNE

Table 3.1.1.1. Battle of the Sexes with a Compromise Option (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise ($1-\alpha_2$)
Player 1	Hawkish (α_1)	(30, 20)	(0, 0)
	Compromise ($1-\alpha_1$)	(0, 0)	(15, 15)

Equations

Player 2

$$U_{Dovish2} = U_{Compromise2} \; (1)$$

$$U_{Dovish2} = (1 - \alpha_1) * 0 + \alpha_1 * 20 \Rightarrow U_{Dovish2} = \; 20\alpha_1 (2)$$
$$U_{Compromise2} = (1 - \alpha_1) * 15 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = \; 15 - 15\alpha_1 (3)$$

From *(1)* and *(2)* and *(3)*

$$15 - 15\alpha_1 = 20\alpha_1 \Rightarrow \; \alpha_1 = \frac{3}{7}$$

$$\Rightarrow (1 - \alpha_1) = \frac{4}{7}$$

Player 1

$$U_{Hawkish1} = U_{Compromise1} \; (1)$$

$$U_{Hawkish1} = (1 - \alpha_2) * 0 + \alpha_2 * 30 \Rightarrow U_{Hawkish1} = \; 30\alpha_2 (2)$$

$$U_{Compromise1} = (1 - \alpha_2) * 15 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = \; 15 - 15\alpha_2 (3)$$

From *(1)* and *(2)* and *(3)*

$$15 - 15\alpha_2 = 30\alpha_2 \Rightarrow \; \alpha_2 = \frac{1}{3}$$

$$\Rightarrow (1 - \alpha_2) = \frac{2}{3}$$

Expected payoffs

$EP_1 = \frac{1}{3} * \frac{3}{7} * 30 + \frac{2}{3} * \frac{4}{7} * 15 = 10$

$EP_2 = \frac{1}{3} * \frac{3}{7} * 20 + \frac{2}{3} * \frac{4}{7} * 15 = 8.57$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

3.2. Battle of the Sexes Game

Table 3.2.1. Battle of the Sexes Game

		Player 2	
		Hawkish (α_2)	Dovish (1-α_2)
Player 1	Hawkish (α_1)	(0, 0)	(30, 20)
	Dovish (1-α_1)	(20, 30)	(0, 0)

$U_{Dovish2} = U_{Hakwish2}$ (1)

$U_{Hawkish2} = (1 - \alpha_1) \times 30 + \alpha_1 \times 0 \Rightarrow U_{Hawkish2} = 30 - 30\alpha_1 (2)$
$U_{Dovish2} = (1 - \alpha_1) \times 0 + \alpha_1 \times 20 \Rightarrow U_{Dovish2} = 20\alpha_1 (3)$

Using (1) and (2) and (3)

$$30 - 30\alpha_1 = 20\alpha_1 \Rightarrow \alpha_1 = \frac{3}{5}$$

$$\Rightarrow (1 - \alpha_1) = \frac{2}{5}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{3}{5}$$

$$\Rightarrow (1 - \alpha_2) = \frac{2}{5}$$

Expected payoffs

$\frac{3}{5} * \frac{2}{5} * 30 + \frac{3}{5} * \frac{2}{5} * 20 = 12$

4. Pairwise Correlation Matrices

A matrix is presented for each probit table in chapter 2. The correlation coefficient is present together with the (2-tailed) p value in brackets after each.

Table 4.1. Pairwise Correlation Matrix for Table. 5.2.1.2

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.6368 (0.0000)	1.0000			
Undergraduates	-0.2673	0.2508 (0.0000)	1.0000		
Social Science Students	0.3304 (0.0000)	-0.2777 (0.0000)	-0.0000	1.0000	
Humanities Students	0.1158 (0.0450)	0.0480 (0.4074)	-0.0788 (0.1734)	-0.5160 (0.0000)	1.0000

Table 4.2. Pairwise Correlation Matrix for Table 5.2.1.3(a).
- All Subjects

	South East Asian	Western European	Males	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000					
Western European	-0.6087 (0.0000)	1.0000				
Males	-0.0790 (0.0180)	0.1508 (0.0000)	1.0000			
Undergraduates	-0.1175 (0.0004)	0.3313 (0.0000)	0.1295 (0.0001)	1.0000		
Social Science Students	0.3625 (0.0000)	-0.3677 (0.0000)	-0.0501 (0.1345)	-0.2345 (0.0000)	1.0000	
Humanities Students	-0.2036 (0.0000)	0.3189 (0.0000)	-0.0566 (0.0904)	0.0523 (0.1182)	-0.4503 (0.0000)	1.0000

- **Males Only**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.6453 (0.0000)	1.0000			
Undergraduates	0.0279 (0.5551)	0.3295 (0.0000)	1.0000		
Social Science Students	0.2605 (0.0000)	-0.3333 (0.0000)	-0.3134 (0.0000)	1.0000	
Humanities Students	-0.1445 (0.0021)	0.2587 (0.0000)	0.1225 (0.0093)	-0.3989 (0.0000)	1.0000

- **Females Only**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5696 (0.0000)	1.0000			
Undergraduates	-0.2191 (0.0000)	0.3093 (0.0000)	1.0000		
Social Science Students	0.4516 (0.0000)	-0.3961 (0.0000)	-0.1591 (0.0008)	1.0000	
Humanities Students	-0.2648 (0.0000)	0.4006 (0.0000)	0.0094 (0.8438)	-0.5061 (0.0000)	1.0000

Table 4.3. Pairwise Correlation Matrix for Table 5.2.1.3(b).

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5916 (0.0000)	1.0000			
Undergraduates	0.0000 (1.0000)	0.3708 (0.0000)	1.0000		
Social Science Students	0.1971(0.0006)	-0.2968 (0.0000)	-0.3517 (0.0000)	1.0000	
Humanities Students	-0.0417 (0.4721)	0.1690 (0.0033)	0.0962 (0.0962)	-0.3404 (0.0000)	1.0000

Table 4.4. Pairwise Correlation Matrix for Table 5.2.1.3(c).

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5910 (0.0000)	1.0000			
Undergraduates	-0.2453 (0.0000)	0.3509 (0.0000)	1.0000		
Social Science Students	0.5097 (0.0000)	-0.4214 (0.0000)	-0.1394 (0.0166)	1.0000	
Humanities Students	-0.2789 (0.0000)	0.3717 (0.0000)	0.0536 (0.3593)	-0.5594 (0.0000)	1.0000

Table 4.5. Pairwise Correlation Matrix for Table 5.2.1.3(d).

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5724 (0.0000)	1.0000			
Undergraduates	-0.2903 (0.0000)	0.3764 (0.0000)	1.0000		
Social Science Students	0.5003 (0.0000)	-0.4497 (0.0000)	-0.3212 (0.0000)	1.0000	
Humanities Students	-0.3359 (0.0000)	0.4112 (0.0000)	0.1089 (0.0619)	-0.4835 (0.0000)	1.0000

Table 4.6. Pairwise Correlation Matrix for Table 5.2.1.4(a).
- **All Subjects**

	South East Asian	Western European	Males	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000					
Western European	-0.5951 (0.0000)	1.0000				
Males	-0.0571 (0.0479)	0.1917 (0.0000)	1.0000			
Undergraduates	-0.0632 (0.0285)	0.2920 (0.0000)	0.2082 (0.0000)	1.0000		
Social Science Students	0.2353 (0.0000)	-0.1999 (0.0000)	0.1086 (0.0002)	-0.1901 (0.0000)	1.0000	
Humanities Students	-0.1616 (0.0000)	0.2842 (0.0000)	-0.0534 (0.0645)	0.0841 (0.0035)	-0.4456 (0.0000)	1.0000

- **Males Only**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.6757 (0.0000)	1.0000			
Undergraduates	-0.0019 (0.9633)	0.3024 (0.0000)	1.0000		
Social Science Students	0.1787 (0.0000)	-0.1770 (0.0000)	-0.2495 (0.0000)	1.0000	
Humanities Students	-0.1938 (0.0000)	0.2739 (0.0000)	0.1817 (0.0000)	-0.4624 (0.0000)	1.0000

- **Females Only**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5223 (0.0000)	1.0000			
Undergraduates	-0.0888 (0.0297)	0.2375 (0.0000)	1.0000		
Social Science Students	0.3054 (0.0000)	-0.2762 (0.0000)	-0.1998 (0.0000)	1.0000	
Humanities Students	-0.1404 (0.0006)	0.3253 (0.0000)	0.0404 (0.3228)	-0.4262 (0.0000)	1.0000

Table 4.7. Pairwise Correlation Matrix for Table 5.2.1.4(b).

- **MM Subjects**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.7648 (0.0000)	1.0000			
Undergraduates	-0.0157 (0.7871)	0.1406 (0.0148)	1.0000		
Social Science Students	0.1470 (0.0108)	-0.2052 (0.0003)	-0.3178 (0.0000)	1.0000	
Humanities Students	-0.1685 (0.0034)	0.1686 (0.0034)	0.1625(0.0048)	-0.5114 (0.0000)	1.0000

- **MF Subjects**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5916 (0.0000)	1.0000			
Undergraduates	0.0000 (1.0000)	0.4384 (0.0000)	1.0000		
Social Science Students	0.2004 (0.0005)	-0.1581 (0.0061)	-0.2092 (0.0003)	1.0000	
Humanities Students	-0.2236 (0.0001)	0.3780 (0.0000)	0.2000 (0.0005)	-0.4183 (0.0000)	1.0000

- **FF Subjects**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.4804 (0.0000)	1.0000			
Undergraduates	-0.0235 (0.6858)	0.1239 (0.0319)	1.0000		
Social Science Students	0.1811 (0.0016)	-0.1958 (0.0006)	-0.2255 (0.0001)	1.0000	
Humanities Students	-0.1455 (0.0116)	0.3320 (0.0000)	-0.0179 (0.7573)	-0.3804 (0.0000)	1.0000

- **FM Subjects**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5641 (0.0000)	1.0000			
Undergraduates	-0.1566 (0.0066)	0.3495 (0.0000)	1.0000		
Social Science Students	0.4394 (0.0000)	-0.3761 (0.0000)	-0.1764 (0.0022)	1.0000	
Humanities Students	-0.1342 (0.0201)	0.3190 (0.0000)	0.0971 (0.0931)	-0.4757 (0.0000)	1.0000

Table 4.8. Pairwise Correlation Matrix for Table 5.2.2.3(a).

- **All Subjects**

	South East Asian	Western European	Males	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000					
Western European	-0.6087 (0.0000)	1.0000				
Males	-0.0790 (0.0180)	0.1508 (0.0000)	1.0000			
Undergraduates	-0.1175 (0.0004)	0.3313 (0.0000)	0.1295 (0.0001)	1.0000		
Social Science Students	0.3625	-0.3677 (0.0000)	-0.0501 (0.1345)	-0.2345 (0.0000)	1.0000	
Humanities Students	-0.2036 (0.0000)	0.3189 (0.0000)	-0.0566 (0.0904)	0.0523 (0.1182)	-0.4503 (0.0000)	1.0000

- **Males Only**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.6453 (0.0000)	1.0000			
Undergraduates	0.0279 (0.5551)	0.3295 (0.0000)	1.0000		
Social Science Students	0.2605 (0.0000)	-0.3333 (0.0000)	-0.3134 (0.0000)	1.0000	
Humanities Students	-0.1445 (0.0021)	0.2587 (0.0000)	0.1225 (0.0093)	-0.3989 (0.0000)	1.0000

- **Females Only**

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.5696 (0.0000)	1.0000			
Undergraduates	-0.2191	0.3093 (0.0000)	1.0000		
Social Science Students	0.4516 (0.0000)	-0.3961 (0.0000)	-0.1591 (0.0008)	1.0000	
Humanities Students	-0.2648 (0.0000)	0.4006 (0.0000)	0.0094 (0.8438)	-0.5061 (0.0000)	1.0000

Table 4.9. Pairwise Correlation Matrix for Table 5.2.2.3(b).

	South East Asian	Western European	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000				
Western European	-0.7323 (0.0000)	1.0000			
Undergraduates	-0.0701 (0.2262)	0.2510 (0.0000)	1.0000		
Social Science Students	0.2573 (0.0000)	-0.3655 (0.0000)	-0.3342 (0.0000)	1.0000	
Humanities Students	-0.0962 (0.0962)	0.1371 (0.0175)	0.0607 (0.2948)	-0.3942 (0.0000)	1.0000

Table 4.10. Pairwise Correlation Matrix for Table 5.2.2.4.

	South East Asian	Western European	Males	Undergraduates	Social Science Students	Humanities Students
South East Asian	1.0000					
Western European	-0.7046 (0.000)	1.0000				
Males	-0.3236 (0.000)	0.2891 (0.000)	1.0000			
Undergraduates	-0.3413 (0.000)	0.3988 (0.000)	0.3333 (0.000)	1.0000		
Social Science Students	0.3264 (0.000)	-0.2855 (0.000)	-0.1231 (0.0002)	-0.1296 (0.0001)	1.0000	
Humanities Students	-0.0358 (0.2847)	0.1069 (0.0014)	-0.0674 (0.0431)	-0.0693 (0.0377)	-0.4651 (0.000)	1.0000

5. Additional Regressions

Table 5.1. Choices made without compromise (NP-NC) - Period 1 only

		Treatment							
		Males				Females			
		G-NP (All Males)	G-NP (MF)	G-NP (MM)	NG-NP (All Males)	G-NP (All Females)	G-NP (FM)	G-NP (FF)	NG-NP (All Females)
Amount taken	20 (Dovish)	41.67 (25)	33.33 (10)	50.00 (15)	43.33 (13)	50.00 (30)	46.67 (14)	53.33 (16)	43.33 (13)
	30 (Hawkish)	58.33 (35)	66.67 (20)	50.00 (15)	56.67 (17)	50.00 (30)	53.33 (16)	46.67 (14)	56.67 (17)

Table 5.2. Choices made without compromise (P-NC) - Period 1 only

		Treatment							
		Males				Females			
		G-P (All Males)	G-P (MF)	G-P (MM)	NG-P (All Males)	G-P (All Females)	G-P (FM)	G-P (FF)	NG-P (All Females)
Amount taken	20 (Dovish)	50.00 (30)	46.67 (14)	53.33 (16)	56.67 (17)	38.33 (23)	30.00 (9)	46.67 (14)	50.00 (15)
	30 (Hawkish)	50.00 (30)	53.33 (16)	46.67 (14)	43.33 (13)	61.67 (37)	70.00 (21)	53.33 (16)	50.00 (15)

Table 5.3. Choices made without compromise (NG-NC) - Period 1 only

		Treatment			
		Males		**Females**	
		NG-P (All Males)	NG-NP (All Males)	NG-P (All Females)	NG-NP (All Females)
Amount taken	20 (Dovish)	56.67 (17)	43.33 (13)	50.00 (15)	43.33 (13)
	30 (Hawkish)	43.33 (13)	56.67 (17)	50.00 (15)	56.67 (17)

Table 5.4. Choices made by males without compromise (G-NC) - Period 1 only

		Treatment					
		G-P-NC (Males)	G-P-NC (MM)	G-P-NC (MF)	G-NP-NC (Males)	G-NP-NC (MM)	G-NP-NC (MF)
Amount taken	20 (Dovish)	50.00 (30)	53.33 (16)	46.67 (14)	41.67 (25)	50.00 (15)	33.33 (10)
	30 (Hawkish)	50.00 (30)	46.67 (14)	53.33 (16)	58.33 (35)	50.00 (15)	66.67 (20)

Table 5.5. Choices made by females without compromise (G-NC) - Period 1 only

		Treatment					
		G-P-NC (Females)	G-P-NC (FF)	G-P-NC (FM)	G-NP-NC (Females)	G-NP-NC (FF)	G-NP-NC (FM)
Amount taken	20 (Dovish)	38.33 (23)	46.67 (14)	30.00 (9)	50.00 (30)	53.33 (16)	46.67 (14)
	30 (Hawkish)	61.67 (37)	53.33 (16)	70.00 (21)	50.00 (30)	46.67 (14)	53.33 (16)

Table 5.6. The effect of gender information – G-P-NC v. NG-P-NC

		30 (Hawkish)	20 (Dovish)
All subjects	Gender information available	-0.194 (0.14)	0.194 (0.14)
	Hawkish lag **Base: Dovish lag**	0.754*** (0.25)	-0.754*** (0.25)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.792*** (0.11)	0.792*** (0.11)
	Coordination achieved in previous period	-0.048 (0.11)	0.048 (0.11)
	Co-participant “Full Monty” lag	-0.438 (0.31)	0.438 (0.31)
	Co-participant “Slap on the Wrist” lag	-0.359*(0.19)	0.359* (0.19)
	“Full Monty” lag	-0.118 (0.33)	0.118 (0.33)
	“Slap on the Wrist” lag	0.018 (0.19)	-0.018 (0.19)
	Males	-0.091(0.13)	0.091 (0.13)
	South-East Asian	0.109 (0.18)	-0.109 (0.18)
	Western European	0.030 (0.18)	-0.030 (0.18)
	Undergraduates	0.038 (0.14)	-0.038 (0.14)
	Social Sciences Students	0.006 (0.15)	-0.006 (0.15)
	Humanities Students **Base: Medicine and science students**	-0.212 (0.18)	0.212 (0.18)
	Constant	0.478* (0.29)	-0.478* (0.29)
	No. of Obs.	716	716
	Wald chi2(13)	70.13	70.13
Males	Gender information available	-0.070 (0.16)	0.070 (0.16)
	Hawkish lag **Base: Dovish lag**	1.278*** (0.16)	-1.278*** (0.16)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.707*** (0.15)	0.707*** (0.15)
	Coordination achieved in previous period	-0.003 (0.15)	0.003 (0.15)
	Co-participant “Full Monty” lag	-0.816* (0.44)	0.816* (0.44)
	Co-participant “Slap on the Wrist” lag	-0.414 (0.30)	0.414 (0.30)
	“Full Monty” lag	-0.183 (0.28)	-0.074 (0.44)
	“Slap on the Wrist” lag	0.074 (0.44)	0.183 (0.28)
	South-East Asian	0.022 (0.24)	-0.022 (0.24)
	Western European	0.085 (0.22)	-0.085 (0.22)
	Undergraduates	-0.080 (0.20)	0.080 (0.20)
	Social Sciences Students	-0.109 (0.18)	0.109 (0.18)
	Humanities Students **Base: Medicine and science students**	-0.091 (0.20)	0.091 (0.20)
	Constant	0.076 0.28)	-0.076 (0.28)
	No. of Obs.	360	360
	Wald chi2(13)	84.90	84.90
Females	Gender information available	-0.461** (0.23)	0.461** (0.23)
	Hawkish lag **Base: Dovish lag**	0.170 (0.28)	-0.170 (0.28)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.928*** (0.17)	0.928*** (0.17)
	Coordination achieved in previous period	-0.122 (0.17)	0.122 (0.17)
	Co-participant “Full Monty” lag	0.127 (0.47)	-0.127 (0.47)
	Co-participant “Slap on the Wrist” lag	-0.340 (0.25)	0.340(0.25)
	“Full Monty” lag	0.063 (0.27)	0.422 (0.50)
	“Slap on the Wrist” lag	-0.422 (0.50)	-0.063 (0.27)
	South-East Asian	0.431 (0.31)	-0.431 (0.31)
	Western European	-0.075 (0.31)	0.075 (0.31)
	Undergraduates	0.208 (0.22)	-0.208 (0.22)
	Social Sciences Students	0.107 (0.25)	-0.107 (0.25)
	Humanities Students **Base: Medicine and science students**	-0.499 (0.31)	0.499 (0.31)
	Constant	0.904** (0.42)	-0.904** (0.42)
	No. of Obs.	356	356
	Wald chi2(13)	44.40	44.40

Table 5.7. The effect of gender information – G-P-NC (MM subjects) v. NG-P-NC (Male subjects)

	30 (Hawkish)	20 (Dovish)
Gender information available	-0.158 (0.24)	0.158 (0.24)
Hawkish lag **Base: Dovish lag**	1.034*** (0.39)	-1.034*** (0.39)
Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.597*** (0.20)	0.597*** (0.20)
Coordination achieved in previous period	0.050 (0.20)	-0.050 (0.20)
Co-participant "Full Monty" lag	-0.999* (0.59)	0.999* (0.59)
Co-participant "Slap on the Wrist" lag	-0.550 (0.43)	0.550 (0.43)
"Full Monty" lag	-0.421 (0.43)	0.421 (0.43)
"Slap on the Wrist" lag	0.030 (0.57)	-0.030 (0.57)
South-East Asian	-0.100 (0.41)	0.100 (0.41)
Western European	0.048 (0.36)	-0.048 (0.36)
Undergraduates	-0.339 (0.38)	0.339 (0.38)
Social Sciences Students	-0.039 (0.28)	0.039 (0.28)
Humanities Students **Base: Medicine and science students**	-0.301 (0.32)	0.301 (0.32)
Constant	0.460(0.59)	-0.460 (0.59)
No. of Obs.	240	240
Wald chi2(13)	29.55	29.55

Table 5.8. The effect of gender information – G-NP-NC v. NG-NP-NC[98]

		30 (Hawkish)	20 (Dovish)
All Subjects	Gender information available	-0.181 (0.13)	0.181 (0.13)
	Hawkish lag **Base: Dovish lag**	0.322** (0.15)	-0.322** (0.15)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.497*** (0.11)	0.497*** (0.11)
	Coordination achieved in previous period	-0.245 (0.21)	0.123 (0.11)
	Males	-0.074 (0.12)	0.074 (0.12)
	South-East Asian	0.094 (0.20)	-0.094 (0.20)
	Western European	-0.083(0.22)	0.083 (0.22)
	Undergraduates	-0.006 (0.14)	0.006 (0.14)
	Social Sciences Students	-0.016 (0.15)	0.016 (0.15)
	Humanities Students **Base: Medicine and Science Students**	0.010 (0.18)	-0.010 (0.18)
	Constant	0.496* (0.27)	-0.496* (0.27)
	No. of Obs.	720	720
	Wald chi2(10)	30.51	30.51
Males	Gender information available	-0.132 (0.16)	0.132 (0.16)
	Hawkish lag **Base: Dovish lag**	0.818*** (0.15)	-0.818*** (0.15)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.708*** (0.15)	0.708*** (0.15)
	Coordination achieved in previous period	-0.082 (0.29)	0.041(0.15)
	South-East Asian	0.015(0.30)	-0.015 (0.30)
	Western European	-0.077 (0.31)	0.077 (0.31)
	Undergraduates	-0.105 (0.16)	0.105 (0.16)
	Social Sciences Students	0.179(0.18)	-0.179 (0.18)
	Humanities Students **Base: Medicine and Science Students**	-0.155(0.23)	0.155 (0.23)
	Constant	0.204 (0.38)	-0.204 (0.38)
	Wald chi2(9)	53.09	53.09
	No. of Obs.	360	360
Females	Gender information available	-0.270 (0.19)	0.270 (0.19)
	Hawkish lag **Base: Dovish lag**	-0.022 (0.20)	0.022 (0.20)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.392** (0.15)	0.392** (0.15)
	Coordination achieved in previous period	-0.457 (0.31)	0.229 (0.15)
	South-East Asian	0.185 (0.26)	-0.185 (0.26)
	Western European	-0.053 (0.31)	0.053 (0.31)
	Undergraduates	0.064 (0.22)	-0.064 (0.22)
	Social Sciences Students	-0.260 (0.22)	0.260 (0.22)
	Humanities Students **Base: Medicine and Science Students**	0.190 (0.27)	0.190 (0.27)
	Constant	0.751** (0.36)	-0.751**(0.36)
	No. of Obs.	360	360
	Wald chi2(9)	15.55	15.55

[98] We also run regressions with an interaction term between gender information and gender but find no significant effects of gender information

Table 5.9. The effect of gender information – G-NP-C v. NG-NP-C

		30 (Hawkish)	20 (Dovish)	15 (Equal)
All subjects	Gender information available	0.148 (0.12)	-0.103 (0.12)	-0.084 (0.12)
	Hawkish lag	1.112*** (0.13)	0.490*** (0.14)	-1.459*** (0.14)
	Dovish lag **Base: Equal lag**	0.668*** (0.14)	0.980*** (0.14)	-1.503*** (0.15)
	Co-participant hawkish lag	0.623*** (0.13)	0.586*** (0.13)	-1.155*** (0.14)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.976*** (0.13)	0.098 (0.15)	-1.117*** (0.14)
	Coordination Achieved in the previous period	-0.067 (0.12)	-0.139 (0.12)	-0.156 (0.13)
	Males	0.194* (0.12)	-0.126 (0.12)	-0.063 (0.12)
	South-East Asian	0.019 (0.16)	0.215 (0.17)	-0.215 (0.16)
	Western European	0.010 (0.16)	0.339** (0.17)	-0.300* (0.16)
	Undergraduates	0.135 (0.14)	-0.420*** (0.14)	0.251* (0.14)
	Social Sciences Students	0.040 (0.12)	-0.048 (0.13)	-0.025 (0.12)
	Humanities Students **Base: Medicine and science students**	0.283* (0.16)	-0.205 (0.18)	-0.099 (0.16)
	Constant	-1.837*** (0.22)	-1.169*** (0.23)	1.487*** (0.22)
	No. of Obs.	720	720	720
	Wald chi2(12)	129.50	90.49	214.14
Males	Gender information available	0.098 (0.17)	-0.072 (0.18)	-0.033 (0.17)
	Hawkish lag	1.318*** (0.19)	0.428** (0.20)	-1.618*** (0.20)
	Dovish lag **Base: Equal lag**	0.802*** (0.20)	0.794*** (0.20)	-1.413*** (0.21)
	Co-participant hawkish lag	1.020*** (0.20)	0.300 (0.20)	-1.297*** (0.21)
	Co-participant dovish lag **Base: Co-participant equal lag**	1.218*** (0.19)	-0.063 (0.20)	-1.178*** (0.19)
	Coordination Achieved in the previous period	-0.181 (0.18)	-0.166 (0.18)	-0.038 (0.19)
	Males	n/a	n/a	n/a
	South-East Asian	-0.051 (0.30)	0.310 (0.32)	-0.190 (0.30)
	Western European	0.131 (0.27)	0.221 (0.30)	-0.319 (0.27)
	Undergraduates	0.095 (0.24)	-0.211 (0.24)	0.067 (0.24)
	Social Sciences Students	0.160 (0.18)	-0.245 (0.18)	-0.010 (0.18)
	Humanities Students **Base: Medicine and science students**	0.422* (0.24)	-0.302 (0.26)	-0.155 (0.24)
	Constant	-1.993*** (0.41)	-1.104*** (0.41)	1.604*** (0.40)
	No. of Obs.	356	356	356
	Wald chi2(11)	78.63	25.20	106.07
Females	Gender information available	0.194 (0.17)	-0.167 (0.17)	-0.116 (0.17)
	Hawkish lag	0.969*** (0.19)	0.527** (0.21)	-1.328*** (0.20)
	Dovish lag **Base: Equal lag**	0.594*** (0.19)	1.126*** (0.19)	-1.596*** (0.21)
	Co-participant hawkish lag	0.336* (0.18)	0.842*** (0.18)	-1.109*** (0.19)
	Co-participant dovish lag **Base: Co-participant equal lag**	0.777*** (0.20)	0.246 (0.22)	-1.096*** (0.22)
	Coordination Achieved in the previous period	-0.027 (0.17)	-0.103 (0.18)	-0.237 (0.19)
	Males	n/a	n/a	n/a
	South-East Asian	0.119 (0.20)	0.090 (0.22)	-0.246 (0.20)
	Western European	-0.094 (0.21)	0.436* (0.22)	-0.270 (0.21)
	Undergraduates	0.168 (0.18)	-0.517*** (0.18)	0.301* (0.17)
	Social Sciences Students	-0.077 (0.18)	0.153 (0.20)	-0.038 (0.18)
	Humanities Students **Base: Medicine and science students**	0.195 (0.22)	-0.097 (0.26)	-0.074 (0.23)
	Constant	-1.626*** (0.29)	-1.374*** (0.30)	1.473*** (0.30)
	No. of Obs.	364	364	364
	Wald chi2(11)	45.25	66.37	105.60

Table 5.10. The effect of punishment – G-NP-NC v. G-P-NC

		30 (Hawkish)	20 (Dovish)
All subjects	Punishment Available	0.089 (0.12)	-0.089 (0.12)
	Hawkish lag	0.229 (0.16)	-0.229 (0.16)
	Base: Dovish lag		
	Co-participant hawkish lag	-0.603*** (0.10)	0.603*** (0.10)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	-0.197** (0.10)	0.197** (0.10)
	South-East Asian	0.321* (0.19)	-0.321* (0.19)
	Western European	-0.066 (0.20)	0.066 (0.20)
	MM	-0.199 (0.17)	0.199 (0.17)
	FM	-0.174 (0.17)	0.174 (0.17)
	FF	-0.138 (0.17)	0.138 (0.17)
	MF	Omitted	Omitted
	Undergraduates	0.011 (0.13)	-0.011 (0.13)
	Social Sciences	0.066 (0.14)	-0.066 (0.14)
	Humanities	0.006 (0.18)	-0.006 (0.18)
	Base: Science and Medicine Students		
	Constant	0.379 (0.25)	-0.379 (0.25)
	No. of Obs.	956	956
	Wald chi2(12)	58.04	58.04
Males	Punishment Available	0.119 (0.13)	-0.119 (0.13)
	Hawkish lag	0.892* (0.47)	-0.892* (0.47)
	Base: Dovish lag		
	Co-participant hawkish lag	-0.634*** (0.13)	0.634*** (0.13)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	-0.134 (0.13)	0.134 (0.13)
	South-East Asian	0.140 (0.24)	-0.140 (0.24)
	Western European	-0.054 (0.23)	0.054 (0.23)
	MM	n/a	n/a
	FM	n/a	n/a
	FF	n/a	n/a
	MF	0.129 (0.14)	-0.129 (0.14)
	Undergraduates	-0.116 (0.16)	0.116 (0.16)
	Social Sciences	0.068 (0.15)	-0.068 (0.15)
	Humanities	0.047 (0.20)	-0.047 (0.20)
	Base: Science and Medicine Students		
	Constant	-0.050 (0.36)	0.050 (0.36)
	No. of Obs.	480	480
	Wald chi2(10)	36.70	36.70
Females	Punishment Available	0.055 (0.16)	-0.055(0.16)
	Hawkish lag	-0.137 (0.21)	0.137 (0.21)
	Base: Dovish lag		
	Co-participant hawkish lag	-0.654*** (0.14)	0.654*** (0.14)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	-0.300** (0.14)	0.300** (0.14)
	South-East Asian	0.543** (0.26)	-0.543** (0.26)
	Western European	-0.037 (0.29)	0.037 (0.29)
	MM	n/a	n/a
	FM	-0.057 (0.16)	0.057 (0.16)
	FF	n/a	n/a
	MF	n/a	n/a
	Undergraduates	0.185 (0.18)	-0.185 (0.18)
	Social Sciences	0.056 (0.20)	-0.056 (0.20)
	Humanities	-0.025 (0.25)	0.025 (0.25)
	Base: Science and Medicine Students		
	Constant	0.352 (0.32)	-0.352 (0.32)
	No. of Obs.	476	476
	Wald chi2(10)	34.58	34.58

Table 5.11. The effect of punishment – G-NP-NC v. G-P-NC

		30 (Hawkish)	20 (Dovish)
MM	Punishment Available	0.052 (0.23)	-0.052 (0.23)
	Hawkish lag	0.426 (0.31)	-0.426 (0.31)
	Base: Dovish lag		
	Co-participant hawkish lag	-0.579*** (0.19)	0.579*** (0.19)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	0.028 (0.19)	-0.028 (0.19)
	South-East Asian	-0.021 (0.56)	0.021 (0.56)
	Western European	-0.355 (0.56)	0.355 (0.56)
	Undergraduates	-0.288 (0.27)	0.288 (0.27)
	Social Sciences	0.114 (0.26)	-0.114 (0.26)
	Humanities	0.045 (0.36)	-0.045 (0.36)
	Base: Science and Medicine Students		
	Constant	0.460 (0.62)	-0.460 (0.62)
	No. of Obs.	240	240
	Wald chi2(9)	16.82	16.82
MF	Punishment Available	0.164 (0.19)	-0.164 (0.19)
	Hawkish lag	1.140*** (0.18)	-1.140*** (0.18)
	Base: Dovish lag		
	Co-participant hawkish lag	-0.652*** (0.18)	0.652*** (0.18)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	-0.270 (0.18)	0.270 (0.18)
	South-East Asian	0.135 (0.28)	-0.135 (0.28)
	Western European	0.036 (0.29)	-0.036 (0.29)
	Undergraduates	-0.089 (0.25)	0.089 (0.25)
	Social Sciences	0.069 (0.22)	-0.069(0.22)
	Humanities	0.056 (0.28)	-0.056 (0.28)
	Base: Science and Medicine Students		
	Constant	-0.083 (0.35)	0.083 (0.35)
	No. of Obs.	240	240
	Wald chi2(9)	53.58	53.58
FM	Punishment Available	0.065 (0.22)	-0.065 (0.22)
	Hawkish lag	0.104 (0.29)	-0.104 (0.29)
	Base: Dovish lag		
	Co-participant hawkish lag	-0.333* (0.19)	0.333* (0.19)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	-0.284 (0.19)	0.284 (0.19)
	South-East Asian	0.561 (0.43)	-0.561 (0.43)
	Western European	-0.244 (0.45)	0.244 (0.45)
	Undergraduates	0.466 (0.33)	-0.466 (0.33)
	Social Sciences	0.279 (0.31)	-0.279 (0.31)
	Humanities	0.013 (0.37)	-0.013 (0.37)
	Base: Science and Medicine Students		
	Constant	-0.279 (0.56)	0.279 (0.56)
	No. of Obs.	236	236
	Wald chi2(9)	13.64	13.64
FF	Punishment Available	0.067 (0.26)	-0.067 (0.26)
	Hawkish lag	-0.443 (0.33)	0.443 (0.33)
	Base: Dovish lag		
	Co-participant hawkish lag	-1.032*** (0.21)	1.032*** (0.21)
	Base: Co-participant dovish lag		
	Coordination achieved in previous period	-0.334 (0.21)	0.334 (0.21)
	South-East Asian	0.588 (0.37)	-0.588 (0.37)
	Western European	0.101 (0.40)	-0.101 (0.40)
	Undergraduates	0.083 (0.26)	-0.083 (0.26)
	Social Sciences	-0.010 (0.29)	0.010 (0.29)
	Humanities	0.177 (0.40)	-0.177 (0.40)
	Base: Science and Medicine Students		
	Constant	0.748* (0.45)	-0.748* (0.45)
	No. of Obs.	240	240
	Wald chi2(9)	28.91	28.91

Table 5.12. The effect of punishment – NG-NP-NC v. NG-P-NC

		30 (Hawkish)	**20 (Dovish)**
All subjects	Punishment Available	-0.049 (0.15)	0.049 (0.15)
	Hawkish lag **Base: Dovish lag**	0.889*** (0.20)	-0.889*** (0.20)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.816*** (0.15)	0.816*** (0.15)
	Coordination achieved in previous period	0.212 (0.15)	-0.212 (0.15)
	South-East Asian	-0.037 (0.21)	0.037 (0.21)
	Western European	0.211 (0.22)	-0.211 (0.22)
	Males	-0.233 (0.15)	0.233 (0.15)
	Undergraduates	-0.088 (0.18)	0.088 (0.18)
	Social Sciences	-0.199 (0.19)	0.199 (0.19)
	Humanities **Base: Science and Medicine Students**	-0.340 (0.21)	0.340 (0.21)
	Constant	0.550* (0.32)	-0.550* (0.32)
	No. of Obs.	480	480
	Wald chi2(10)	52.86	52.86
Males	Punishment Available	-0.089 (0.21)	0.089 (0.21)
	Hawkish lag **Base: Dovish lag**	1.349*** (0.22)	-1.349*** (0.22)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-1.040*** (0.22)	1.040*** (0.22)
	Coordination achieved in previous period	0.334 (0.22)	-0.334 (0.22)
	South-East Asian	-0.038 (0.30)	0.038 (0.30)
	Western European	0.209 (0.29)	-0.209 (0.29)
	Males	n/a	n/a
	Undergraduates	-0.187 (0.24)	0.187 (0.24)
	Social Sciences	-0.255 (0.24)	0.255 (0.24)
	Humanities **Base: Science and Medicine Students**	-0.465* (0.26)	0.465* (0.26)
	Constant	0.323 (0.42)	-0.323 (0.42)
	No. of Obs.	240	240
	Wald chi2(9)	50.46	50.46
Females	Punishment Available	0.008 (0.25)	-0.008 (0.25)
	Hawkish lag **Base: Dovish lag**	0.407 (0.26)	-0.407 (0.26)
	Co-participant hawkish lag **Base: Co-participant dovish lag**	-0.628 (0.22)***	0.628*** (0.22)
	Coordination achieved in previous period	0.139 (0.21)	-0.139 (0.21)
	South-East Asian	-0.019 (0.35)	0.019 (0.35)
	Western European	0.071 (0.38)	-0.071 (0.38)
	Males	n/a	n/a
	Undergraduates	0.061 (0.31)	-0.061 (0.31)
	Social Sciences	-0.235 (0.33)	0.235 (0.33)
	Humanities **Base: Science and Medicine Students**	-0.288 (0.35)	0.288 (0.35)
	Constant	0.716 (0.46)	-0.716 (0.46)
	No. of Obs.	240	240
	Wald chi2(9)	11.46	11.46

Table 5.13. The effect of punishment – NG-NP-C v. NG-P-C

		30 (Hawkish)	20 (Dovish)	15 (Equal)
All subjects	Punishment available	-0.156 (0.15)	-0.042 (0.14)	0.130 (0.14)
	Hawkish lag	1.291*** (0.17)	0.524*** (0.18)	-1.585*** (0.18)
	Dovish lag	0.714*** (0.17)	0.952*** (0.17)	-1.404*** (0.17)
	Base: Equal lag			
	Co-participant hawkish lag	0.396** (0.18)	0.442*** (0.17)	-0.754*** (0.18)
	Co-participant dovish lag	0.621*** (0.17)	0.264 (0.17)	-0.820*** (0.17)
	Base: Co-participant equal lag			
	Coordination Achieved in the previous period	-0.089 (0.16)	-0.177 (0.15)	-0.032 (0.16)
	South-East Asian	-0.010 (0.23)	0.181 (0.25)	-0.146 (0.22)
	Western European	-0.101 (0.23)	0.442* (0.24)	-0.269 (0.22)
	Males	0.127 (0.15)	-0.175 (0.15)	0.016 (0.15)
	Undergraduates	0.117 (0.18)	-0.294* (0.18)	0.176 (0.17)
	Social Sciences Students	-0.058 (0.17)	-0.133 (0.17)	0.155 (0.17)
	Humanities Students	-0.023 (0.20)	0.022 (0.19)	0.033 (0.19)
	Base: Medicine and science students			
	Constant	-1.504*** (0.31)	-1.255*** (0.32)	1.136*** (0.30)
	No. of Obs.	476	476	476
	Wald chi2(12)	80.59	55.58	154.55
Males	Punishment available	-0.333 (0.22)	0.020 (0.24)	0.137 (0.21)
	Hawkish lag	1.886*** (0.27)	0.206 (0.28)	-1.859*** (0.27)
	Dovish lag	1.262*** (0.27)	0.451 (0.36)	-1.418*** (0.25)
	Base: Equal lag			
	Co-participant hawkish lag	0.523* (0.28)	0.494* (0.26)	-0.936*** (0.28)
	Co-participant dovish lag	0.506** (0.24)	0.283 (0.25)	-0.630*** (0.24)
	Base: Co-participant equal lag			
	Coordination Achieved in the previous period	-0.185 (0.24)	-0.278 (0.24)	0.104 (0.24)
	South-East Asian	-0.328 (0.46)	n/a	-0.473 (0.44)
	Western European	-0.118 (0.45)	n/a	-0.719* (0.42)
	Males	n/a	n/a	n/a
	Undergraduates	-0.091 (0.33)	0.092 (0.29)	0.112 (0.28)
	Social Sciences Students	0.048 (0.26)	-0.267 (0.29)	0.057 (0.26)
	Humanities Students	-0.010 (0.32)	-0.043 (0.32)	0.052 (0.27)
	Base: Medicine and science students			
	Constant	-1.442*** (0.52)	-1.158*** (0.42)	1.618*** (0.52)
	No. of Obs.	236	236	236
	Wald chi2(11)	58.09	11.05	84.24
Females	Punishment available	0.043 (0.21)	-0.237 (0.21)	0.110 (0.19)
	Hawkish lag	0.770*** (0.25)	0.953*** (0.27)	-1.448*** (0.26)
	Dovish lag	0.307 (0.24)	1.340*** (0.24)	-1.436*** (0.24)
	Base: Equal lag			
	Co-participant hawkish lag	0.377 (0.25)	0.369 (0.25)	-0.670*** (0.24)
	Co-participant dovish lag	0.692*** (0.25)	0.382 (0.26)	-1.055*** (0.26)
	Base: Co-participant equal lag			
	Coordination Achieved in the previous period	-0.073 (0.22)	-0.031 (0.23)	-0.172 (0.24)
	South-East Asian	0.262 (0.29)	-0.222 (0.30)	-0.114 (0.27)
	Western European	-0.220 (0.29)	0.278 (0.29)	-0.050 (0.28)
	Males	n/a	n/a	n/a
	Undergraduates	0.237 (0.23)	-0.531** (0.24)	0.242 (0.22)
	Social Sciences Students	-0.324 (0.25)	0.073 (0.26)	0.248 (0.25)
	Humanities Students	-0.071 (0.28)	0.200 (0.29)	-0.060 (0.28)
	Base: Medicine and science students			
	Constant	-1.382*** (0.41)	-1.233*** (0.41)	1.047*** (0.40)
	No. of Obs.	240	240	240
	Wald chi2(11)	26.47	42.87	69.40

Table 5.14. Effects of co-participant gender in punishment (G-P-C)

		All Punishment	"Slap on the Wrist"	"Full Monty"
All subjects	Male Co-Participant	0.874** (0.42)	0.432 (0.31)	1.173 (0.82)
	Chose hawkish	0.120 (0.37)	0.291 (0.32)	-0.659 (0.65)
	Chose dovish **Base: Chose equal**	-0.263 (0.42)	0.088 (0.37)	-1.544* (0.88)
	Co-participant chose hawkish	-0.357 (0.29)	-0.073 (0.28)	-0.514 (0.53)
	Co-participant chose dovish **Base: Co-participant chose equal**	0.370 (0.32)	0.162 (0.32)	0.904 (0.55)
	Coordination achieved	-1.160*** (0.28)	-0.741*** (0.26)	-1.812*** (0.60)
	South/ South East Asian	0.674 (0.63)	0.649 (0.48)	-0.065 (1.03)
	Western European	0.662 (0.65)	0.667 (0.49)	-0.219 (1.08)
	Males	0.070 (0.40)	-0.551* (0.31)	1.463* (0.89)
	Undergraduates	-0.695 (0.54)	-0.179 (0.40)	-1.350 (1.03)
	Social Science students	0.238 (0.49)	0.178 (0.38)	0.218 (0.80)
	Humanities Students **Base: Science and medicine students**	-0.035 (0.58)	0.177 (0.43)	-0.341 (1.09)
	Constant	-2.191*** (0.73)	-2.274*** (0.59)	-3.264** (1.42)
	No. of Obs.	480	480	480
	Wald chi2(12)	26.17	15.29	10.92

Table 5.15. Effects of co-participant gender in punishment (G-P-NC)

		All Punishment	"Slap on the Wrist"	"Full Monty"
All subjects	Male Co-Participant	-0.141 (0.45)	-0.125 (0.39)	0.158 (0.33)
	Chose hawkish **Base: Chose dovish**	-0.283 (0.26)	-0.235 (0.26)	-0.081 (0.29)
	Co-participant chose hawkish **Base: Co-participant chose equal**	-0.395 (0.25)	-0.356 (0.26)	-0.012 (0.29)
	Coordination achieved	0.054 (0.24)	-0.057 (0.25)	0.125 (0.28)
	South/ South East Asian	-1.027* (0.60)	-1.030** (0.52)	-0.140 (0.43)
	Western European	-1.885*** (0.66)	-1.428*** (0.55)	-0.991* (0.51)
	Males	-0.018 (0.44)	-0.081 (0.38)	0.071 (0.32)
	Undergraduates	0.208 (0.45)	0.095 (0.39)	0.382 (0.34)
	Social Science students	-0.220 (0.48)	-0.193 (0.40)	-0.162 (0.35)
	Humanities Students **Base: Science and medicine students**	-0.796 (0.73)	-0.919 (0.69)	-0.094 (0.49)
	Constant	-0.501 (0.61)	-0.528 (0.53)	-2.031*** (0.57)
	No. of Obs.	476	476	476
	Wald chi2(10)	12.72	12.39	5.42

Table 5.16. The effects of gender information on punishment decisions - NG-P-NC v. G-P-NC

		All Punishment	**"Slap on the Wrist"**	**"Full Monty"**
Males	Gender information present	0.569 (0.44)	0.550 (0.37)	0.097 (0.35)
	Chose hawkish **Base: Chose dovish**	0.484 (0.33)	0.223 (0.30)	0.288 (0.34)
	Co-participant chose hawkish **Base: Co-participant chose dovish**	-0.543* (0.29)	-0.228 (0.27)	-0.384 (0.33)
	Coordination achieved	-0.378 (0.28)	-0.416 (0.28)	-0.004 (0.30)
	South/ South East Asian	-1.020* (0.60)	-0.876* (0.48)	-0.043 (0.42)
	Western European	-1.217** (0.56)	-0.897** (0.44)	-0.448 (0.40)
	Males	n/a	n/a	n/a
	Undergraduates	1.445** (0.63)	0.838* (0.48)	n/a
	Social science students	0.197 (0.44)	0.107 (0.36)	n/a
	Humanities students **Base: Science & medicine students**	-1.314* (0.77)	-0.878 (0.59)	n/a
	Constant	-2.428*** (0.81)	-2.034*** (0.66)	-1.874*** (0.56)
	No. of Obs.	360	360	360
	Wald chi2(9)	14.70	11.09	3.92
Females	Gender information present	-0.263 (0.52)	-0.233 (0.47)	-0.097 (0.30)
	Chose hawkish **Base: Chose dovish**	-0.222 (0.31)	-0.375 (0.32)	0.274 (0.32)
	Co-participant chose hawkish **Base: Co-participant chose dovish**	0.103 (0.29)	-0.199 (0.29)	0.459 (0.34)
	Coordination achieved	-0.130 (0.28)	-0.232 (0.29)	0.100 (0.29)
	South/ South East Asian	-0.349 (0.69)	-0.491 (0.61)	0.301 (0.50)
	Western European	-1.194 (0.81)	-1.119 (0.72)	-0.157 (0.56)
	Males	n/a	n/a	n/a
	Undergraduates	-0.937* (0.55)	-0.664 (0.49)	-0.494 (0.36)
	Social science students	-0.258 (0.61)	-0.231 (0.54)	-0.261 (0.38)
	Humanities students **Base: Science & medicine students**	-0.326 (0.73)	-0.376 (0.66)	-0.027 (0.42)
	Constant	-0.704 (0.84)	-0.515 (0.75)	-2.179*** (0.73)
	No. of Obs.	356	356	356
	Wald chi2(9)	8.24	7.64	7.35

Chapter 3

Pre-Play Communication and the Efficiency-Equality Trade-Off in Coordination Situations: An Experiment*

Appendix

Zoë C. Bett[a] and Anders Poulsen[b]

[a]School of Economics, and Centre for Behavioural and Experimental Social Science, University of East Anglia, Norwich NR4 7TJ, UK

[b]School of Economics and Centre for Behavioural and Experimental Social Science, University of East Anglia, Norwich NR4 7TJ, UK

1. Screen Shots

Figure 1.1 The Welcome Screen

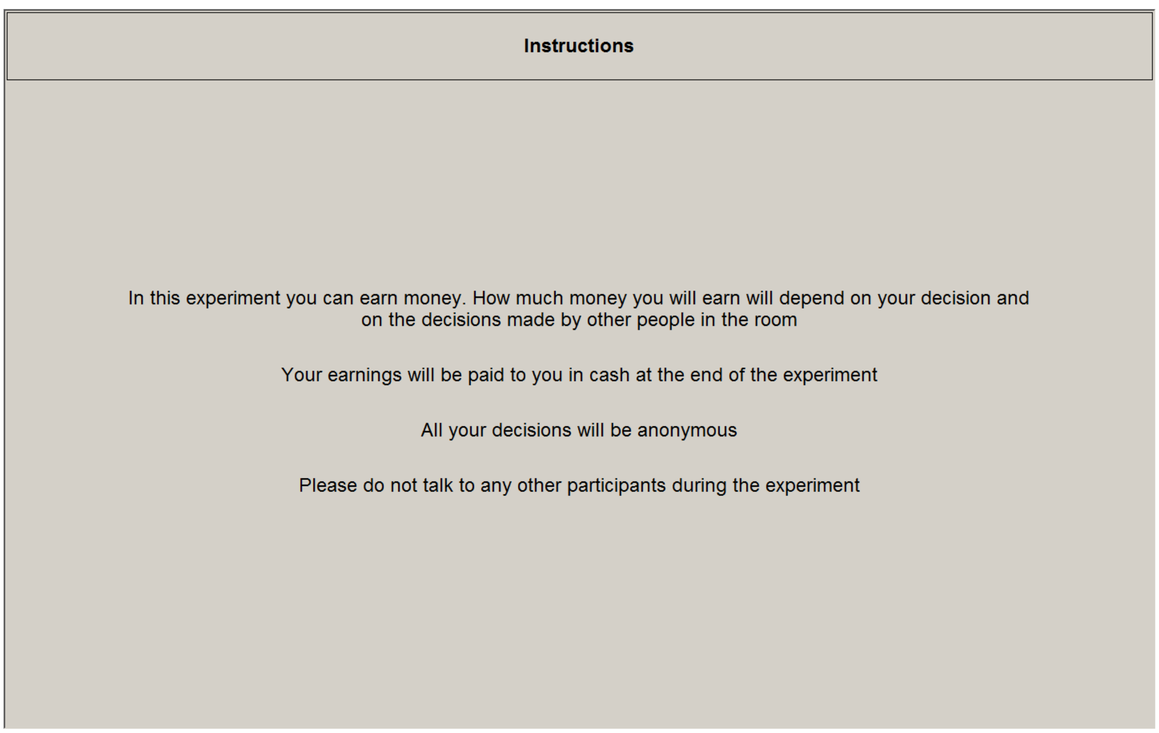


Figure 1.2. Instructions Screen 1

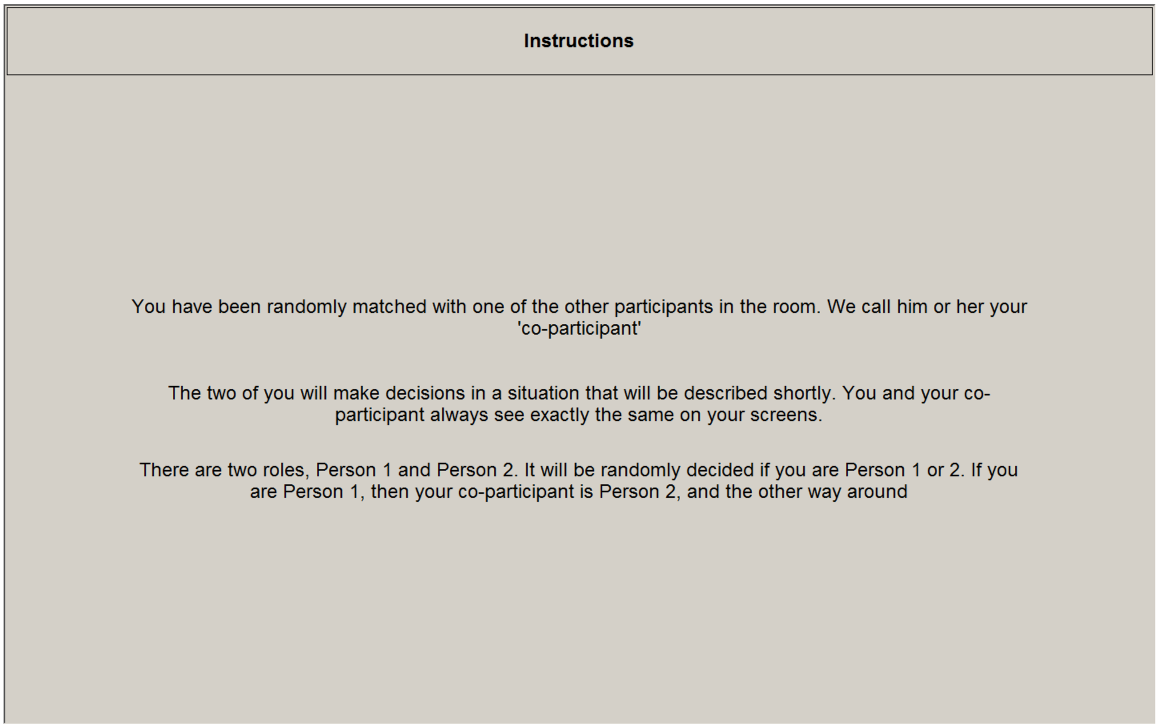


Figure 1.3. Instructions Screen 2

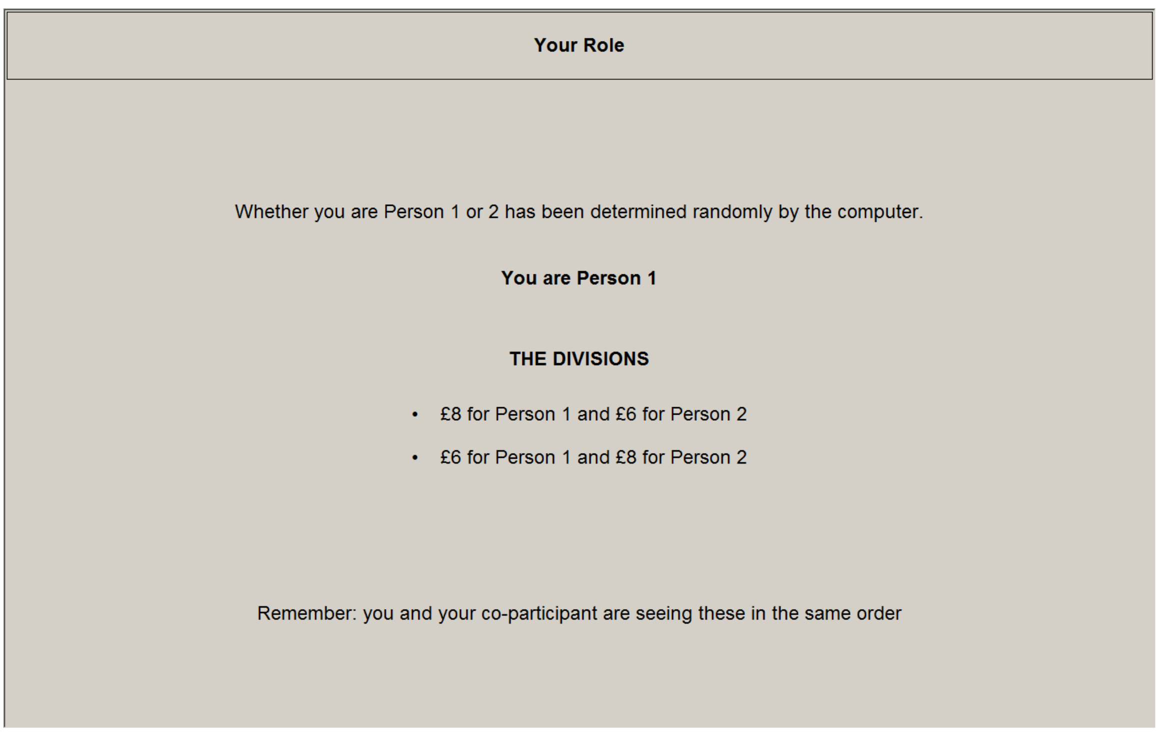


Figure 1.4. Instructions Screen 3

The Task

There are two possible divisions of money between Person 1 and 2 (see below)

THE DIVISIONS

- £8 for Person 1 and £6 for Person 2
- £6 for Person 1 and £8 for Person 2

Person 1 and 2 must each separately propose one of these divisions

Remember: you and your co-participant are seeing these in the same order

Figure 1.5. Instructions Screen 4

How to earn money

If Person 1 and 2 propose the *same* division, then each person gets the money specified by that division
But if Person 1 and 2 propose *different* divisions, each person gets no money (= £0)
It is therefore in the interest of both Person 1 and 2 to propose the same division

THE DIVISIONS

- £8 for Person 1 and £6 for Person 2
- £6 for Person 1 and £8 for Person 2

Are there any questions?

Figure 1.6. Instructions Screen 5

Messages

Before you decide which division to propose, you and your co-participant will be given 120 seconds to send chat messages to each other. You can write as many or as few messages as you like (you can choose not to write anything at all).

You can use the chat messages to indicate what you intend to do, and/or to discuss what the two of you should do.

You can write whatever you wish, except that you are not allowed to reveal your identity or discuss what might happen outside the lab. Also all chat messages will be recorded, so please avoid any aggressive or threatening language.

You write a message by entering the text in the chat window, and then you press -Enter- to send it to your co-participant. You can scroll up and down to see all the messages you and your co-participant have written.

When the 120 seconds have passed, no more messages can be written, and you and your co-participant then each separately decide what division to propose.

Figure 1.7. Instructions Screen 6

This text was only shown in the treatments where communication was permitted

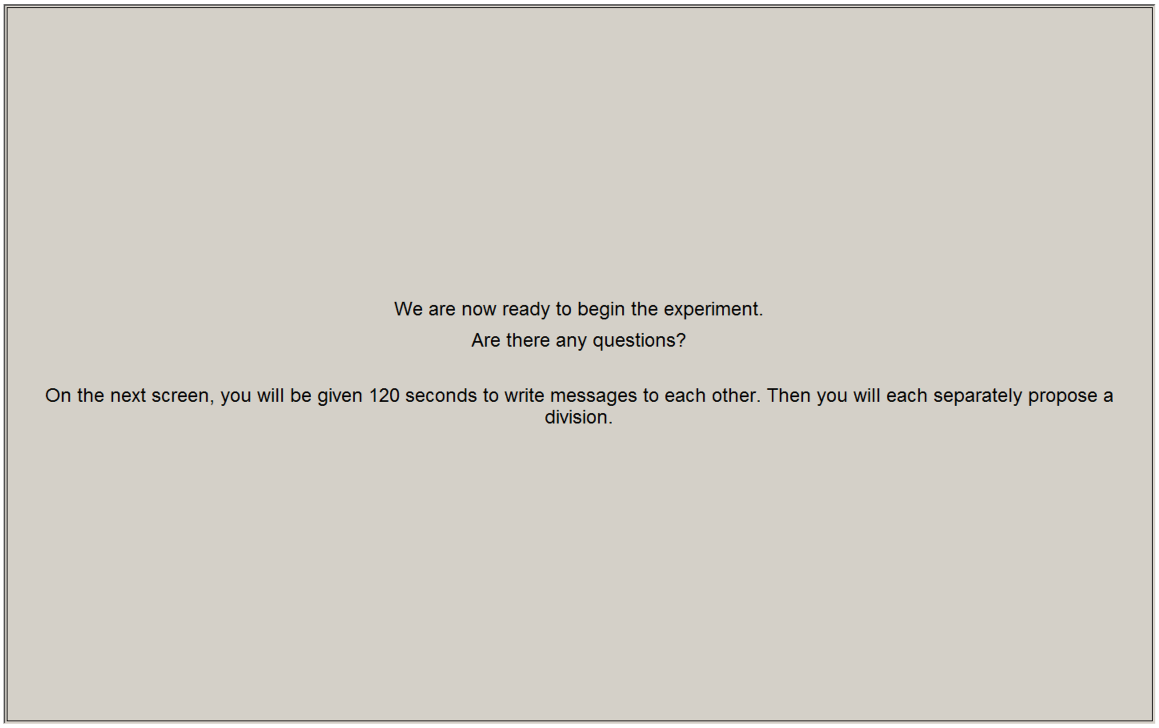


Figure 1.8. Instructions Screen 7

In the treatments without communication the last sentence the words “to write messages to each other” were replaced with the word “and”.

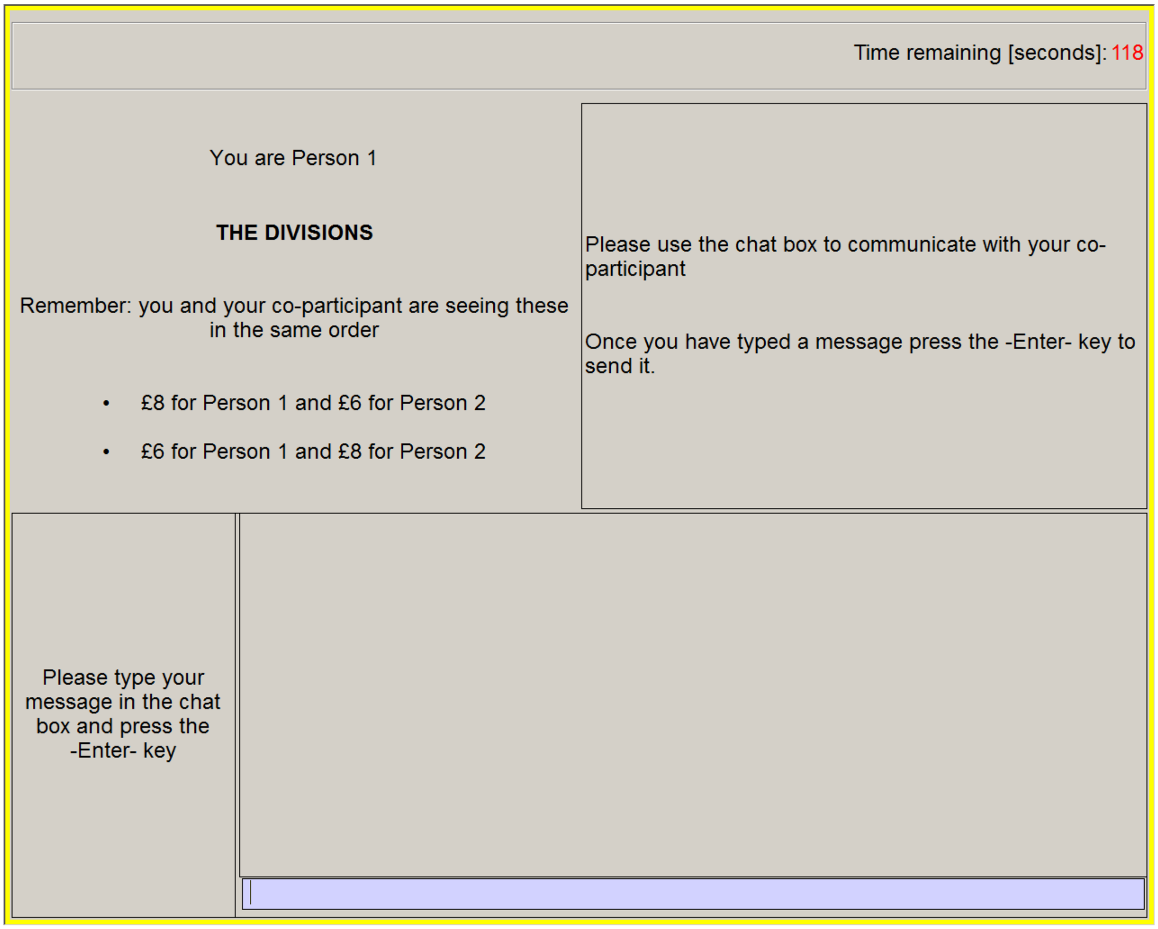


Figure 1.9. The chat screen

In the treatments without communication the screen looked exactly the same apart from that the top right box and bottom half of the screen were not included.

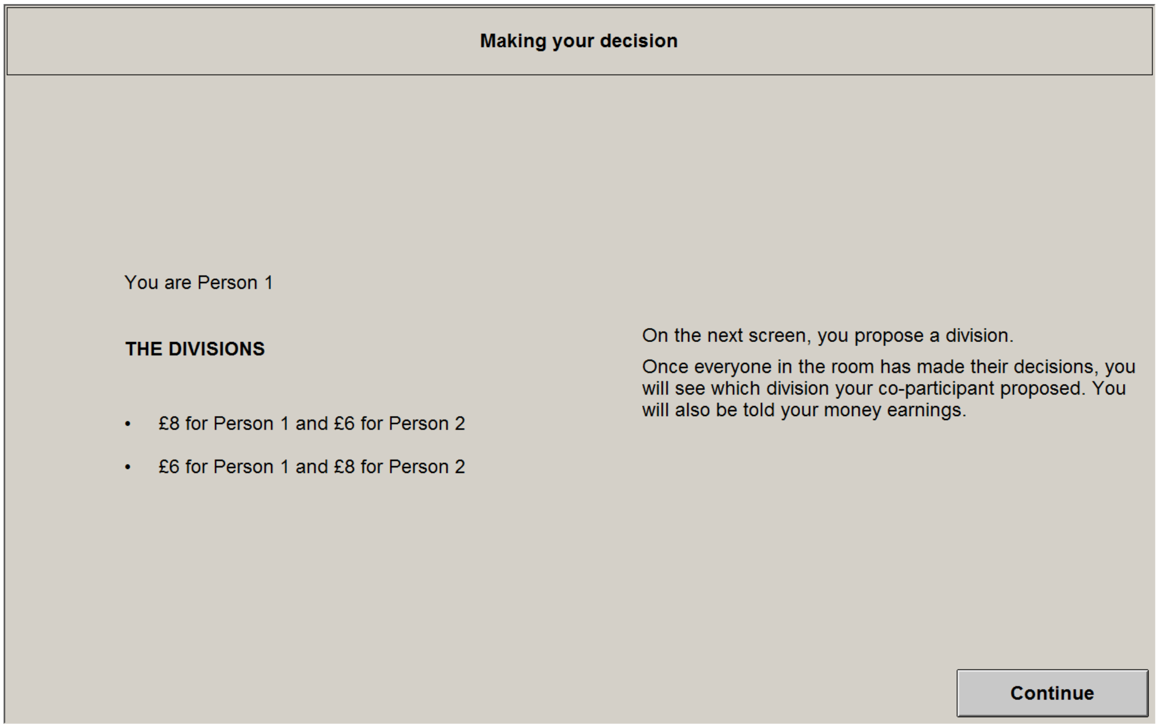


Figure 1.10. The pre-decision screen

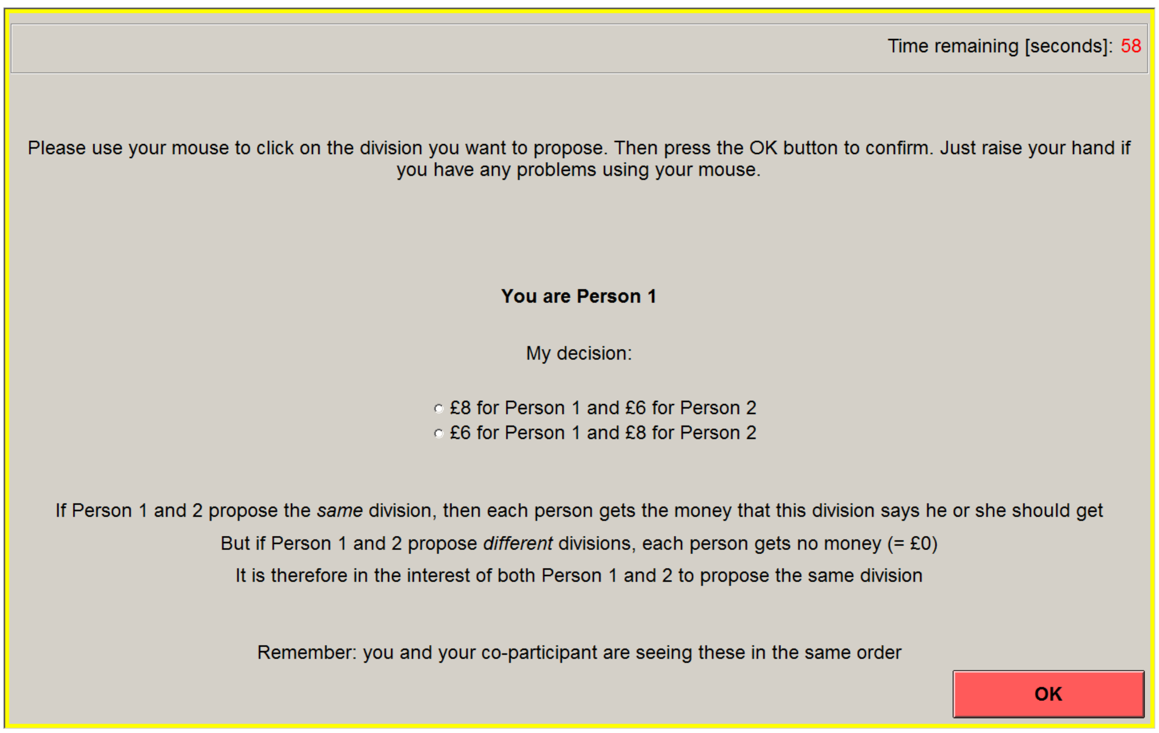


Figure 1.11. The decision screen

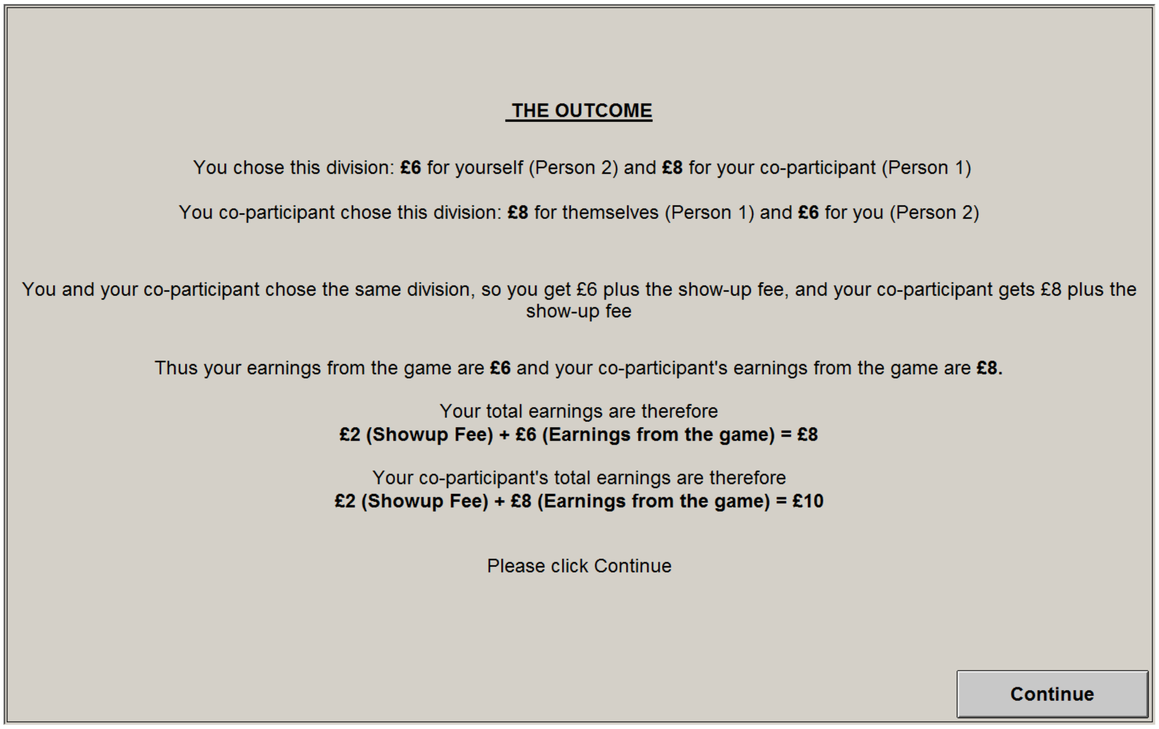


Figure 1.12. The results screen

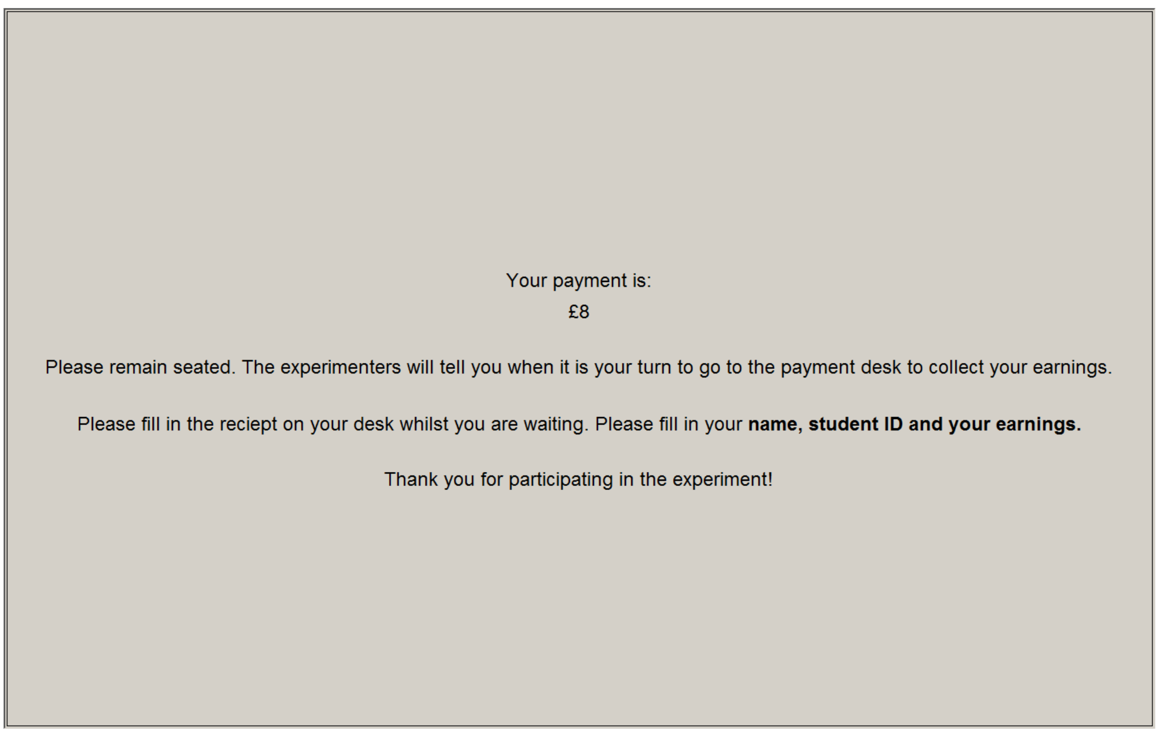


Figure 1.13. The final payoff screen

2. Theoretical Predictions
2.1. BOS

Table 2.1.1. The BOS Game

		Player 2	
		Hawkish (α_2)	Dovish ($1-\alpha_2$)
Player 1	Hawkish (α_1)	(0, 0)	(8, 6)
	Dovish ($1-\alpha_1$)	(6, 8)	(0, 0)

Equations

$U_{Dovish2} = U_{Hawkish2}$ (1)

$U_{Hawkish2} = (1-\alpha_1)*8+\alpha_1*0 \Rightarrow U_{Hawkish2} = 8-8\alpha_1 (2)$
$U_{Dovish2} = (1-\alpha_1)*0+\alpha_1*6 \Rightarrow U_{Dovish2} = 6\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$8-8\alpha_1 = 6\alpha_1 \Rightarrow \alpha_1 = \frac{4}{7}$$

$$\Rightarrow (1-\alpha_1) = \frac{3}{7}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{4}{7}$$

$$\Rightarrow (1-\alpha_2) = \frac{3}{7}$$

Expected payoffs

$$\frac{4}{7}*\frac{3}{7}*8+\frac{3}{7}*\frac{4}{7}*6 = £3.429$$

2.2. BOS-E1

Table 2.2.1. The BOS-E1 Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(8, 6)	(0, 0)
	Dovish (β_1)	(6, 8)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(5, 5)

Equations

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise2}$ (1)

$U_{Hawkish2} = ß_1 * 8 + \alpha_1 * 0 + (1-\alpha_1 - ß_1) * 0 \Rightarrow U_{Hawkish2} = 8ß_1 (2)$
$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 6 + (1-\alpha_1 - ß_1) * 0 \Rightarrow U_{Dovish2} = 6\alpha_1 (3)$
$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1-\alpha_1 - ß_1) * 5 \Rightarrow U_{Compromise2} = 5 - 5\alpha_1 - 5ß_1 (4)$

From *(1)* and *(2)* and *(3)*

$8ß_1 = 6\alpha_1 \Rightarrow ß_1 = \frac{3}{4}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$6\alpha_1 = 5 - 5\alpha_1 - 5ß_1 \ (replace\ from\ (5))$
$\Rightarrow 6\alpha_1 = 5 - 5\alpha_1 - 5 * \frac{3}{4}\alpha_1$
$\Rightarrow \frac{59}{4}\alpha_1 = 5$

$\Rightarrow \quad \alpha_1 = \frac{20}{59}$ (6)

Replace *(6)* into *(5)*

$\Rightarrow ß_1 = \frac{3}{4} * \frac{20}{59}$
$\Rightarrow ß_1 = \frac{15}{59}$

$$\Rightarrow 1 - \alpha 1 - ß_1 = 1 - \frac{20}{59} - \frac{15}{59}$$

$$\Rightarrow 1 - \alpha_1 - ß_1 = \frac{35}{59}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{20}{59}$$

$$\Rightarrow ß_2 = \frac{15}{59}$$

$$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{24}{59}$$

Expected payoffs

$$\frac{20}{59} * \frac{15}{59} * 8 + \frac{20}{59} * \frac{15}{59} * 6 + \frac{24}{59} * \frac{24}{59} * 5 = £2.034$$

2.2.1 Alternative MSNE 1

Table 2.2.1.1. BOS-E1 Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise (1-α_2)
Player 1	Hawkish (α_1)	(8, 6)	(0, 0)
	Compromise (1-α_1)	(0, 0)	(5, 5)

Equations

Player 2

$U_{Dovish2} = U_{Compromise2}$ (1)

$U_{Dovish2} = (1 - \alpha_1) * 0 + \alpha_1 * 6 \Rightarrow U_{Dovish2} = 6\alpha_1 (2)$

$U_{Compromise2} = (1 - \alpha_1) * 5 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$5 - 5\alpha_1 = 6\alpha_1 \Rightarrow \alpha_1 = \frac{5}{11}$$

$$\Rightarrow (1 - \alpha_1) = \frac{6}{11}$$

Player 1

$U_{Hawkish1} = U_{Compromise1}$ (1)

$U_{Hawkish1} = (1 - \alpha_2) * 0 + \alpha_2 * 8 \Rightarrow U_{Hawkish1} = 8\alpha_2 (2)$

$U_{Compromise1} = (1 - \alpha_2) * 5 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_2 (3)$

From *(1)* and *(2)* and *(3)*

$$5 - 5\alpha_2 = 8\alpha_2 \Rightarrow \alpha_2 = \frac{5}{13}$$

$$\Rightarrow (1 - \alpha_2) = \frac{8}{13}$$

Expected payoffs

$EP_1 = \frac{5}{11} * \frac{5}{13} * 8 + \frac{5}{13} * \frac{6}{11} * 5 = £3.08$

$EP_2 = \frac{5}{11} * \frac{5}{13} * 6 + \frac{5}{13} * \frac{6}{11} * 5 = £2.72$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

2.3. BOS-E2

Table 2.3.1 The BOS-E2 Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(8, 5)	(0, 0)
	Dovish (β_1)	(5, 8)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(5, 5)

Equations

$$U_{Dovish2} = U_{Hawkish2} = U_{Compromise2}\ (1)$$

$$U_{Hawkish2} = ß_1 * 8 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Hawkish2} = 8ß_1 (2)$$
$$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 5 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Dovish2} = 5\alpha_1 (3)$$
$$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 5 \Rightarrow U_{Compromise2} = 5 - 5\alpha_1 - 5ß_1 (4)$$

From *(1)* and *(2)* and *(3)*

$$8ß_1 = 5\alpha_1 \Rightarrow ß_1 = \frac{5}{8}\alpha_1\ (5)$$

From *(1)* and *(3)* and *(4)*

$$5\alpha_1 = 5 - 5\alpha_1 - 5ß_1\ (replace\ from\ (5))$$
$$\Rightarrow 5\alpha_1 = 5 - 5\alpha_1 - 5 * \frac{5}{8}\alpha_1$$
$$\Rightarrow \frac{105}{8}\alpha_1 = 5$$

$$\Rightarrow \quad \alpha_1 = \frac{8}{21}\ (6)$$

Replace *(6)* into *(5)*

$$\Rightarrow ß_1 = \frac{5}{8} * \frac{8}{21}$$
$$\Rightarrow ß_1 = \frac{5}{21}$$

$$\Rightarrow 1-\alpha 1-ß_1=1-\frac{8}{21}-\frac{5}{21}$$

$$\Rightarrow 1-\alpha_1-ß_1=\frac{8}{21}$$

By symmetry

$$\Rightarrow \quad \alpha_2=\frac{8}{21}$$

$$\Rightarrow ß_2=\frac{5}{21}$$

$$\Rightarrow 1-\alpha_2-ß_2=\frac{8}{21}$$

Expected payoffs

$$\frac{5}{21}*\frac{8}{21}*8+\frac{5}{21}*\frac{8}{21}*5+\frac{8}{21}*\frac{8}{21}*5=£1.905$$

2.3.1. Alternative MSNE 1

Table 2.3.1.1. The BOS-E2 Game (BOS Section Only)

		Player 2	
		Hawkish (α_2)	Dovish (β_2)
Player 1	Hawkish (α_1)	(0, 0)	(8, 5)
	Dovish (β_1)	(5, 8)	(0, 0)

Equations

$U_{Dovish2} = U_{Hawkish2}$ (1)

$U_{Hawkish2} = (1 - \alpha_1) * 8 + \alpha_1 * 0 \Rightarrow U_{Hawkish2} = 8 - 8\alpha_1 (2)$
$U_{Dovish2} = (1 - \alpha_1) * 0 + \alpha_1 * 5 \Rightarrow U_{Dovish2} = 5\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$8 - 8\alpha_1 = 5\alpha_1 \Rightarrow \alpha_1 = \frac{8}{13}$$

$$\Rightarrow (1 - \alpha_1) = \frac{5}{13}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{8}{13}$$

$$\Rightarrow (1 - \alpha_2) = \frac{5}{13}$$

Expected payoffs

$$\frac{5}{13} * \frac{8}{13} * 8 + \frac{5}{13} * \frac{8}{13} * 5 = £3.08$$

2.3.2. Alternative MSNE 2

Table 2.3.2.1. The BOS-E2 Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise (1-α_2)
Player 1	Hawkish (α_1)	(8, 5)	(0, 0)
	Compromise (1-α_1)	(0, 0)	(5, 5)

Equations

Player 2

$U_{Dovish2} = U_{Compromise2}$ (1)

$U_{Dovish2} = (1 - \alpha_1) * 0 + \alpha_1 * 5 \Rightarrow U_{Dovish2} = 5\alpha_1 (2)$

$U_{Compromise2} = (1 - \alpha_1) * 5 + \alpha_1 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$5 - 5\alpha_1 = 5\alpha_1 \Rightarrow \alpha_1 = \frac{1}{2}$$

$$\Rightarrow (1 - \alpha_1) = \frac{1}{2}$$

Player 1

$U_{Hawkish1} = U_{Compromise1}$ (1)

$U_{Hawkish1} = (1 - \alpha_2) * 0 + \alpha_2 * 8 \Rightarrow U_{Hawkish1} = 8\alpha_2 (2)$

$U_{Compromise1} = (1 - \alpha_2) * 5 + \alpha_2 * 0 \Rightarrow U_{Compromise2} = 5 - 5\alpha_2 (3)$

From *(1)* and *(2)* and *(3)*

$$5 - 5\alpha_2 = 8\alpha_2 \Rightarrow \alpha_2 = \frac{5}{13}$$

$$\Rightarrow (1 - \alpha_2) = \frac{8}{13}$$

Expected payoffs

$\text{EP}_1 = \frac{1}{2} * \frac{5}{13} * 8 + \frac{1}{2} * \frac{8}{13} * 5 = £3.08$

$\text{EP}_2 = \frac{1}{2} * \frac{5}{13} * 5 + \frac{1}{2} * \frac{8}{13} * 5 = £2.69$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

2.4. BOS-E3

Table 2.4.1. The BOS-E3 Game

		Player 2		
		Hawkish (α_2)	Dovish (β_2)	Compromise ($1-\alpha_2-\beta_2$)
Player 1	Hawkish (α_1)	(0, 0)	(18, 6)	(0, 0)
	Dovish (β_1)	(6, 18)	(0, 0)	(0, 0)
	Compromise ($1-\alpha_1-\beta_1$)	(0, 0)	(0, 0)	(5, 5)

Equations

$U_{Dovish2} = U_{Hawkish2} = U_{Compromise2}$ (1)

$U_{Hawkish2} = ß_1 * 18 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Hawkish2} = 18ß_1 (2)$
$U_{Dovish2} = ß_1 * 0 + \alpha_1 * 6 + (1-\alpha_1-ß_1) * 0 \Rightarrow U_{Dovish2} = 6\alpha_1 (3)$
$U_{Compromise2} = ß_1 * 0 + \alpha_1 * 0 + (1-\alpha_1-ß_1) * 5 \Rightarrow U_{Compromise2} = 5-5\alpha_1-5ß_1 (4)$

From *(1)* and *(2)* and *(3)*

$18ß_1 = 6\alpha_1 \Rightarrow ß_1 = \frac{1}{3}\alpha_1$ (5)

From *(1)* and *(3)* and *(4)*

$6\alpha_1 = 5-5\alpha_1-5ß_1\ (replace\ from\ (5))$
$\Rightarrow 6\alpha_1 = 5-5\alpha_1-5*\frac{1}{3}\alpha_1$
$\Rightarrow \frac{38}{3}\alpha_1 = 5$

$\Rightarrow \alpha_1 = \frac{15}{38}$ (6)

Replace *(6)* into *(5)*

$\Rightarrow ß_1 = \frac{1}{3}*\frac{15}{38}$
$\Rightarrow ß_1 = \frac{5}{38}$

$$\Rightarrow 1 - \alpha 1 - ß_1 = \frac{18}{38}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{15}{38}$$

$$\Rightarrow ß_2 = \frac{5}{38}$$

$$\Rightarrow 1 - \alpha_2 - ß_2 = \frac{18}{38}$$

Expected payoffs

$$\frac{5}{38} * \frac{15}{38} * 18 + \frac{15}{38} * \frac{5}{38} * 6 + \frac{18}{38} * \frac{18}{38} * 5 = £2.368$$

2.4.1. Alternative MSNE 1

Table 2.4.1.1. BOS-E3 (BOS Section only)

		Player 2	
		Hawkish (α_2)	Dovish (β_2)
Player 1	Hawkish (α_1)	(0, 0)	(18, 6)
	Dovish (β_1)	(6, 18)	(0, 0)

Equations

$U_{Dovish2} = U_{Hawkish2}$ (1)

$U_{Hawkish2} = (1-\alpha_1) * 18 + \alpha_1 * 0 \Rightarrow U_{Hawkish2} = 18 - 18\alpha_1 (2)$

$U_{Dovish2} = (1-\alpha_1) * 0 + \alpha_1 * 6 \Rightarrow U_{Dovish2} = 6\alpha_1 (3)$

From *(1)* and *(2)* and *(3)*

$$18 - 18\alpha_1 = 6\alpha_1 \Rightarrow \alpha_1 = \frac{3}{4}$$

$$\Rightarrow (1-\alpha_1) = \frac{1}{4}$$

By symmetry

$$\Rightarrow \quad \alpha_2 = \frac{3}{4}$$

$$\Rightarrow (1-\alpha_2) = \frac{1}{4}$$

Expected payoffs

$$\frac{3}{4} * \frac{1}{4} * 18 + \frac{1}{4} * \ \frac{3}{4} * 6 = £4.50$$

2.4.2. Alternative MSNE 2

Table 2.4.2.1. The BOS-E3 Game (Alternative MSNE)

		Player 2	
		Dovish (α_2)	Compromise (1-α_2)
Player 1	Hawkish (α_1)	(18, 6)	(0, 0)
	Compromise (1-α_1)	(0, 0)	(5, 5)

Equations

Player 2

$U_{Dovish2} = U_{Compromise2}$ (1)

$U_{Dovish2} = (1-\alpha_1)*0+\alpha_1*6 \Rightarrow U_{Dovish2} = 6\alpha_1(2)$

$U_{Compromise2} = (1-\alpha_1)*5+\alpha_1*0 \Rightarrow U_{Compromise2} = 5-5\alpha_1(3)$

From *(1)* and *(2)* and *(3)*

$$5-5\alpha_1 = 6\alpha_1 \Rightarrow \alpha_1 = \frac{5}{11}$$

$$\Rightarrow (1-\alpha_1) = \frac{6}{11}$$

Player 1

$U_{Hawkish1} = U_{Compromise1}$ (1)

$U_{Hawkish1} = (1-\alpha_2)*0+\alpha_2*18 \Rightarrow U_{Hawkish1} = 18\alpha_2(2)$

$U_{Compromise1} = (1-\alpha_2)*5+\alpha_2*0 \Rightarrow U_{Compromise2} = 5-5\alpha_2(3)$

From *(1)* and *(2)* and *(3)*

$$5-5\alpha_2 = 18\alpha_2 \Rightarrow \alpha_2 = \frac{5}{23}$$

$$\Rightarrow (1-\alpha_2) = \frac{8}{13}$$

Expected payoffs

$EP_1 = \frac{5}{23} * \frac{5}{11} * 18 + \frac{18}{23} * \frac{6}{11} * 5 = £3.91$

$EP_2 = \frac{5}{23} * \frac{5}{11} * 6 + \frac{18}{23} * \frac{6}{11} * 5 = £2.73$

These calculation can also be calculated in the same way reversing the possible actions for players 1 and 2

3. Transcripts

Key:

- Subject Index = Unique index for subject. Corresponds to dataset
- Top Option / Bottom Option / Middle Option= Indicates how the game was presented to subjects. e.g. Top Option: £6 (P1) £8 (P2) indicates that a subject pair saw the top option of the game as £6 for person 1 and £8 for person 2.
- Time message written (seconds) = Time remaining at the time message for written (120 seconds were available in total)

3.1. BOS Game

Subject Index	Person Number	Top Option	Bottom Option	Text	Time message written (seconds)
91	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	hello :)	116
99	2			hey	114
91	1			any thoughts?	112
99	2			i am going to be generous with this one	103
91	1			haha	97
91	1			you sure?	94
99	2			let's go for option 1?	91
91	1			sounds good to me	85
99	2			as long as we pick the same option right?	77
91	1			better than getting nothing	72
99	2			i mean, sorry option 2	69
99	2			option 2!	65
91	1			yeah	59
91	1			option 2	57
99	2			my bad	55
91	1			all good!	50
99	2			second bullet point is looking pretty good...	12
91	1			lol	2
92	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	rock paper scissors?	111
100	2			agreed	99
92	1			on 80 seconds go r p or s	86
92	1			r	80
100	2			r	80
92	1			haha	76
92	1			60	71

92	1			seconds	69
92	1			p	61
100	2			s	60
92	1			fair enough ill take the 6 quid	47
100	2			thanks, good rock paper sissors idea	25
92	1			no worries =)	5
101	2	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	You take £8 i will take £6	91
93	1			ahh ok, thats very kind of you, thank you :)	77
101	2			£8 for Person 1 and £6 for Person 2 (just to confirm) :-)	8
94	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	Hi! I'm a little poor right now. You?	104
102	2			aha yeah	84
94	1			Mind if we go for the 2nd option	79
94	1			?x	76
94	1			Pretty please?	68
102	2			i guess either way some money is better than no money	54
94	1			Thank you so is that yes to option 2?	37
94	1			Just to confirm	32
102	2			yeah why not, u got in first no point getting it wrong for both of us haha	6
103	2	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	I am going to choose the first option.	106
95	1			i was going to choose the second option	89
103	2			Well we need to come choose a senario where we both choose the same option to ensure that we both profit.	60
95	1			Thinking about it now i don't mind if we choose the first one so its ok :)	25
103	2			Thank you :)	11
103	2			Good luck!	2
96	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	hi	118
104	2			Hi	111
96	1			how's life?	106
104	2			Not too bad, you?	95
96	1			Can't complain :)	89

104	2			Anyway. Happy for you to take the £8?	87
96	1			I'm happy either way so long as we agree	78
96	1			I really don't mind, I'd jsut be gutted if we got nothing	69
104	2			Rock, paper scissors doesn't work on here...	50
96	1			Lol, don't think we have time	43
104	2			Haha	40
104	2			Well	38
104	2			£8 for you then	35
104	2			~Congratulations!	31
96	1			I'm happy for you to take it if you want?	28
104	2			Both being too nice!	16
104	2			I suggested it first ;)	8
96	1			Lol, it's unusual in these things...	5
104	2			Just leave it as it is	4
104	2			Bye	3
104	2			:)	2
97	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	we need to pick the same one	114
97	1			I am happy to take less money	108
97	1			in order that we are both able to get some	101
105	2			Ok then! That makes sense, we will go for the first option then?	87
97	1			Yes im happy with that	80
97	1			(I think that is how things work!)	72
105	2			Yep! Cool :)	67
97	1			awesome	63
97	1			I hope this works out right	15
97	1			:)	13
105	2			I think it will :)	9
105	2			Hopefully!	4
106	2	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	i think we should pick which ever is displayed on the top	108
106	2			oh we can already see it	95
106	2			can i have more money? :(	89
106	2			hello?	76
98	1			yeah sure	73
106	2			really :) you're nice	65
98	1			we'll pick the bottom one	65
106	2			thank you	61
98	1			i.e you £8 me £6	58

106	2			yes	48
117	2			hi there	117
107	1			hi, well we need to choose the same thing either way really!	104
117	2			yeah, so which would you bargain for/	85
117	2			?	82
107	1			Haha, well would obviously prefer £8, but happy to have £6 if you want the £8	67
107	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	£6 is better than £0	51
117	2			True	47
107	1			So, you want £8?	25
117	2			If we could go for the second option that would help my finaces greatly but i dont mind either way	23
107	1			sure £6 is nice	16
117	2			second one it is	9
107	1			deal!	5
117	2			thanks alot	3
108	1			im willing to agree to choosing the same one, are you?	95
118	2	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	Yes. Agreeing on the same divison is the only why either of us can make any money	44
108	1			higher or lower amount for you?	27
119	2			I'm happy with 6	115
109	1			Ok, So second decision then?	104
119	2			Yup	100
109	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	Cool.	97
109	1			Thank you.	94
119	2			=] hey its free money	86
109	1			true!	80
110	1			Hello	119
120	2			hi	115
120	2			what do you want to decide?	106
120	2			how shall we choose?	94
110	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	I'm happy to have £6	76
120	2			are you sure?	72
110	1			I'd rather have £6 than £0 so yeah	63
120	2			ok, ye	58
120	2			that makes sense?	54
110	1			I don't mind really	35

120	2			so we will go with choosing the decision that means you get £6?	20
110	1			Yep	15
120	2			ok great.	9
110	1			Cool seeya	3
121	2	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	what do you want to decide?	108
111	1			i am not fussed with either 6 or 8 to be honest	105
121	2			me neither	98
111	1			so if you want to take the 8 i'll take 6?	89
121	2			ok	84
111	1			so top option right?	75
121	2			yep	68
112	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	shall we go for £6 for person 1 and £8 for 2	105
122	2			ok that is acceptable	91
122	2			i am sorry that one of us has to get more than the other	75
112	1			or do you want to go for £8 for 1 and £6 for 2	69
112	1			then we both get 8 not 6	58
112	1			no sorry £6 for 1	17
122	2			ok we'll go for the 8 for person 1 and 6 for person 2	14
122	2			confirm	10
112	1			ok	7
112	1			8 for 1	2
113	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	Hi	115
113	1			Any thoughts?	107
123	2			Hi	106
113	1			I don't really mind which sum of money I get	94
123	2			Well, obviously, i'd rather we chose the same one	92
113	1			That would be for the best	81
113	1			Rck, Paper, Scissors?	72
113	1			*Rock	67
123	2			Ha	63
113	1			(That was a serious suggestion)	32
123	2			Which one should we pick?	9
113	1			Option 1?	4
123	2			Ok	1

114	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	hi	116
124	2			lets both agree to choose the top option?	110
124	2			hi	106
114	1			yeah that sounds good to me	101
124	2			or the bottom? i dont mind?	93
114	1			so £6 for person 1, and £8 for person 2?	86
114	1			we will go for the top	79
114	1			agreed?	60
124	2			ok, theres only £2 differenc anyway	60
124	2			agreed	58
115	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	hi	114
125	2			Hi there	94
115	1			do you want the £6 or £8?	82
115	1			may aswell just make the same desicion	71
125	2			I don't mind, happy to take either	62
125	2			Yeah, both just need to agree.	50
125	2			I am happy to take the 6	41
115	1			ok :)	35
125	2			Easy, so you (as player 1) select 8, and I will go for 6. Done. Enjoy!	5
126	2	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	Im happy to take the lower amount	94
116	1			I'm also very happy with that obviously	75
116	1			so option 2?	69
126	2			That was easy.	61
116	1			Yeah a lot easier than I thought, thanks	41
126	2			yeah, option 2	39

3.2. BOS-E1 Game

Subject index	Person Number	Top Option	Middle Option	Bottom Option	Text	Time message written (seconds)
25	2	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	hello	115
17	1				if we chose option 1 we both get more than a fiver	113
17	1				or option 2#]	104
25	2				lol	100
25	2				I don't mind which I get	94
17	1				ok then, option 2? lol	87
17	1				but we must both choose the same one or we'll get nothing	60
25	2				so £8 for person 1 and £6 for person 2? (just clarifying)	58
17	1				yeah	53
25	2				sure	51
25	2				it'll pay for my dinner, so it's all good lol	40
17	1				haha same	32
26	2	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	There is no point in doing the 5 each as the minimum on the other two is 6 at least, so just need to decide who gets 8 and who gets 6	97
18	1				We should do the one where you get the £8 and I get the £6	91
26	2				ok that's fine	82
18	1				Good Good	77
19	1	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	Both go for division 2!	115
19	1				Yes?	103
27	2				how about if you are person 1 you get 8 and i get 6?	98
27	2				dont mind as 6 is mroe than 5!	89
19	1				Are you sure?	81
19	1				If we don't agree then neither of us get anything.	49
27	2				yeap. its better than argueing and I still get mroe than 6, and you were nice enough to offer the same. so its win win in my books.	49

19	1				Thanks! :D	34
19	1				So division 3?	26
27	2				oh that bit missed off meant you offered a fair split so its fine with me	23
27	2				cool go for 8 for you 6 for me.	7
19	1				THANK YOU	3
28	2				we should chose division 2 or 3	104
20	1				it would benefit both of us to choose one of the 8 and 6 pound options	104
20	1				yeah but which? lol	96
28	2				yes, who should get the £8	87
20	1				flip a coin?	84
28	2				lol .. if only as we dont have a coin lol	69
20	1	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	if you can guess my age you can have the 8 pounds	67
20	1				we need to make a decision quickly	45
28	2				ok	26
28	2				il guess what level your degree is	17
28	2				undergrate	15
20	1				ok you can have the 8 pounds, choose division 2	5
28	2				ok	0
21	1				Hi!	111
29	2				Hi	105
29	2				You can take the £8 if you want, my good deed for the day :)	85
29	2				8 for you, 6 for me?	78
21	1	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	haha, If you're sure!	76
21	1				That sounds great	65
21	1				:)	56
29	2				yeah might as well, at least this way we're better off than just going for a fiver each!	56
21	1				exactly yeah	49
29	2				cool, 40 seconds left !	37
22	1				Hi.	113
30	2				Hiya - I'm happy to take 6 quid and give you 8. :)	111
22	1				I was going to say the same!	105
30	2	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	Haha. I typed it first! ;) So decision 1, yeah?	94
30	2				No, wait. Haha. That's wrong. Decision3!	81
22	1				Haha, alright, you win this one.	77
22	1				Alright, decision three is fine with me. Thank you!	70

30	2				So decision three. Sounds good. Happy Christmas!	63
22	1				Happy Christmas to you as well! I hope you spend the six quid, plus the two for showing up, on something nice =)	37
22	1				on something nice *	27
30	2				My family are coming to visit from the States! I'll buy Dad a drink. ;)	11
23	1	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	Hello!	115
23	1				I'm happy to take the £6 so we both get more than £5	91
31	2				Hi, we might as well go for either option 1 or 3?	91
31	2				ok then deal	78
23	1				Which would be.... option.... 3? Yes Ok. Excellent	67
31	2				so option 3 yes ?	67
23	1				I thought you might agree lol.	60
31	2				haha :)	46
32	2	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	I am happy to go home with £6 and you take the £8	107
24	1				Are you sure? Im happy to go with 5-5	79
32	2				Nope I would prefer to have the extra £1	62
24	1				okay if you insist	50
32	2				£6 me and £8 you then we both get the maximum possible	36
24	1				sure	29
24	1				so person 1=8 pounds, person 2=6£ right?	5
32	2				yes	1
1	1	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	hi	115
1	1				are u willing to go for the first choice?	101
9	2				if we choose the first one or the third one we will make more money than the second one	101
1	1				yaya	96
9	2				i say option c	89
1	1				wont pick option 2	87
1	1				i prefer option 1	82
1	1				hmm	75
9	2				i prefer option 2	73
1	1				y?	69
9	2				so i get £8	62
1	1				obviously 2 is not goog	57
9	2				you still get £6, £1 more than option 2	50

1	1				can we go for option 1???	32
1	1			please????	31
9	2				option 3	30
1	1				only 25 secs are left!!	24
9	2				please	24
9	2				option 3?	18
1	1				no mroe timr!!!	16
1	1				nono	14
1	1				1 plz!!	13
9	2				3	9
1	1				ok...	6
1	1				option 2	4
9	2				3	1
1	1				option 2!!!!	0
2	1	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	hi	118
10	2				hi!	115
10	2				£5 each is probably the fairest	107
2	1				I propose a 50-50 choice of the first or last option?	101
2	1				Then we get at least 6 each	91
10	2				How would we decide?	91
10	2				How would we decide which one we choose	68
2	1				countdown from 3, then each type 'a' or 'b'. If we pick the same letter we go option 1. If we go different, we go option 3	57
10	2				Ok	50
10	2				3	47
2	1				yeah?	46
10	2				yes	44
10	2				3	42
10	2				2	40
10	2				1	39
10	2				b	37
2	1				So i'll do a countdown. then type a or b	35
2	1				Sorry!	31
10	2				oops	28
2	1				Was just checking that was ok	25
2	1				Aha	22
10	2				thats fine	22
2	1				Right, you do the countdown, I'm ready	10
10	2				3	8
10	2				2	7
10	2				1	6

2	1				a	5
10	2				b	5
10	2				fiver each?	0
11	2				Hey, I am going to go for division 2	98
3	1				I'd like to go for 1	86
11	2				we both get more money then in division 3 so lets go for it	75
3	1				1	69
3	1				?	67
11	2				I won't be changing from 2	63
3	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	then we both get nothing	57
11	2				your call 2 or nothing	45
3	1				or, your call 1 or nothing	35
11	2				then it will be nothing I'm afraid	22
3	1				sorted	18
11	2				2 and we both get more money	10
3	1				an interesting water of 5 minutes	8
3	1				1 and we both get more money	2
12	2				Hi there	116
4	1				hey	112
4	1				what we gunna do?	94
12	2				so i think we should go for option 2 or 3 because they benenfit us both the most	87
4	1				yes!	82
12	2				but its just deciding which one haha	68
4	1				clever person 2 :P	64
4	1				yeah	57
12	2				has been said... :P	53
4	1				haha i like it	46
12	2	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	£8 (P1) £6 (P2)	errrr whats a random way	43
4	1				oh crap 45 secs	41
4	1				ermmmm	28
12	2				ill flip a coin	23
4	1				can i just get an extra 2 quid?	17
12	2				h or t	15
4	1				headsd	14
4	1				haha	12
12	2				tis heads	5
4	1				sweet	2
12	2				go for 2	1
4	1				2?	0
13	2				hey	117

5	1	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	£8 (P1) £6 (P2)	hey	115
13	2				so youre person 1 right?	106
5	1				yeah, i'm happy for either of the last two options	93
13	2				guessing we're both wanting £8 as well?	93
5	1				i'll take the £6 if you like	83
13	2				yeah? that sounds awesome	75
13	2				so person 1 gets £6 and person 2 gets £8?	63
5	1				yeah sounds good. that's more than i came with so i'm happy.	55
13	2				same	50
13	2				cheers	48
5	1				your welcome	30
13	2				didnt need 120 seconds lol	19
6	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	Right. Were going to split it so I get £8 and you get £6.	95
6	1				Theres no chance I am going to change this decision	83
6	1				For both of us we are better off to split in this way	69
14	2				Not strictly true	58
6	1				You gain more in this decision	48
6	1				You get £6 instead of getting £5 or nothing	29
14	2				I am aware that the third decision is pointless	29
6	1				If you wish to split it so that you get the £8, be my guest	5
7	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	I think we should both choose the option where we get £5 each as it is fairest	99
15	2				Hi i personally dont care about it being exactly equal	75
15	2				i dont mind having 6	58
7	1				Are you sure?	53
15	2				6 is more than 5!	47
7	1				That is very true	28
15	2				yeh as the 5 5 option means i will get less	22
15	2				so choice 1?	7
16	2	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	which one are you going to choose?	112
16	2				don't want to chat?	72
8	1				I'm going to choose the £5 decision! What about you?	54
16	2				alright, i'll choose that too....so we'll get equal amount of money	33
16	2				done!	31
8	1				Seems fair :-)	23

16	2				yeap	20
43	2	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	hello	117
33	1				hi	114
33	1				so we must choose the same division ... whats ur idea?	99
43	2				in my mind, we could go equal, but we both lose a certain amount of money, I suppose that you have the £8, and I'll take the £6	69
33	1				yea... so dont go equal	47
43	2				that you take the £8 and I'll take the £6	47
33	1				sure?	39
43	2				why not, I don't mind	31
43	2				so it's number 3, choice 3 right?	13
33	1				ok, then we'll go for £8 for person 1 and £6 for person 2	11
33	1				yes, number 3	7
43	2				yeah	5
33	1				thanks btw	2
43	2				nice one :o)	1
34	1	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	quite happy to choose the top option if it means we both get more than £5	78
44	2				Sounds good to me if your sure?	62
34	1				yeah, it's cool :)	53
44	2				:)	49
35	1	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	hi	118
45	2				flip a coin between 1 and three, I'll pick whatever you ger	100
35	1				I guess it makes sense to go for either top or bottom	92
45	2				*get	92
45	2				so flip heads top tails bottom	79
35	1				Ok	68
35	1				Its tails	56
45	2				ok I'll pick bottom	46
35	1				so we both go to the bottom, I get £6 , you get £8	39
45	2				seems fair as this can get	25
35	1				Great idea by the way! yeah definitely the fairest way	5
36	1	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	Hey	111
46	2				Hi. I'm going to go for the £5 / £5 thing.	100
46	2				Seems more fair.	92

36	1				Why, if I take 8 and you take 6 you still get more than 5	78
46	2				Fair enough. I'll go with that then.	17
36	1				Cool xD	10
47	2	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	do you want 6 or 8 pounds	108
47	2				your choice	77
37	1				I would obviously like 8 pounds	77
47	2				happy days ill take 6	64
37	1				Beautiful	50
37	1				Thank you	40
47	2				so that's option 3	9
48	2	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £6 (P2)	£5 each?	108
38	1				I think we should agree on one of the unequal divisions as then we both get more than £5	91
48	2				Which one do you want to go for then?	69
38	1				Well, I imagine we'd both prefer the £8	43
38	1				but I don't mind	30
38	1				I'd rather £6 than £5	22
48	2				Would it be ok to go for the first one then?	11
38	1				yeah	2
39	1	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	Well we should decide on the same or we both get nothing!	110
49	2				the only way we can make money is to choose the same decision	102
39	1				I guess the fairest is to both choose £5 each?	83
49	2				basically its better for one of us to make £6 than both make £5	73
39	1				Yeah but who will get what?	58
49	2				well one will get £2 extra and another will get £1 but will still be better than £5	23
39	1				You get £8, I get £6	5
39	1				i dont mind	1
50	2	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	£5 (P1) £5 (P2)	So, we are obviously better off with either option 1 or 2	106
40	1				yeah	97
40	1				any ideas which one to choose?	86
50	2				Are you willing to take the £6?	78
40	1				i would obviously prefer the £8	64
50	2				Same	55
40	1				are you willing to take the £6?	55
50	2				I guess I am	46

50	2				In the interests of us both getting a better deal	31
50	2				So option 2?	19
40	1				yes, it does make sense	14
50	2				Ok	9
40	1				great, thanks! option 2	1
41	1	£8 (P1) £6 (P2)	£6 (P1) £8 (P2)	£5 (P1) £5 (P2)	what do you think is the best idea?	110
41	1				think its in our best interest to choose one that involves one of us getting 6 and the other getting 8	84
51	2				yes	74
41	1				how shall we decide which way round?	59
41	1				is there a fair way?	53
51	2				no	47
51	2				i've seen this before	40
41	1				so have i	34
51	2				do you want 8?	32
51	2				im happy to have 6	27
41	1				ok then	17
51	2				i didn't think we would get to chat	12
41	1				are we agreed with that?	9
41	1				no neither	5
42	1	£5 (P1) £5 (P2)	£6 (P1) £8 (P2)	£8 (P1) £6 (P2)	Hey	118
52	2				hello	104
42	1				How are you?	92
42	1				I know we don't have long!	86
52	2				I am well thanks. Let's both choose £5 for each of us - that way we both get the same amount of money.	48
42	1				Well I'm happy to choose 6 and you get 8	30
42	1				then we both have more	26
42	1				what do you think?	19
52	2				£5 each	7
42	1				fine o	3
42	1				*ok	0

3.3. BOS-E2 Game

Subject Index	Person Number	Top Option	Middle Option	Bottom Option	Text	Time message written (seconds)
170	2	£5 (P1) £8 (P2)	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	he	114
170	2				hey	112
163	1				Hey	112
170	2				same dcision?	109
170	2				which one shall we go for?	101
163	1				So, clearly needs to be one of the top two	99
170	2				yes	96
170	2				first one?	89
163	1				Might as well, £5 > £0	80
170	2				ok so thats the top?	73
163	1				yeah	67
170	2				ok cool we will do that then	60
163	1				I'm assuming this is the only one for the whole thing	42
170	2				yes as am i	36
163	1				Alright, just checking	28
170	2				ok	22
163	1				Well, that was easy.	5
164	1	£5 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £5 (P2)	hotdogs?	111
171	2				haha	105
164	1				split equal?	92
171	2				Yeah, lets go for £5 each	81
164	1				or do you want 8?	71
164	1				you have 8 i'll have 5?	62
171	2				I'm happy to go for 5 each, seems fairer	50
164	1				ok	35
164	1				£5 each it is	25
171	2				OK Cool!	16
165	1	£5 (P1) £5 (P2)	£8 (P1) £5 (P2)	£5 (P1) £8 (P2)	hi :) what option do you want to go for ?	107
172	2				There is no point in us both getting £5. Shall we agree on option 2 or 3?	72
165	1				yes but how to decide ?	49

172	2				Who's poorest?	38
165	1				time is ticking#	12
172	2				Time's running - lets go for option2	9
165	1				thank yuo!!!!!!!!!	3
173	2	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	hello want to do it in a fair way - rock paper scissors?	105
166	1				ok	90
173	2				go 3 secs after this message?	70
173	2				rock	64
166	1				scissors	63
166	1				fair enough	56
173	2				sorry! is that ok?	50
166	1				yeah that's fine	39
166	1				well done!	35
173	2				okay so 3rd decision down?	27
166	1				yep	21
173	2				thankyou!	18
166	1				enjoy your extra £3!	10
174	2	£5 (P1) £5 (P2)	£8 (P1) £5 (P2)	£5 (P1) £8 (P2)	Go for the £8	75
174	2				I will take £5	64
167	1				excellent, option c then	51
167	1				*B	40
174	2				Sure	33
167	1				thank you	22
175	2	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	£8 (P1) £5 (P2)	hi	107
168	1				hi :) i think we should split it equally as its fairer	100
175	2				I propose the same	95
168	1				sorted!	90
175	2				so we choose senario 1 - £5 each	79
168	1				yeah, that seems to be the best option	60
175	2				ok, agreed :)	51
168	1				cool :)	39
169	1	£5 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £5 (P2)	Hi :)	116
169	1				£5 each? I am player one	108
176	2				hi	107
176	2				well if youir happy to take 5 then how about you take 5 and i have 8	80
169	1				Both select £5 each, then we get £5 plus £2 show up £7	73
176	2				yeah but if your happy with 5 i may aswell have 8	48

169	1				No. Im being fair to you, remember I make the decision, if we choose differently we get nothing	46
176	2				yeah but it doesnt make much sense if your happy with 5	20
176	2				decision 1	17
169	1				Im telling you I am going to choose £5 for both of us	16
176	2				ok	6
169	1				remember if different we get nothin	1
177	1	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	£8 (P1) £5 (P2)	I will choose option 3, as to spilt the money evenly does not make sense.	96
183	2				okay	84
177	1				Awesome :)	75
178	1	£5 (P1) £8 (P2)	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	hay, ok what do you want to do?	111
184	2				im person 2, you can take the 8, i'll have the 5?	102
178	1				sounds good to me	80
178	1				so we are chosing option 2?	71
184	2				yeah	63
178	1				super	60
178	1				thankyou	57
184	2				cos then at least we know no ones gonna lie and lose the extra money	46
178	1				exactly	38
178	1				i was going to say the same to you before you said it	28
184	2				damn haha	18
178	1				:)	15
184	2				but yeah we;ll go with 2	9
178	1				option 2	4
179	1	£8 (P1) £5 (P2)	£5 (P1) £8 (P2)	£5 (P1) £5 (P2)	hello :)	117
185	2				hi	114
179	1				okay, so i take it we both want a bit of money here	104
185	2				indeed	100
179	1				so if we both go for the 3rd option	95
185	2				yeh £5 and £5	88
179	1				it's a 5 each	87
179	1				exactly	84
185	2				yeh i agree	82
179	1				both happy	81
185	2				yep	77
179	1				perfect :)	70

185	2				fantastic	67
179	1				easy decision haha	35
185	2				i know, if we have any other where we cant chat then still choose £5 and £5	11
179	1				ok	0
186	2	£5 (P1) £8 (P2)	£5 (P1) £5 (P2)	£8 (P1) £5 (P2)	what do you think we should do?	110
180	1				alright i'm pretty happy just to go £5 and £5	102
186	2				yeah me too	94
180	1				haha that was easy then	87
186	2				ha	71
186	2				great, sorted	68
187	2	£8 (P1) £5 (P2)	£5 (P1) £8 (P2)	£5 (P1) £5 (P2)	equal money each?	110
181	1				hey, i am happy to just have 5 if you want to take 8. seen as we would both get 5 anyway	96
187	2				if u are happy to take 5 that is fine with me	61
187	2				as long as you are ok with that?	47
181	1				yea thats fine so we both go for option 2?	41
187	2				yes	36
187	2				thank you :)	28
181	1				great!!!	23
182	1	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	£5 each?	101
188	2				Good idea	91
182	1				sorted	63
188	2				i will definately stick to that	57
188	2				will you?	38
182	1				of course	34
188	2				great	20
189	1	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	hello	118
195	2				hi!!	112
195	2				what would you like to do??	108
195	2				are you there?	87
189	1				i think the £5 split is the most 'fair' division	83
195	2				I would agree with that!	77
189	1				unless you are feeling particularly alturistic, and wish to give me £8? :p	68
195	2				I am unsure :P are you feeling generous?	44
195	2				i would like to but then, it is a tad unfair...	34
189	1				i will select the equal £5 split, to make sure there is no feeling of spite at the end	25

189	1				is this ok?	12
195	2				5/5 split is probably the best, and then we are the most even keel for the rest of the experiment!	12
195	2				that is what i will be selecting also	3
189	1				yes sounds good to me :)	3
196	2	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	I think £5 for Person 1 and £5 for Person 2?	100
190	1				Would be the fairest	90
196	2				yeah okay	84
190	1				Awesome	64
196	2				DONE	61
191	1	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	Hello!	117
197	2				heya:)	110
197	2				only makes sense to split in 50\50	96
197	2				£5.00 each	86
191	1				No, why don't we say you get 8 pounds and me 5	78
191	1				because then we get as much money as possible	69
197	2				I think it's only fair for it to be split between the two of us equally	60
191	1				and I'd like to make someone's day	56
197	2				what do you say?	55
197	2				noooooo	51
191	1				well, it's not like I'm losing out	46
191	1				I still get 5	39
197	2				we are both students, lets split it equally	34
197	2				I know but I think we deserve the same amount	27
191	1				no, because it's sensible for one person to get more.	19
197	2				yes or yes? lol	19
191	1				I'm choosing 8 for you	13
197	2				okay then	9
197	2				thanks	8
197	2				:)	5
191	1				no worres	4
198	2	£8 (P1) £5 (P2)	£5 (P1) £8 (P2)	£5 (P1) £5 (P2)	£5 for both of us?	111
192	1				sounds good to me	105
198	2				awesome :)	90
199	2				£ each?	111

199	2	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	£8 (P1) £5 (P2)	5	108
199	2				*£5 for 1 and 2?	79
193	1				i am happy to give you £8 for being fair. so, £5 for person 1, £8 for person 2. yes?	59
199	2				If your sure, thankyou	44
193	1				no problem :)	37
199	2				:)	33
200	2	£8 (P1) £5 (P2)	£5 (P1) £5 (P2)	£5 (P1) £8 (P2)	hi	115
194	1				hey, 8 for me 5 for you?	102
200	2				i will give you the higher one this time and then you give it to me the next time?	99
194	1				yeah sure	96
194	1				we can just alternate it each time	82
200	2				every time we should confirm it yeah	76
194	1				yep	73
200	2				so shall we say in CAPS each time YOU and ME before and both say okay	51
200	2				so this time it is YOU	26
194	1				okay i get you	22
194	1				and its always the higher value?	17

3.4. BOS-E3

Subject Index	Person number	Top Option	Middle Option	Bottom Option	Text	Time message written (seconds)
245	2	£5 (P1) £5 (P2)	£6 (P1) £18 (P2)	£18 (P1) £6 (P2)	Hello	118
245	2				How desperate are you for £18?	105
235	1				Hey should we choose the least amount of money for each person|?	103
235	1				eh	99
245	2				No	96
235	1				id rather get some money	93
245	2				We should make the money	91
235	1				okay	88
235	1				so we pick the m ost|?	81
245	2				You want the 18? I'll be kind	76
235	1				sure if you dont wnt it	64
245	2				Well I do	58
245	2				But I'd rather 6 then 5	53
245	2				So I think we go Person 2 gets 6	38
245	2				And you (person 1) has 18	29
235	1				okay sounds good	29
245	2				Agreed?	26
235	1				yeah	23
245	2				Of course, haha	19
245	2				I'll take £8 it's quick money	12
235	1				yeah haha	5
245	2				£6 for person 2	2
236	1	£5 (P1) £5 (P2)	£6 (P1) £18 (P2)	£18 (P1) £6 (P2)	6 for me 18 for you?	114
236	1				option 2...	101
246	2				ok yea sounds good	94
236	1				I'm not fussed for £8 for a couple of minutes work	74
236	1				'work'	62
246	2				yea, easy money	62
236	1				sorted then	46
246	2				perfect	39

246	2				thanks, very much	14
236	1				rather that than a fiver each anyway	11
236	1				no worries	9
247	2				i think we should pick the first or last	109
237	1				Well,	100
247	2				did you have a preference before deciding if you were person 1 or 2?	95
237	1				Becuase I am person 1 I like the last one	93
237	1				I just want an option where we all pick the same thing	77
237	1				So I thought you might want to do the five pound each thing	69
237	1	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	But, yeah, the first and last get us the most possible for both	56
237	1				Do you know which you'll do?	45
247	2				Yeah that's what I thought	44
247	2				I obviouslt would prefer to pick the first one equally	35
237	1				right	29
247	2				*obviously	29
237	1				hm	15
237	1				uh	14
247	2				ok I'll pick the 3rd one	2
238	1				hi	117
238	1				what do you want to do?	112
248	2				I think we should do option number 2	105
248	2				so we both get £5?	95
238	1				i think one of the others would be better because then we will both get more that £5	79
238	1	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	but who is willing to accept the lesser?	70
248	2				do we only make the decision once, or are there multiple rounds of decision making?	52
238	1				just once	47
248	2				right so then one person gets more and the other person much less	28
238	1				yeah but still more than middle	19
248	2				not by very much	9
238	1				go for 1	2
249	2				hello	114
239	1				hello	110
249	2	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	what do you think we should do?	106
239	1				its in our interest to split 6/18 in some way	101
249	2				Yeah i was thinking that	92

239	1				i don't mind getting the 6	88
249	2				neither do I really	82
239	1				so which way round?	70
249	2				erm....	66
249	2				I'll take the 6	55
239	1				alright	49
249	2				good good	44
239	1				a coin toss would be excellent here	38
249	2				it sure would haha	27
239	1				so were going for 18 person 1 6 person 2?	10
249	2				yeah	5
239	1				alright cheers	0
250	2	£6 (P1) £18 (P2)	£18 (P1) £6 (P2)	£5 (P1) £5 (P2)	hello	97
250	2				What are your thoughts on the options?	74
240	1				Hello there. Well go for it	53
250	2				I'm happy to take £6 and then you get 18	32
240	1				Okay lets do it	18
250	2				great	14
241	1	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	hello!	118
251	2				hiiiii	115
251	2					115
241	1				what do you think?	112
251	2				okay how do you want to do this#	108
251	2				lol	107
241	1				hmm...	104
241	1				tricky	102
251	2				welll first off do you haev a job?	98
241	1				hahaha, no	94
241	1				you?	89
251	2				hah okay same boat	89
251	2				no	86
251	2				im here on a visa and have little $$	74
241	1				makes more sense to go 6/18, but which way round is a problem	59
241	1				maybe just 5/5?	53
241	1				fairest?	52
251	2				so im fine with us both getting 5£ or if youre feeling generous	49
251	2				hah yeah	45
241	1				ditto	44
251	2				okay so i think thats our answer then yeah?	32

241	1				ok go on, you take 18	27
241	1				why not	26
251	2				oh man okay!	22
241	1				you're 2, right?	21
251	2				ur awesome!	19
241	1				hehehe	16
251	2				yes im person 2	16
241	1				aces	11
251	2				thanks alow you made my wknd!	5
252	2				How would you like to split?	114
242	1				ok so what do you want to do? :)	112
242	1				Ah	108
242	1				haha ok, well if you choose one of the larger devisions, then both person gets more money	94
252	2				get more	90
242	1				OBVIOUSLY both of us want to get 18 pounds or w/e it was	79
252	2				This is true	74
242	1				so how to decide who gets which	61
252	2				rock paper scissors on three?	58
242	1				sure	52
252	2				1	49
252	2				2	49
252	2				3	47
242	1				scizzors	47
242	1	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	oops	45
242	1				wait	44
242	1				go sagain	43
242	1				:P	43
252	2				quick	41
252	2				1 2	36
242	1				1	36
242	1				2	34
242	1				3	32
242	1				paper	30
252	2				paper	30
242	1				1	27
252	2				sicssors	27
242	1				2	24
242	1				3	23
252	2				rockl	21
242	1				scizzors	20

252	2				i win	18
242	1				ok there you go	18
252	2				thank yo	14
242	1				congrats :P	13
252	2				very democratic	4
242	1				so person 2 gets 18 right?	4
252	2				I like it	1
242	1				indeed	1
252	2				yes	1
243	1	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	What would you suggest?	106
243	1				C seems the fairest... but least profitable for both	92
253	2				I think one of the first two, - as we each end up better than 3?	74
243	1				yeah	67
243	1				we could always try and describe ourselves so we can meet after and split the money fairly	50
243	1				*fairly	44
253	2				We could... but I think that might be a bit beyond. I'm happy to go with 1?	26
243	1				I'm broke so would probably go for first option... hang on really?	11
254	2	£6 (P1) £18 (P2)	£18 (P1) £6 (P2)	£5 (P1) £5 (P2)	hey	117
244	1				Hi	113
254	2				Start with £6 P1, £18 P2. Then we alternate to £18 P1, £6 P2 ok?	95
254	2				and just repeat that	85
244	1				i'm happy to go with p1 £6 and p2 £18	49
254	2				We need to make the same choice each time, so alternate how much you get	36
244	1				don't we only get one choice?	23
254	2				You will get £6 first time, and then £18 the next, then £6, then £18 etc. Does this make sense?	21
254	2				Yes, but we both need to make the same choice	16
254	2				so choose £6 to start, then 18, 6.18,6,18,6... etc	4
265	2	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	safest to do 5 and 5	111
265	2				otherwise we get nothing	101
255	1				you happy with that?	97
265	2				we only have one round tho yes?	82
255	1				yeah just one	77

255	1				if we dont say the same we get nothing	69
265	2				actually you know what, we will get more out of it if one of us choose to do the 18 and other other 6	63
255	1				so if we both say 5	59
265	2				i will take 6	54
265	2				if you want the 18	51
255	1				you sure?	48
265	2				i dont mind...and i still get more than 5#	43
265	2				5£**	36
255	1				so were going decision one	34
265	2				yes decision one	26
265	2				i promise	25
255	1				okay	8
265	2				its too bad we cant talk after about this...haha	3
266	2	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	yo	117
256	1				yoo	110
266	2				how we going to work this out	109
266	2				clearly makes no sense to pick bottom option	93
256	1				TRUE	86
266	2				im poor	78
256	1				me too	74
266	2				haha	71
266	2				lets play rock paper scissors	55
256	1				hmm	53
256	1				ok	49
256	1				how	46
266	2				just type r/p/s	44
256	1				ok	41
266	2				one of them	39
256	1				3	35
266	2				i'll count down from 3	35
256	1				ok 2 secs	31
266	2				3	24
266	2				2	23
256	1				ok go	23
266	2				3	21
256	1				s	21
266	2				2	19
266	2				1	18
266	2				r	17
256	1				lol that didnt work	11

266	2				haha	7
266	2				1 more go	4
266	2				3	3
266	2				2	2
256	1				ok	1
266	2				1	1
266	2				r	0
267	2	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	I am putting division 1 no matter what	107
267	2				you might as well take the £6 plus the £2 sign up fee	90
257	1				I am putting decision 3 then	73
267	2				well that's pointless	64
257	1				I propose decision number 2...	35
267	2				thats less money than divison 1 for you	22
267	2				im putting division 1	16
267	2				you get more money than division 2	9
257	1				It's fairer for both of us	4
258	1	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	hiya	117
268	2				Yo	110
268	2				I'm very happy to take the 6 pound and you get the 18	98
258	1				alright awesome. then we can switch next round?	78
258	1				and then alternate throughout the experiment?	69
268	2				There on to usa	54
268	2				us*	51
258	1				oh crap	46
268	2				nah you take it	42
258	1				really?	33
258	1				thank you	30
268	2				Yeah i only want a nandos	27
258	1				hahaha	23
258	1				i'll pay it forward	18
268	2				aye?	11
259	1	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£18 for me and £6 for you? You'll get more than if we chose the first option and got a fiver each	73
259	1				??	41
269	2				I will choose £18 for me and 6 for you, you can go along with that if you wish but that is what I will choose 100%	4

270	2	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	Which do you think?	116
260	1				ok so no matter what it is in our best interest to agree on one of them, and not the second option	102
270	2				I agree that it's best for us to go for the same one... And it's best to go for 1 or 3	83
270	2				but which way round are we going to go?	74
270	2				please keep messages short	47
270	2				they go off the screen otherwise	41
270	2				I'm quite happy to go for 3	34
270	2				so you'll get 18 and I'll get 6	27
270	2				i'd rather go home with 6 than 5	19
270	2				division 3?	16
270	2				...	11
260	1				okay cool sounds good!	10
270	2				good stuff!	7
260	1				:)	4
261	1	£5 (P1) £5 (P2)	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	I'm going for £18	107
271	2				which one do you want to select?	105
271	2				are you sure?	72
261	1				Yes	65
271	2				im going for 18 too	14
261	1				Ok	5
272	2	£5 (P1) £5 (P2)	£6 (P1) £18 (P2)	£18 (P1) £6 (P2)	would you rather have 18 or 6?	108
262	1				Obviously 18, but can simply split if need be	94
272	2				we cant split outside the room sadly	82
262	1				TRUE	78
262	1				Well I don't mind	76
272	2				however if you want the 18 i will take the 6	73
272	2				better than 5 each	68
262	1				Either way is better than 5 yeah	66
272	2				so option 3 then?	51
262	1				Ok option 3	46
272	2				i would take that	41
272	2				awesome	40
262	1				Job done :)	35
272	2				hahaha	31
272	2				its free money either way	19
262	1				Exactly	16
262	1				Alcohol money :D	12
272	2				pretty much!	7

272	2				have fun :)	1
273	2	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	Hi	115
263	1				hi	112
263	1				what do you want to do	103
273	2				well I think the £5 one is pointless	82
263	1				definately not the bottom option!	81
273	2				haha I know right	73
263	1				lol yeah	58
273	2				do you want to go for the 6 or the 18	38
263	1				so do you fancy taking one for the team and having the £6 ;) lol	38
273	2				haha I knew you'd say that	24
263	1				youre thinking the same i suppose	15
273	2				you could take the 6 if you prefer :P	13
263	1				erm...	8
263	1				erm,..	6
263	1				5secs	4
264	1	£18 (P1) £6 (P2)	£6 (P1) £18 (P2)	£5 (P1) £5 (P2)	hey	116
264	1				we should do one of the top 2	107
264	1				what do you think?	93
274	2				we'll each do better if we take turns. starting with person 1 (you) getting £18 and me £6, and then my turn at getting £18 and you £6	87
274	2				if we repeat this everytime	75
274	2				we will do better	73
264	1				theres only one round i think?	66
274	2				oh	54
264	1				or i can meet you outside and we can split 12 each	37
274	2				ok	25
274	2				you can have the 18	22
264	1				okay	17
264	1				where shall we meet	14
274	2				so go for £18 you and £6 me	10
264	1				top of the stairs?	6
274	2				yeah	3
264	1				k	1

4. Coding Tables

Coder:
Game: BOS/ BOS-E1/ BOS-E2/ BOS-E3
Subject Numbers: _________ and _________
Time at which FINAL agreement was reached (sec): ____
First please select one of the four categories below in order to most broadly describe the nature of the conversations
NB. You must choose one and only one of these four categories for each conversation

	1. Efficiency talk o Use this category if subjects recognise that although one person will get more than the other if the unequal outcome is chosen, both (or one participant in the case of BOS-E2) will get more in an unequal outcome compared to getting (5, 5) or nothing at all in the case of non-coordination o Example: “One of us can get 6 and the other 8, and that is better for each of thus than if we each get 5”	If you feel that there are elements of both in the conversation them choose the one that leads to the final decision. If no decision reached due to this kind of disagreement choose 3.
	2. Fairness/equality talk a. Use this category if people refer to the fairness and/or equality of the equal outcome, (5,5). Example: “We can get the same, and that is fair”	
	3. Conflict a. Use this category if subjects cannot agree on an outcome	
	4. Other (if possible please give brief explanation why you think none of 1,2,3 apply)	

You can select as many of the following categories as you wish – choose those that you think apply to the conversation:

	1. Greeting
	2. Open first offer Question a. e.g. “What shall we do?”. This category is used if no specific offer is made at the start of negotiations. There is merely an opening question such as the example.
	Categories 3 and 4 relate to discussion purely based on deciding which of the two unequal allocations they should settle on.
	3. First offer generous a. The category is used if the person to open negotiations offers their co-participant the higher amount of the unequal outcome. Example: “You can get 8, I am happy to get 6.”
	4. First offer non-generous a. The category is used if the person to open negotiations offers their co-participant the lower amount of the unequal outcome. Example: “You can get 6, I then get 8.”
	Category 5 relates to discussions such as those above but where the discussion <u>also</u> includes mentions of the fact that subjects will get more earnings <u>in total</u> if they coordinate on an unequal outcome.
	5. “Better than nothing” a. This category is used if a subject agrees on an outcome because coordinating is better than not coordinating. Example: “I am OK with this proposal, because it is gives something which is better than nothing (=0)”
	6. First mover proposes equal outcome
	7. Counter offer equal a. Use this category if one person suggests an unequal outcome and the other person proposes the equal outcome instead.
	8. Random o Use this category if people try to find a random way (a methods based on chance) to decide on an allocation a. e.g. Rock, paper, scissors
	9. Counter offer “no I want more” a. This category is used if an offer made by a co-participant of a lower amount is not accepted Example: “No, I will not accept 6, I want 8.”
	10. Counter offer “no you have more!”

	a. This category is used if an offer made by a co-participant of a higher amount is not accepted Example: “No, I will not accept 8, I want 6. You have the 8”
	11. Assurance of offer made or received a. e.g. “Are you sure?” This category is used if a co-participant asks for confirmation of a previous offer.
	12. Appealing to better nature (sympathy etc.) a. e.g. “I’m a bit skint this weekend so can I have the higher amount?”
	13. no firm agreement reached (ran out of time) a. Use the category if it seems that subjects did not keep an eye on the time and ran out of time
	14. no firm agreement reached (fighting for last word) a. Use this category if subjects did not reach an explicit agreement but instead fought for the last word in the negotiations, e.g. a subject waits till the last second to claim an amount so that his/her partner couldn’t make a counter offer
	15. Sticking to guns when disagreement a. Use this category if a subject refuses to move on an offer despite disagreement.
	16. One subject indifferent o when one subject "claim" they are happy to take either outcome, "I don't mind which we go for"
	17. Both subjects indifferent o "I don't mind either!"
	18. Necessity of Coordination o "We need to pick the same one in order to earn money" "Let's both agree to pick this option"

5. Chi-squared tests for differences between person 1 and person 2 behaviour

Table 5.1. Individual choice differences between person 1 and person 2 with no communication

This table reports the p-values for the differences between individual choices made by those labelled person 1 and 2 using the chi-square test/ fishers exact test

	Overall	Hawkish	Dovish	Equal
BOS	0.502	0.502	0.502	X[99]
BOS-E1	0.478	1.000*	0.604*	0.476*
BOS-E2	1.000	1.000*	n/a[100]	1.000*
BOS-E3	0.748	1.000*	0.716*	0.525

* indicates that a Fisher's exact statistic is reported as opposed to a chi-squared test due to observation numbers.

Table 5.2. Outcome differences between person 1 and person 2 with communication

This table reports the p-values for the differences between outcome for those labelled person 1 and 2 using the chi-square test/ fisher's exact test

Own choice	**Hawkish**	**Hawkish**	**Hawkish**	**Equal**	**Equal**	**Equal**	**Dovish**	**Dovish**	**Dovish**
Co-participant's choice	**Hawkish**	**Dovish**	**Equal**	**Hawkish**	**Dovish**	**Equal**	**Hawkish**	**Dovish**	**Equal**
BOS	0.757*	0.738	X[101]	X	X	X	0.738	n/a[102]	x
BOS-E1	n/a	0.262	n/a	0.490*	0.490*	1.000*	0.262	n/a	0.490
BOS-E2	n/a	0.643	n/a	n/a	n/a	0.627	0.643*	n/a	n/a
BOS-E3	0.669*	0.337	n/a	n/a	n/a	n/a	0.337	n/a	n/a

* indicates that a Fisher's exact statistic is reported as opposed to a chi-squared test due to observation numbers.

[99] X here indicates that this outcome is not applicable in this particular game
[100] n/a here indicates that this outcome did not occur
[101] X here indicates that this outcome is not applicable in this particular game
[102] n/a here indicates that this outcome did not occur

6. Tests of order effects

In the order to test for order effects in the experiment we run chi-squared tests. For this with test if incidences of choosing an individual choices (without communication) or outcomes (with communication) differ between difference ordering. Where significance difference between orderings is found we also report the observation numbers below the table of test statistics. Due to the low observation numbers in these categories these order effects could well be due to randomness. We also notice that although the order was assigned randomly by the computer in the experiment, some orders were used more than others. We therefore believe that these order effects need to be investigated further with more observations in order to provide a better interpretation and more reliable statistics. This can be the subject of future research.

6.1 Games without communication

Table 6.1.1. Test statistics for difference in strategy choices between orderings (without communication)

BOS	1.000
BOS-E1	0.630*
BOS-E2	0.838*
BOS-E3	0.012*&

*indicates that a Fisher's exact statistic is reported as opposed to a chi-squared test due to observation numbers.
& indicates significant behavioural differences observed between strategy choice orderings

Table 6.1.2. Individual choice differences between orderings in NC-BOS-E3

	Choice Amount			
	Equal	Dovish	Hawkish	Total
Ordering				
1	7	2	0	9
2	5	0	2	7
3	1	3	0	4
4	5	5	1	11
5	2	0	4	6
6	2	0	1	3
Total	22	10	8	40

6.2 Games with communication

Table 6.2.1. Test statistics for difference in strategy choices between orderings (with communication)

BOS	0.117*
BOS-E1	0.062*[&]
BOS-E2	0.274*
BOS-E3	0.027*[&]

*indicates that a Fisher's exact statistic is reported as opposed to a chi-squared test due to observation numbers.
[&] indicates significant behavioural differences observed between strategy choice orderings

Table 6.2.2. Outcome differences between orderings in C-BOS-E1

	Profit from Game				
	0	5	6	8	Total
Ordering					
1	0	0	4	6	10
2	1	1	4	4	10
3	1	3	1	4	9
4	0	0	3	6	9
5	2	0	6	1	9
6	0	0	4	1	5
Total	4	4	22	22	52

Table 6.2.3. Outcome differences between orderings in C-BOS-E3

	Profit from Game			
	0	6	18	Total
Ordering				
1	2	1	7	10
2	0	6	5	11
3	1	2	4	7
4	0	2	1	3
5	2	2	0	4
6	1	4	0	5
Total	6	17	17	40