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Gender difference in performance under competitive pressure:

evidence from a professional team sport.

Master Thesis

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PREFACE AND ACKNOWLEDGEMENTS

‘Success is not a destination, it is a journey’

(Wim Kan, Dutch comedian (1911-1983))

Abstract

This thesis investigates whether men and women perform differently when playing together as a team under competitive pressure. Recently, the concept of working in teams has been more widely developed and within these teams female participation has increased. Most research done on gender differences however, does not include this important development. This thesis investigates whether men and women perform differently when playing as a team under pressure by researching a selection of data on the Dutch Korfball league 2008-2009. Existing literature claims that gender differences in performance exist. The two research methods used in this thesis lead to contradictory results. The first method finds no statistical significance in favour of a gender differences in performance under pressure whereas the alternative method does find evidence that indicates a gender difference in performance under pressure.

Key words: Gender differences, competition, pressure, performance, Korfball.

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1. Introduction:

The existence of a gender gap is a well known fact. By contrast, the exact definition of the gender gap is certainly not common knowledge. In this thesis it is defined as the income disparities of females versus males within a purely economic context. The gender gap has been the subject of discussion recent decades, but the topic has not yet lost any ground. Meanwhile, many arrangements have been made to improve the position of females. The introduction of part-time jobs and the improvement of childcare facilities are only two means of stimulating a woman's decision to participate in the labour market and to increase its accessibility. It is pretty astonishing that the gap has not disappeared yet in spite of all the efforts made through the years. This leads to the question: is gender equality really an objective within reach?

Over the years the employment gender gap decreased in EU-27[1]. Additionally, as reported by the CBS[2], when taking a closer look at Dutch universities, female participation rates have stabilized around fifty percent during the last decennium. Although employment opportunities for women increased, women still lag behind financially. Betrand and Hallock (2001) found the striking result that of the five-highest-paid positions in the U.S., only 2.5% are held by females. Additionally, it is quite shocking that the salary of women working in the private sector in the EU-15[3] earn almost 20% less than men do (CBS, 2002). These numbers confirm the gender gap. Within this context the question that immediately arises is how it is possible that this unbalance remains to be present? Do men and women respond differently to working conditions in such a way that gender income disparities are validated?

A large number of research has been done concerning gender inequality. Some argue that the gender gap is caused by general gender differences in ability and preferences. Specifically, in 2005 the influential former Harvard President Lawrence H. Summers publicly suggested that

[1] The composition of the European Union from 1 January 2007: Austria, Belgium, Bulgary, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Rumania, Slovakia, Slovenia, Spain, Sweden, and the UK.
[2] Het Centraal Bureau voor de Statistiek (CBS), is a Dutch database with the aim of providing publications on statistics on daily life, policy and science.
[3] The composition of the European Union from 1 January 1995: België, Duitsland, Denemarken, Finland, Frankrijk, Griekenland, Ierland, Italië, Luxemburg, Nederland, Oostenrijk, Portugal, Spanje, Verenigd Koninkrijk en Zweden

the under-representation of female scientists at elite universities may stem part from innate differences between men and women. Others argue that the gender gap is partially attributable to different attitudes towards competition. Gneezy and Rustichini (2004) for example, state that male performance is relatively better than female performance when exposed to competition. Ivanova-Stenzel and Kubler (2005), studied the performance of mixed teams versus teams consisting of one sex only. They concluded, consistent with results found by Gneezy and Rustichini (2004), that women perform best when competing in pure female teams against male teams, whereas men perform best when women are present.

In the past, the company workforce mainly consisted of males. Today, the workforce includes men as well as women. Besides this change, companies have been embracing the concept of work in teams. These two developments have altered working conditions immensely. Although the development of these trends has started quite some time ago, research done with respect to gender performance within mixed teams is inadequate. This thesis will focus on the manner in which men and women respond to competitive pressure when they play as a team. It will be an addition to existing literature, because it incorporates the aforementioned developments.

To investigate the main question of this thesis, data is used from the Dutch Korfball league 2008-2009. Korfball is a ball game played between two mixed gender teams. Hence, it is the only sport in the world that makes it possible to measure male and female performance under similar conditions. Two different methods are used to analyze the data with the main difference between these methods being the way in which pressure is measured. In the first method, the absolute difference in goals scored at half-time is taken as a measure of pressure, whereas in the alternative method the absolute difference in goals scored at the moment a player scores a goal is taken as a measure of pressure. The analyses provide insight on how males and females perform under competitive pressure when playing as a team.

Results of the study will aid in a better understanding of daily life practice. First, the outcome of this study will be valuable to corporations. When knowing how males and females react while working together in a team that faces competition, overall team performance can improve. Moreover, if we are able to maximize overall performance, then this will result in higher efficiency levels with cost reductions on labour expenses. Corporations will reach higher levels of competiveness and hence will be more successful. Lastly, the outcome will be

useful in the aim to achieve gender equality. If we are able to find a cause why women still lack behind financially and do not reach top positions as often as men do, then this study will provide information that could help close the gap.

This thesis is structured as follows: the second chapter includes a review of existing literature. The next section describes some basic terms and impressions concerning Korfball. Section 4 provides an in-depth explanation of the dataset. Furthermore, in chapter 5 the methodology is described and in chapter 6 the results are analyzed. Conclusions with regards to the data can be found in chapter 7 and lastly, research limitations are covered in chapter 8.

2. Literature Review

'Men are from Mars and Women are from Venus' is the title of a book written by John Gray in 1992. The metaphor suggests that the differences between genders are so enormous, that men and women seem to be from different planets. The fact that gender differences exist is obvious. The factors that cause these differences however remain for the large part unexplained. This chapter provides an overview of the existing literature that relates to the research on the factors causing these differences.

2.1. Gender differences

For a long time it was claimed that gender differences were caused by a general difference in ability and preferences between the sexes. Former Harvard's President Lawrence H. Summers advocated the existence of general gender differences at an economical conference in 2005 by suggesting that the under-representation of female scientists at universities might be attributable to innate differences between genders. Much research has been done trying to answer the question whether preferences vary between the genders.

Croson and Gneezy (2009) provided an overview on economic experiments that investigated the influence of gender. Specifically, focal points within their review are risk taking, social preferences and response to competition. They concluded that gender differences exist when looking at the way in which men and women respond emotionally. This is in line with results found in the world of medical science. Nicolai (2009) stated that females react stronger to emotional incidents and additionally think and talk about it more than males do. By means of an MRI- investigation it is found that differences in brain segment activity exist between males and females. This could be one of the innate factors that influences gender performance enormously. Besides evidence found in favour of the theory that points to innate factors causing gender differences, other research points to the effect of nurture. Psychologist Maccoby (1990) pointed out that nurture and nature can co-exist in the explanation of gender differences. In her article she summarised the literature related to the factors that cause differences in interactional styles between genders. More specifically, it was argued that a variance in interactional styles among individuals is caused by gender specifics. Maccoby concluded that there is no single answer to the question on how much variance is caused by gender. However, innate factors seem to have been given too much credit, as differences in

sex mainly surface in social situations. Croson and Gneezy (2009) stated in their review that females are more insecure than males and additionally experience risk in a different manner. Men on the other hand are more opportunistic in comparison to women. These differences have been found in the majority of workplaces, with the exception of merely some professions. For instance, entrepreneurs show no sign of gender differences.

When reviewing social preferences, it is clear that the outcome varies per study. Gilligan (1993) found that females are more cooperative and community minded than males. He tested for this gender effect by measuring the amount of contribution paid for public goods by the use of laboratory experiments. Counter to his findings, Brown-Kruse and Hummels (1993) controlled for a period effect and found that males contribute significantly more than females. Cadsby and Maynes (1998) came up with similar results. They found that females initially contribute more, but they added that the significance vanished as the game was repeated. The results of the study of Andreoni and Vesterlund (2001) can be categorized in the middle compared to the aforementioned studies. They concluded in their paper that either sex can be found to be more altruistic. Men are more likely to be either perfectly selfish or perfectly selfless, whereas women care more about equalizing payoffs. Croson and Gneezy (2009) concluded in their paper that results found by studies that investigate social preferences and gender should not be interpreted in black and white: specifics differ per situation. Nevertheless, they suggested that female performance depends more on situational factors than is the case for male performance. Lastly, Croson and Gneezy described the relation between gender and competitive behaviour. This will be explained in more detail in the next paragraph.

2.2. Gender and competition

Gneezy et al (2003), performed a lab experiment and found that competition enhances the performance of males, but not that of females. They performed an experiment in which both genders were asked to solve mazes. In the first experiment participants were paid on piece rate, while in the second experiment contestants were paid on competitive base. When paid on piece rate hardly no difference in gender performance could be found. When paid on a competitive base however, male performance increased significantly, whereas female performance remained the same.

Gupta et al (2005) studied whether males and females differ in competitive behaviour. In their experiment men and women could choose between a reward system based on relative performance or a compensation system based on piece rate. Results showed that men choose the competitive setting significantly more often than women. The experiment showed that women are mainly influenced by their degree of risk-aversion. Men however are not. One explanation for the avoidance of competitive situations by women could be that women are less self-oriented than men. Eckel and Grossman (2003) confirmed these results in relation to women's choices. They found that the choices women make are less individually-oriented and more socially-oriented instead. In their experiment men and women were asked to settle on the distribution of $10 between themselves and an unknown person. The experiment showed that females are two times more inclined to share money with the unknown on average compared to men. Niederle and Vesterlund (2007) tested whether males and females with similar capabilities vary in their behaviour within competitive and non-competitive environments. Similar to the aforementioned experiment performed by Gneezy et al. (2003), Niederle and Veterlund asked their participants to solve real tasks under a piece rate as well as on a competitive base. While no gender difference in performance could be indicated, men opted for the competitive base roughly twice as often as women. It was suggested that this gender difference is not caused by differences in risk taking, but instead is mainly caused by women being less confident than men.

Booth and Nolen (2009) studied the possible effect that nurture could play on the decision of men and women in choosing to compete. In the experiment the participants were students of just under 15 years old that attended single-sex and co-educational schools. They found that for girls a difference exists between the level of competitiveness at both schools. Gender identity seems to play a role in choosing how to behave in the company of the other gender. Women do not avoid competition if they compete with other women, but they are averse to competition when they are in the company of men. Niederle, Segal and Vesterlund (2008) used experiments to test whether affirmative action stimulates more women to compete. When imposing affirmative action in a competitive setting that is in favour of females, competition became more gender specific. They showed that affirmative action increases the amount of female participants choosing to compete and even decreases male entry. The increased probability to win and the fact that affirmative action took place could explain this phenomenon. Additionally, the belief that gender differences persist when concerning relative

performance changed in the minds of the females and with it the willingness of females to compete was found to increase.

Gneezy et al (2008) suggested that society plays a role with respect to gender and competition. They investigated whether gender differences in preferences to choose into competitive settings varied when comparing different societies. They compared gender behaviour with respect to competition between a tribe in Tanzania and a tribe in India. The most important difference between these two ethnic groups is that the Tanzania tribe is characterised by a patriarchal[4] society, whereas the India tribe is characterised by a matriarchal[5] society. Results showed that when a society is patriarchal, men compete more than women and when society is matriarchal, women choose the competitive environment more often.

The last paragraphs discussed various factors having an impact on gender and competition. As Croson and Gneezy (2009) concluded in their reviewing paper, it has become clear that the impact of competition on gender can be affected by nature as well as nurture.

2.3. Gender teams

The concept of working in teams has gained more popularity during the last decades. This development, in combination with a sharp increase in the female labour participation rate, makes that the role of gender within teams has become an important factor to consider. A related question that arises in this context is how people should best be put into teams. In other words, in what way do men and women function in teams and how can they perform optimally? By reviewing the literature, it seems that especially the number and composition of the two genders within teams impacts the way both genders behave. Additionally, these teams are as a whole affected by external factors as explained in the coming paragraphs.

One of the first to point out the importance of team production for the society as a whole were Alchian and Demsetz (1972). Overall performance increases when individuals work in teams, but overall success is dependent on the ability to track the performance of individuals within the teams and additionally their motivation. They researched the differences in the response of the two genders when considering public and private goods. In the case of public goods, all

[4] When society is patriarchal, the tribe is ruled by a man.
[5] When society is matriarchal, the tribe is ruled by a woman.

participants receive an even award, irrespective of their performance. In the case of private goods, participants are rewarded in accordance to their performance. After Alchian and Demsetz, more and more research started to focus on team production. Marwell and Ames (1979) for example investigated whether individuals prefer either a private good or a public good when working in teams. With the provision of the public good, the possibility to free-ride is present. Results found in this study were in favour of the public good provision. This indicates the participants chose the safe way, where performance and payment had no direct relation to each other. No significant effect of interest in free riding was present. Nowell et al (1994) also examined the influence of gender on public good provision. They use a four person game including all-female, all-male and mixed gender groups. In an experiment involving undergraduate participants, they found that all-female groups are more cooperative then either all-male or mixed gender groups.

Another study researching the performance of mixed teams versus teams consisting of men or women only is that of Ivanova-Stenzel and Kubler (2005). They concluded that women perform best when competing in pure female teams against male teams, whereas men perform best when women are present. Group productivity as a whole was the subject of a paper by Nalbantian and Schotter (1997). They examined a variety of group incentives in relation to group productivity. Three main findings can be perceived. First, the way in which a group performs in one incentive scheme depends on the mutual history of its team members. Furthermore, relative performance schemes outperform target-based schemes. Lastly, monitoring can elicit higher effort from team members, but the frequency of monitoring must be high and is therefore often costly. Adams and Ferreire (2007) studied team efficiency in relation to team composition in the setting of management boards. They researched whether board composition influences board effectiveness. It is suggested in their paper that gender diversity has a negative effect on board effectiveness only if companies have good corporate governance. In weak corporate governance firms gender diversity does contribute positively to board effectiveness. In other words, external factors highly influence the effect of gender differences on team efficiency.

As seen in the previous paragraph, not only the composition of a team influences gender behaviour. Croson (2000) studied whether different feedback methods influence the way individuals contribute to the overall team production. She suggested that average group contribution under total feedback and under individual feedback are alike. However, it is

remarkable that group contributions under individual feedback have a significantly higher variance than those under total feedback. Individuals within the group thus perform different in comparison to each other, while with total feedback individuals perform more alike. In a completely different setting, the article of Delfgaauw et al (2009) investigated team performance in relation to the gender of the leader and the composition of the team. They performed a field experiment in a Dutch retail chain and found that competition can stimulate both men and women. The large impact of competition however, is especially found where team leader and a large part of the workforce have the same gender.

As can be concluded from this review, existing literature has researched many variables that influence the effect that gender has on team performance, both internally and externally. However, the exact role played by gender in this setting remains unclear. Many relevant studies on this topic exist, but the evidence is nevertheless inconclusive (Ledyard, 1994).

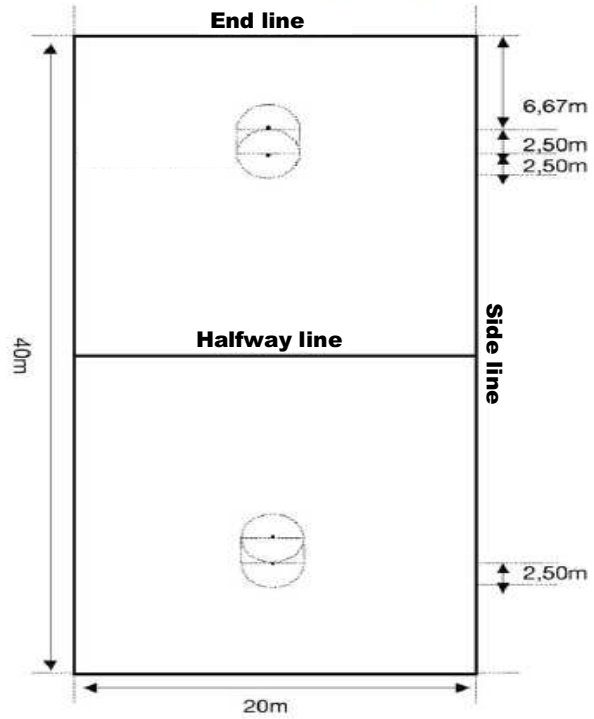
3. Professional mixed Sport: Korfball

This study uses a data selection of the Dutch indoor Korfball league. As defined by the KNKV[6] (2008) Korfball is a ball game played between two teams. Both teams own a basket. The team objective is to score points by throwing the ball through the basket of the opponent. The team that has scored the most goals at the end of the game wins the game.

3.1. Playground, basket and ball

The playground is rectangular and it has a size of 40 x 20 meters (Figure 1). The halfway line, parallel to the short side, divides the rectangular field in two compartments. The basket is attached to a pole that has a height of three point five meters and it has a cross-cut of thirty-nine to forty-one centimetres. The height of the basket is twenty-five centimetres and can be found in the middle-end of the playing field. The pole is located on the longitudinal axis of the playing field and the distance to the short side is one-sixth of the length of the play field. The ball has got a diameter of 22 cm (an outline of 68,0-70,5 cm) and a weight between 445-475 gram.

Figure 1: Playing field Korfball



[6] The 'Koninklijke Nederlandse Korfbalverbond' (KNKV) is the Dutch Korfball association.

3.2. Players

The game is played between two teams. A team consist out of four men and four women. Two male players and two female players are placed in each compartment. One compartment is for attacking only, the other is for defending only. During the game four substitutes are allowed per team. An important piece of information is that women do not have to compete against males or the other way around. Everyone faces an opponent of the same sex. To be more specific, it is not allowed that an attacker is hindered by a player of the opposite sex. In play situations other than the one just described, like catching or walking, it is approved to get in the way of a player of the opposite sex. Overall, the aim of the sport is that both sexes have to work together in order to win the game.

3.3. The game

The duration of a game is two times thirty minutes. The game is separated into these two periods by a break. A goal is scored when the ball comes down the basket completely in the compartment of the attacking team. In order to decide upon the division of compartments between the teams, the referee tosses a coin just before the start of the game in order to decide which team attacks in which compartment in the 1st half. Sequentially both teams assign players to each compartment. After two goals players switch to the other compartment and at the same time this implies that their function is changed.

The game knows two different play situations, namely a dynamic and a static situation of the game. The static situation can be divided in a free shot and in a penalty throw. After the referee interrupted the play due to a violation of the rules by a team, a free shot is assigned to the rival team. A free shot cannot directly lead to a goal. The ball has to be touched first by another player before it hits the basket. When a team violates the rules and accordingly one chance to score is lost for the other team, the penalty throw is allocated to that team. Opposite to the free shot, the penalty throw can directly lead up to a goal. Of course, defenders as well as attackers can violate the rules. The referee will interrupt and assigns the ball to the team opposite to the team that is violating the rules. The dynamic situation is at play whenever the referee is not interrupting the game. When a player misbehaves, the referee can punish him by handing out a ‘yellow card’. In case a player misbehaves very badly, the referee can cause the player to leave the field by handing the person a ‘red card’.

Some general korfball rules have to be taken into account during the course of the game. Most importantly, no player is allowed to:

- make a goal attempt when he or she is in a defender position.
- touch the ball by means of a foot or leg.
- hit the ball with the fist.
- walk with the ball.

Players face a hit clock. When the ball hits the basket, a stopwatch starts to count down 25 seconds. Within these 25 seconds a player has to make a goal attempt. Whenever an attempt is not made within time, the ball is directed to the team that defends. The existence of this rule increases the dynamics of the game.

4. Data

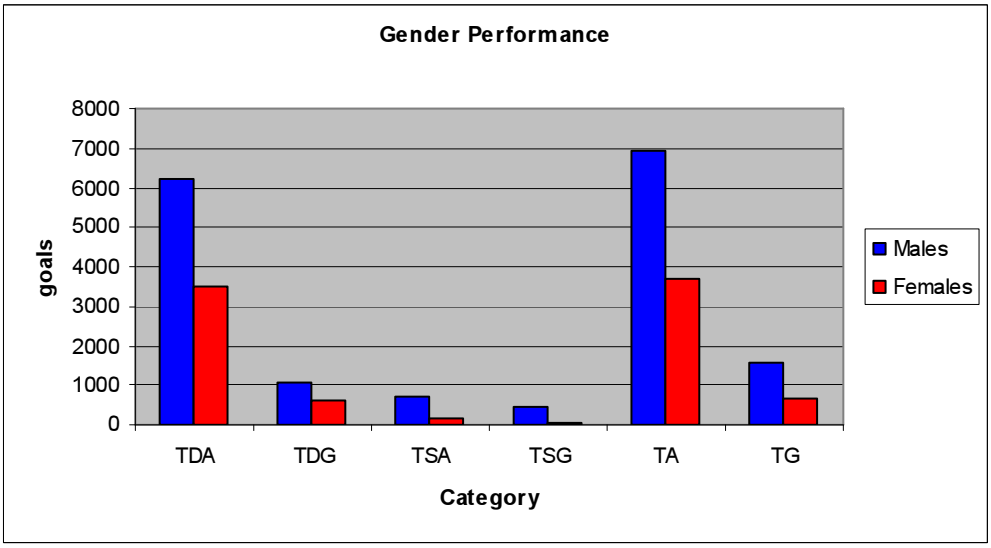
The data sample contains a selection of 50 matches played by 10 different clubs in the Korfball league 2008-2009. Not all the matches that are played in the league are included. In fact, the data covers 4 to 6 matches of each club at the beginning of the season. Only a selection of matches is made, because the database does not cover the complete competition. This single data sample[7][8] will be used for two different research methods. The first method investigates the effect of competitive pressure on gender performance by means of comparing the goals scored in the 1st half and 2nd half between males and females. Furthermore, the alternative method examines the effect of competitive pressure on gender performance by means of comparing the chance that a goal is scored by a female player to the chance that a goal is scored by a male player. Accordingly, the selection of the data will differ per method.

4.1. Dataset for method 1

When applying method 1, the dataset contains 849 players: 430 players are males and 419 players are females. Not all the players that play in the 50 matches are included. Players that play less than 45 minutes, which is less than 75% of total playtime in a single match, are excluded from the data. These players did not experience enough playtime to add value to the study. Information on the difference in half-time scores is included in the dataset. More specifically, the data contains the difference in half-time scores in absolute numbers. Teams within a match face the same difference in half-time scores. This means that with an outcome of '5-1', both teams are assigned the outcome of 4. Moreover, the data provides information concerning the attempted number of goals and the actual number of goals scored by each individual per match. These attempts are specified in static and dynamic attempts and also goals are specified in static and dynamic goals. Figure 2 shows these statistics relating to these attempts and actual goals for gender performance within the dataset of method 1.

[7] The dataset is not corrected for the effect of 'red cards'. The number of times a player received a 'red card' within the dataset is negligible small and therefore it is chosen to leave it out of the data sample.
[8] The dataset does not include the possible effects of the hit clock. By investigating the data it was found that the ringing of the hit clock took place a limited amount of times and therefore it is chosen to leave it out of the data sample.

Figure 2: Gender Performance



Focusing on total goals, or TG as in Figure 2, it is found that males outperform females in the absolute amount of goal attempts as well as in the absolute number of goals scored. The percentage of total goals scored by female players is around 30%. When looking at the columns total dynamic attempts (TDA), total dynamic goals (TDG), total static attempt (TSA), total static goals (TSG) and total attempt (TA), the figure shows that males perform better than females in all disciplines. The data provides information on gender performance per half of the game as well. Figure 3 and Figure 4 present insights in goal attempts and goals scored per gender in the 1st and 2nd half of the game. Remarkably, when looking at the bars in Figure 3 it can be seen that, apart from total static goal attempts, males perform better in the 2nd half compared to the 1st half. In contrast, the bars in Figure 4 show that females perform worse in the 2nd half compared to the 1st half.

Figure 3: Males performance in 1st and 2nd half

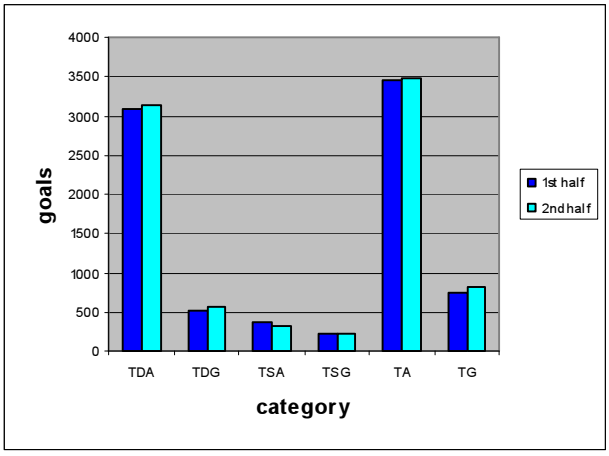
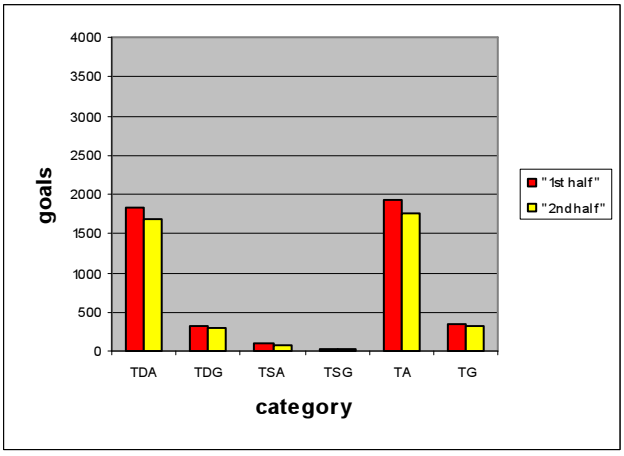


Figure 4: Females performance in 1st and 2nd half



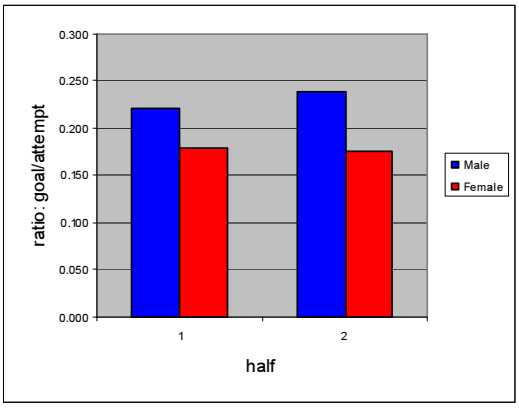
Looking at Table 1, it is found that male efficiency is similar to that of females in dynamic situations. Both sexes score roughly 1.7 goals out of 10 attempts. On the other hand, no similarities are found when looking at the static situation depicted in the middle of the table. Men score approximately 6.5 times out of 10 attempts whereas women score only around 3.6 goals out of 10 attempts. Thus, in static situations males are almost twice as efficient as females. When looking at total efficiency in the most right part of the figure, a gender difference in efficiency on the overall level is shown. Males hit the basket approximately 2.2 times out of 10 attempts compared to 1.8 times out of 10 attempts for females. This gender difference in efficiency is brought about by the enormous difference in efficiency between men and women in static situations.

Table 1: Gender Efficiency

Gender/ Type of play	Dynamic	Static	Total
Males	0.174	0.650	0.223
Females	0.171	0.360	0.180

Figure 5 shows that male efficiency level is higher in the 2nd half compared to the 1st half. This effect is conform the data presented in Figure 3 that males perform better on goal attempts and goals scored in the 2nd half compared to the 1st half. It is found that the female efficiency level in the 2nd half is approximately similar to the level attained in the 1st half. This finding is in line with the expectations based on Figure 4. Figure 4 showed a decrease in goal attempts and goals scored in the 2nd half compared to the 1st half for women. When the number of goals scored in the 2nd half decreases for females, but their efficiency level does not, then Figure 5 suggests that females undertake less attempts in the 2nd half as well. This is confirmed by Figure 4.

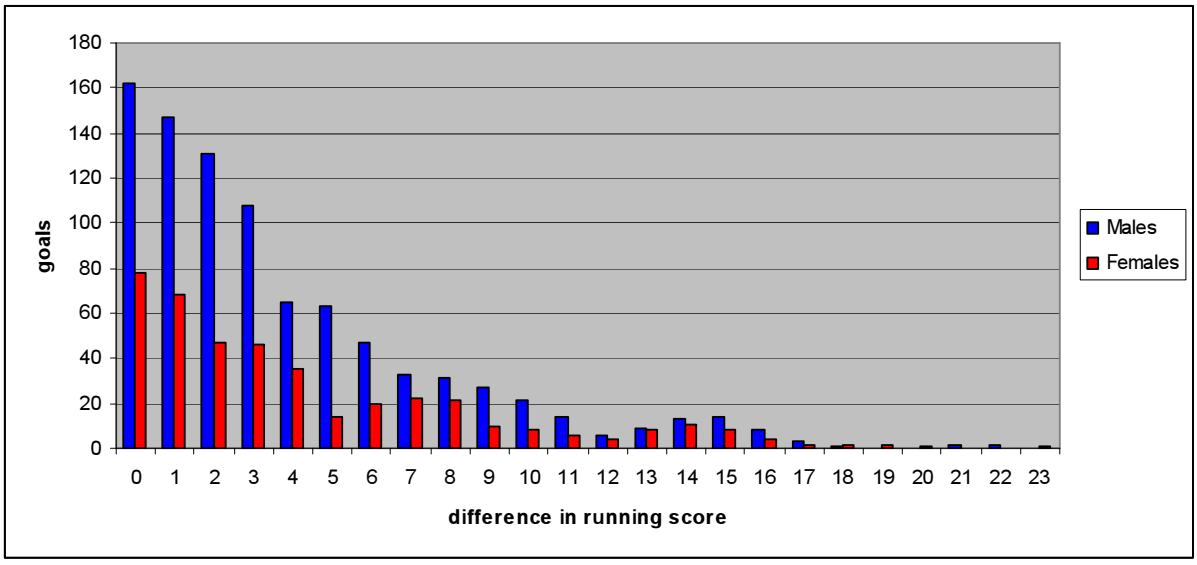
Figure 5: Gender Efficiency by 1st and 2nd half



4.2. Dataset for method 2

Remember that data comes from the same matches. When applying method 2 however, the dataset exists of 2178 goals that are scored by 122 players: 67 Players are female and 55 players are male. The data provides information related to the moment that the players score a goal. It contains the difference in the running score between two rival teams at the moment a player scores a goal. The difference in the running score is measured as an absolute number. A score of '1-0' would become '1' and '1-6' would become '5' for the player that scores the goal. Figure 6 demonstrates gender performance relating to varying differences in running scores at the moment a player scores a goal.

Figure 6: Gender performance under varying running scores



When taking a closer look at Figure 6, it can logically be seen that more goals are scored when differences in running scores are smaller. Every game starts at '0-0'. Not surprisingly, a difference in running score of '0' will occur more often than a difference in running score of '22'. The data thus acts in a logical and natural manner. This logical occurrence has to be taken into account when interpreting the results of Figure 6. What attracts attention is that males show very high peaks compared to females for differences in running scores 0 till 3. This is in line with aforementioned observations that males score more goals compared to females.

5. Objectives and Methods

5.1. Objectives

This thesis will assess whether a gender difference exists in performance whenever males and females play together as a team that is exposed to competitive pressure. For that reason the main question is;

When playing together as a team under competitive pressure; do men and women perform differently?

The effect of pressure on performance will be studied by the use of two research methods. In the first method, the effect of competitive pressure on gender performance can be measured by means of comparing the goals scored in the 1st half and 2nd half between males and females. Performance is defined as *the amount of goals scored per individual in the* 1st *half and in the* 2nd *half.* This approach makes performance quantifiable. In method 1, competitive pressure P is defined as *the absolute difference in number of goals scored between two opposing teams at half-time*. This variable can be used to measure pressure because it indicates the position of rival teams in relation to each other at half-time. Whenever the half-time score is '10-10', the game is still open. There is still a certain level of excitement to which team is going to win the game and consequently the players will still compete relatively intensively. A half-time score of '20-2' on the other hand, does not leave much space for imagination which means both parties will not play at their best after a certain half-time score. In order to study the main question, the assumption is made that there is an inverse linear relation between the difference in score of rival teams at half-time and the pressure level. The assumption is made that whenever pressure does not influence performance, then the number of goals scored per individual will approximately be the same in the 1st and 2nd half. The method described above is an adequate measure to answer the main question of this thesis, because the influences of pressure on performance can be investigated by means of comparing the goals scored in the 1st half and in the 2nd half.

In method 2, the effect of competitive pressure on gender performance is measured by means of comparing the chance that a goal is scored by a female player to the chance that a goal is

scored by a male player. In the alternative method, competitive pressure R is defined as *the absolute difference in amount of goals scored between two opposing teams at the moment a player scores a goal.* This measure of pressure is valuable, because it directly shows the importance of a subsequent goal. Whenever the difference in running score between two opposing teams is '0', the first goal that follows could cause one team or the other to win the match. In contrast, when the difference in running score is '10', then the goal that follows will not make a big difference. It will however make the position of the winner more obvious or, in case the team is lagging behind, its position a bit closer to that of its opponent. The second method is a valid method. By comparing the chances for men and women to score a goal, the influence of pressure on the chance a goal is scored by gender is directly measured. The main difference between these two methods is the definition that is used for measuring pressure. In the first method pressure is measured at half-time and therefore it is the same for both rivalling teams. In contrast, the alternative method measures pressure at the moment a player scores a goal and therefore pressure varies among individual players. This study takes into account these two different ways of measuring pressure in order to strengthen the investigation whether there exists a gender difference in performance when men and women are playing together as a team under competitive pressure.

The estimation of the equations is done with the aid of Econometric Views (EViews). Eviews is a statistical package for windows and can be used for econometric analysis such as panel data analysis and Probit analysis which will be explained in the next two paragraphs. (Vogelzang, 2004). Regression analyses will be used as means to answer the central research question. It will be tested whether there exists a specific relationship between the variables *competitive pressure* and *performance* with respect to gender. Subsequent to the regression analyses it is possible to conclude whether or not a significant relationship exist between those variables. To answer the central research question, the focus will be on the confirmation or rejection of the existence of a gender difference in the influence of pressure on performance.

5.2. Methods

5.2.1. Method 1

To estimate the effect of competitive pressure on performance, Ordinary Least Squares (OLS) panel estimation is used. The OLS panel estimation could be interpreted as a method of fitting

the data. The best fit, between modelled data and observed data, is a regression line that makes the sum of squares of the vertical distances of the data points from the line as small as possible (Moore et al, 2008). Let G_{SM}^{x} be the goals scored in half x by a player S in match M. Let x be ´1´ when the number of goals are added up over the 1st half and let x be ´2´ when it is computed over the 2nd half. Furthermore, let D_S be a dummy variable which is ´1´ for females and ´0´ for males and let P_{SM} be an explanatory variable of the pressure level a player S faces in match M at half-time. Last, an interaction term between D_S and P_{SM} is included as well. This term is the main variable of interest. It is included to investigate whether a difference exists in the effect of competitive pressure on goals scored in the 2nd half between men and women. To assess the average effect of pressure on goals in the 2nd half, the following equation is estimated:

$$G_{SM}^{2} = c + \beta D_S + \gamma G_{SM}^{1} + \upsilon P_{SM} + \kappa (D_S * P_{SM}) + \varepsilon_{SM} \qquad \textbf{(1)}$$

$c, \beta, \gamma, \upsilon$ and κ are parameters to be estimated by EViews, $(D_S * P_{SM})$ is the interaction term and ε_{SM} is an error term.

When estimating, possible interaction among independent variables have to be taken into account. If correlation among independent variables exists, then it will not negatively influence the predictive power or models goodness of fit. However, the existence of correlation among predictors will affect results with respect to single independent variables. Therefore, by testing whether a relationship exists between independent variables used in equation (1), it is possible to strengthen or weaken the usefulness of results found for individual parameters. Whether interaction among independent variables exists is tested by including interaction terms in the equation. The OLS method is a good estimation method whenever the model used is linear. Whether equation (1) is linear, a test is performed by the insertion of quadratic terms in equation (1) (Pindyck and Rubinfeld, 1997).

The data provides insights concerning the players performance on match level and therefore it is easy to compare players ability. Knowing that talent varies among players resulted in an inclusion of player-fixed effects. When inserting player-fixed effects in equation (1), it is possible to control for within gender specific differences in the influences of pressure on

performance. By including player-fixed effects in equation (1), some additional remarks have to be made. It is not possible to include both a constant *and* individual characteristics. That is, whenever fixed effects are included, no single explanatory variable can be included that is constant for an individual player. Hence, the gender dummy cannot be included alongside individually fixed effects. On the other hand, it is possible to leave the gender dummy in the interaction term, because pressure varies among matches for a given player. Consequently, to assess the average effect of pressure on goals in the 2nd half when fixed effects are included, the following equation is estimated:

$$G^2_{SM} = \mathrm{c} + \alpha_S + \gamma G^1_{SM} + \upsilon P_{SM} + \kappa\,(D_S * P_{SM}) + \varepsilon_{SM} \qquad \textbf{(2)}$$

Where α_S are player-fixed effects. In the estimation, no fixed-*match* effects are inserted. This is a well considered choice, due to insufficient information available for the inclusion of fixed-match effects.

Furthermore, it investigates whether a dynamic or static situation of the game changes the end results. To assess the average effect of pressure on static or dynamic goals in the 2nd half when fixed effects are included, the following equations are estimated:

$$GS^2_{SM} = \mathrm{c} + \alpha_S + \gamma GS^1_{SM} + \upsilon P_{SM} + \kappa\,(D_S * P_{SM}) + \varepsilon_{SM} \qquad \textbf{(3)}$$

$$GD^2_{SM} = \mathrm{c} + \alpha_S + \gamma GD^1_{SM} + \upsilon P_{SM} + \kappa\,(D_S * P_{SM}) + \varepsilon_{SM} \qquad \textbf{(4)}$$

Where GS^x_{SM} are static goals scored in half x by a player S in match M and where GD^x_{SM} are dynamic goals scored in half x by a player S in match M. The breakdown of equation (2) into (3) and (4) aids the study on whether the situation of the game, static or dynamic, changes the effect of competitive pressure on performance.

Next, it is tested whether the fact that a team is in a leading position, faces a tie or is lagging behind at half-time influences the effect of pressure on performance. To measure this effect two extra interaction terms, $(B_S * P_{SM})$ and $(B_S * P_{SM} * D_S)$, are included. In these terms B_S captures a dummy variable which is '1' when a player S is lagging behind at half-time and '0'

when a player S is in lead at half-time or when a tie is at play. To assess the average effect of pressure on goals scored in the 2nd half the following equation is estimated:

$$G^2_{SM} = c + \alpha_S + \gamma G^1_{SM} + \upsilon P_{SM} + \kappa (D_S * P_{SM}) + \mu (B_S * P_{SM}) + \eta (B_S * P_{SM} * D_S)\ \varepsilon_{SM} \quad \textbf{(5)}$$

Where μ and η are parameters to be estimated, the variable P_{SM} measures the effect of pressure on male performance, the interaction term $(D_S * P_{SM})$ measures the effect of pressure on female performance, $(B_S * P_{SM})$ measures whether a difference exists in the effect of the relative position within rival teams on performance for males and lastly, the interaction term $(B_S * P_{SM} * D_S)$ measures whether a difference exists in the effect of the relative position within rival teams on performance for females.

As described in chapter 4, data is abundant on the amount of attempted goals and the actual goals scored by each individual per match. This results in a measure for efficiency E. Efficiency can be measured as the ratio:

$$E^x_{SM} = \frac{G^x_{SM}}{A^x_{SM}} \quad \textbf{(6)}$$

E^x_{SM} is the efficiency ratio in half x by a player S in match M, A^x_{SM} is the attempted goals in half x by a player S in match M and x is '1' when the efficiency is computed over the 1st half and x is '2' represents the 2nd half. To assess the average effect of pressure on efficiency, equation (2) is transformed into equation (7):

$$E^2_{SM} = c + \alpha_S + \gamma E^1_{SM} + \upsilon P_{SM} + \kappa (D_S * P_{SM}) + \varepsilon_{SM} \quad \textbf{(7)}$$

Equation (7) will provide information whether competitive pressure influences gender efficiency differently.

5.2.2. Method 2

Besides method 1, an alternative method is studied. The alternative method, method 2, uses the so called Probit function. The Probit estimation could be interpreted as an inverse cumulative distribution function which models regressions of binary response variables. In this study, the Probit function is used to provide insights in the chance a gender scores a goal in a match. Let F be '1' when the goal is scored by a female and '0' when the goal is scored by a male. Furthermore, let R_S be the competitive pressure that a player S is facing at the moment he or she scores a goal. Remember that, as described in paragraph 5.1, the independent variable competitive pressure is defined differently in the alternative method than in the first method. The main difference is that in the first method pressure for each player is measured *at half-time* and in the alternative method, pressure is measures *at the moment a player scores a goal.* That is why players within the same match face similar pressure levels in the first method and different pressure levels in the second method. In this alternative method, it is not possible to include player-fixed effects, because gender does not vary within individuals. To assess the average chance that the goal is scored by a women, the following equation is estimated:

$$F = c + \beta R_S + \gamma H_S + \alpha (R_S * H_S) + \varepsilon_S \qquad \textbf{(8)}$$

Where c, β, γ and α are parameters to be estimated and ε_S is an error term. H_S is a dummy variable that indicates in which half the goal is scored. $H_S = 1$ represents a goal that is scored in the 1st half and $H_S = 0$ is a goal scored in the 2nd half. Again an interaction term $(R_S * H_S)$ is included. This interaction term is included to investigate whether a difference exists in the chance a female scores a goal in the 1st half or in the 2nd half.

An alternative method to investigate the chance a gender scores a goal is tested by the inclusion of the minute a player S scores a goal as an explanatory variable. Therefore equation (8) is slightly transformed into equation (9). This leads to the following equation:

$$F = c + \beta R_S + \omega M_S + \psi (R_S * M_S) + \varepsilon_S \qquad \textbf{(9)}$$

Where c, β, ω and ψ are parameters to be estimated. M_S captures the minute a player S scores a goal and $(R_S * M_S)$ is the interaction term that tests whether the minute a female scores a goal influences the chance a female scores a goal.

Next, it is tested whether the fact that a player is in lead, is in tie or is lagging behind at the moment he or she scores a goal, influences the effect of pressure on performance. To measure this effect an extra interaction term, $(L_S * R_S)$, is included. In this term L_S captures a dummy variable which is '1' when a player S is lagging behind at the moment that he or she scores a goal and '0' when a player S is in lead or when a tie is at play at the moment he or she scores a goal. To assess the average chance that the goal is scored by a women, the following equation is estimated:

$$F = c + \beta R_S + \omega M_S + \psi (R_S * M_S) + \lambda (L_S * R_S) + \varepsilon_S \quad \textbf{(10)}$$

Where c, β, α and λ are parameters to be estimated and $(L_S * R_S)$ is the interaction term.

5.3. Method remarks

The first method uses OLS panel estimations. The OLS method is often applied in regression analysis, because it is a valid way of fitting data (Moore et al, 2008). Furthermore, method 2 uses the Probit function. The Probit function is specialised in regression modelling of binary response variable when the binary dependent is seen as representing an underlying normal distribution. In this study the Probit function can be used because the binary dependent F represents the essential normal distributions of both genders (Pindyck and Rubinfeld, 1997).

Of course every method is known to have its limitation. The regressions in which fixed-player effects are included show a relatively high Durbin- Watson statistic. The statistic is often bigger than 2 within the data sample and therefore suggest that the error terms are, on average, much different in value to one another. In regressions, this could imply an underestimation of the level of statistical significance (Pindyck and Rubinfeld, 1997).
The sample needs to adhere to the principle of normality because then the OLS method can be used optimally. The Jarque-Bera statistic measures the goodness-of-fit from normality, based on sample kurtosis and skewness. '3' is the value for a normal distribution (Pindyck and

Rubinfeld, 1997). Figure 7 in the appendix shows the Jarque-Bera statistic that is compatible with equation (1). The Jarque-Bera is higher than '3'. This implies that the principle of normality for the sample has to be questioned.

Using a period of merely one year provides a limitation to the research. The results in one year are not necessarily similar to those in another year or period. However, the assumption is made that the dataset is large enough to provide this study with validity. In the case that this assumption is found not to be correct, then the results, and consequently the conclusions drawn from the results, will be distorted. For example, when 1 player consequently scores higher than all other players, this could influence the outcome of the results. When the assumption is correct, the size of the dataset will decrease the impact of any outliers within the dataset and consequently any fluctuations in the dataset caused by merely one player will be moderated.

Furthermore, a limitation can be found in the use of the independent variable competitive pressure. Both methods use different definitions of competitive pressure to strengthen the end results. In the first method, pressure is calculated as the difference in the amount of goals scored between two opposing teams at half-time. As a result, players within a team face the same pressure level. One explanation indicating the weakness of this measure is that it measures the score only half way through the game. Another limitation of the measure is that pressure is not personalised. This is the reason why, in the alternative method, pressure is calculated as the difference in the number of goals scored between two opposing teams at the moment a player scores a goal. This means that, contradictory to the first method, pressure varies among individual players. Due to this personalization of pressure in the last method, it could be interpreted that the condition of the measure pressure is improved. However, the question remains on whether the difference in number of goals scored between opposing teams is an adequate measure to calculate the pressure level that a player is facing.

Method 1 studies whether dynamic or static situations of the game change the outcome of the results. The static situation is not subdivided into a study researching whether free shots or penalty shots impact the outcome of the results. Unfortunately, the dataset proved to be too small in order to distinct between free shots and penalty shots.

The alternative method investigates whether the average chance that a given goal is scored by a women depends on the variable pressure. It would be interesting to investigate further, whether the average chance that a given goal attempt is undertaken by a women depends on the variable pressure. Due to the size of the thesis however, this study will be limited to the methods described in paragraph 5.2.

This study has included the measurement of a certain amount of variables in relation to the size of the sample and the availability of the data. As a consequence, certain other variables have been chosen to be left out of the study. These include the possible effect of the distinction between free shots and penalty shots in the static situation, and the possible effect of pressure on the performance of defenders. It would be interesting to research this variables in a different context when the dataset allows it.

6. Results

6.1. Equation (1)

Table 2 gives the EViews output of equation (1).

Table 2: Estimation (1)

Dependent Variable: G2SM

Method: Least Squares

Date: 11/26/09 Time: 10:37

Sample (adjusted): 1 891

Included observations: 797 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	1.138019	0.118989	9.564038	0.0000
DS	-0.911190	0.152993	-5.955778	0.0000
G1SM	0.463412	0.031959	14.50018	0.0000
PSM	-0.020583	0.020196	-1.019170	0.3084
DS*PSM	0.049833	0.028696	1.736599	0.0828

R-squared	0.319165	Mean dependent var	1.328733
Adjusted R-squared	0.315727	S.D. dependent var	1.579498
S.E. of regression	1.306574	Akaike info criterion	3.378947
Sum squared resid	1352.051	Schwarz criterion	3.408313
Log likelihood	-1341.510	Hannan-Quinn criter.	3.390230
F-statistic	92.81947	Durbin-Watson stat	1.846839
Prob(F-statistic)	0.000000		

Focusing at Table 2, it is noteworthy that the interaction term *(DS*PSM)* is statistically positive and significant. This indicates that a difference exists in the effect of pressure on goals scored in the 2nd half between men and women.

By adding the outcome of the variables *PSM* and the interaction term *(DS*PSM)*, the effect of pressure on female performance is calculated. With the use of this calculation, it is found that the effect of pressure on female performance is not statistically significant. Moreover, the effect of pressure on the numbers of goals scored in the 2nd half, as measured by the variable *PSM,* is small and not statistically significant for men either. Results therefore indicate that pressure does not influence female or male performance, but a difference in the effect of pressure on performance between men and women does exist. This specific outcome could

indicate that competitive pressure is an explanatory variable that causes the differences in absolute performances, as showed in chapter 4.

Furthermore, when looking at the dummy variable DS, which is '1' for females and '0' for males, it is found that there is a negative relation between female players and the number of goals scored in the 2nd half that is statistically significant. In addition, the output shows that there is a significantly positive relation between the number of goals scored in the 1st half, G1SM, and the number of goals scored in the 2nd half, G2SM. This implies that the more goals are scored in the 1st half, the more goals will be scored in the 2nd half of the game. One explanation for the positive effect of the number of goals scored in the 1st half on the number of goals scored in the 2nd half, is related to player capabilities. Whenever a player scores in the 1st half, he or she is likely to have the skills or capabilities needed to score and repetition is in the line of expectations. Consequently, when the ability to score is demonstrated in the 1st half, it suggests that the ability to score is present in the 2nd half as well. Therefore a players' individual capability influences for a great deal its own performance with respect to number of goals scored.

Another explanation that could identify the positive relation between goals scored in the 1st half and goals scored in the 2nd half could be a psychological factor. Whenever an individual scores in the 1st half, he or she experiences a rise in self-confidence. This rise could lead to circumstances in which a player becomes motivated and more blunt in the attempts to score goals. This could release a player from the pressure to score a goal and therefore a player's performance will increase. Moreover, every time a player attempts to score, the possibility to score a goal is created and whenever these chances are generated more often, the amount of goals scored will increase along with it. This effect could also be expected when looking closely at the results showed in Figure 2 in chapter 4. The figure suggests that whenever a high number of goal attempts is perceived, the actual amount of goals increases with it.

6.1.1. Robustness of the results of equation (1)

To test whether a relation exists between the independent variables used in equation (1), interaction terms are included. The results, as presented in Table 9 in the appendix, demonstrate that the interaction term (*G1SM*DS)* is statistically significant. This finding is in

line with results found by estimating equation (1), which suggest that the fact that a player is a woman will negatively influence the number of goals scored at a statistically significant level.

To test whether linearity is present in equation (1), a test is performed by the insertion of quadratic terms in equation (1). Results are shown in Table 10 in the appendix. The outcome demonstrates that no quadratic term is found to be significant. Therefore, it can be assumed that the model comprises a linear combination of parameters. By this, the use of OLS panel estimation is justified.

6.2. Including fixed effects into the equation

As described in chapter 5, knowing that talent varies among players resulted in the decision to include player-fixed effects. Consequently, equation (1) is transformed into equation (2). The results of estimating (2) can be found in Table 3.

Table 3: Estimation (2)

Dependent Variable: G2SM
Method: Panel Least Squares
Date: 11/26/09 Time: 16:10
Sample: 1 893
Periods included: 15
Cross-sections included: 116
Total panel (unbalanced) observations: 797

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.967635	0.085224	11.35401	0.0000
G1SM	0.213204	0.038133	5.591137	0.0000
PSM	0.000164	0.020036	0.008191	0.9935
DS*PSM	0.034643	0.028456	1.217436	0.2239

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.509520	Mean dependent var	1.328733
Adjusted R-squared	0.424157	S.D. dependent var	1.579498
S.E. of regression	1.198592	Akaike info criterion	3.337084
Sum squared resid	974.0297	Schwarz criterion	4.035982
Log likelihood	-1210.828	Hannan-Quinn criter.	3.605617
F-statistic	5.968818	Durbin-Watson stat	2.330238
Prob(F-statistic)	0.000000		

Contradicting to the model without fixed effects, it is notable that no statistical significance exists for the difference in the effect of pressure on performance between men and women. Results found in Table 3 do not provide evidence that confirm the existence of a difference in the effect of pressure on goals scored in the 2nd half between men and women. This effect is found to be positive, but certainly not significant. Similar to the results found in Table 2, the effect of pressure on male performance is not statistically significant. Again by adding the outcome of variable *PSM* and interaction term *(DS*PSM)*, it is seen that it is neither significant for females.

Furthermore, the inclusion of player-fixed effects leads to a better fit of the model. The R-squared increases from 32% to 51%. The higher the R-squared, the better the fit of the model. (Moore et al, 2008). After the inclusion of fixed effects, the goals scored in the 1st half are again positive and significant influencing the number of goals scored in the 2nd half. Although still present, its impact became smaller due to a decrease in the coefficient. One explanation could be that there are a few individuals in the competition that consequently score a high amount of goals. This will positively affect the overall effect of goals scored in the 1st half on the number of goals scored in the 2nd half. However, after the inclusion of fixed effects, the effect of pressure on performance is now controlled for within gender specific differences in the influence of pressure on performance. In other words, there is controlled for the effect that is caused by certain individual players and therefore the effect of goals scored in the 1st half on the goals scored in the 2nd half will be smaller. Together Table 2 and Table 3 suggest that capability approximately explains 50% of the relation between *G1SM* and *G2SM*, psychological factors and the shape of the day around 50% as well. Capability has already been included in individual fixed effects, but the player's fitness of the day is not.

6.2.1. Dynamic and static level

As described in chapter 4, Figure 2 demonstrates a striking gender difference in absolute performance. For all disciplines it is shown that males outperform females. It is even more striking that females do not take part of the static actions as frequent as males do. Especially, the figures on static actions result in a large gender difference in absolute performance. For that reason estimations are made at different stages in the game. By doing so, it is tested whether the existence of a difference in the effect of pressure on performance between gender varies with the situation of the game. Hence, the first regression focused merely on the static

situation of the game performed. Later, the regression related to the dynamic situation of the game is performed. Whether the situation of the game played impacts the effect of pressure on performance for males and females is described in the following paragraphs.

6.2.1.1. Splitting the sample for the static level

When looking closely at Table 4 displayed bellow, results correspond to those found by equation (2).

Table 4: Splitting the sample for the static level (equation 3)

Dependent Variable: GS2SM
Method: Panel Least Squares
Date: 11/28/09 Time: 15:04
Sample: 1 893
Periods included: 15
Cross-sections included: 116
Total panel (unbalanced) observations: 795

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.220474	0.037762	5.838552	0.0000
GS1SM	0.255124	0.039237	6.502132	0.0000
PSM	-0.001758	0.009806	-0.179333	0.8577
DS*PSM	0.006197	0.013990	0.442960	0.6579

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.494760	Mean dependent var	0.310692
Adjusted R-squared	0.406567	S.D. dependent var	0.764663
S.E. of regression	0.589055	Akaike info criterion	1.916627
Sum squared resid	234.5622	Schwarz criterion	2.616907
Log likelihood	-642.8591	Hannan-Quinn criter.	2.185722
F-statistic	5.609988	Durbin-Watson stat	2.149569
Prob(F-statistic)	0.000000		

The interaction term does not influence performance on a statistically significant level. This result found on the static regression suggest that men and women do not respond differently to competitive pressure when playing as a team in a static situation.

Furthermore, *PSM* does not significantly influence the number of goals scored in the 2nd half. The finding that pressure does not influence performance in the static play of the game is not unexpected. One explanation could be based on the special characteristic of the static situation of the game. Whenever a static situation is at play, merely one single player gets the chance to score a static goal. Consequently, only the star players are selected to play in the static situation. Thus, contrary to the dynamic situation, chances to score a static goal are far from evenly divided among players. Of course, players are only chosen to throw the static shot if they can handle the pressure. On the other hand, the outcome that there is no significant influence of pressure on the number of static goals scored in the 2nd half, can be said to be surprising. Again, the special character of the static situation could influence the effect of pressure on performance. Remember that for the static moment only one single player has to play the static goal attempt. All the other players do not fulfil a function at that moment, which provides them with a full focus on the single player that has to hit the basket. Therefore it is thinkable that whenever pressure is high and all the other players can watch the performance of the shooter closely, this will influence performance. Consequently, it is notable that in the static estimation the pressure level at half-time is not significant.

6.2.1.2. Splitting the sample for the dynamic level

In Table 5, the output of equation (4) with regards to the dynamic situation of the game is demonstrated. The table points out that the main results found in the dynamic situation are similar to results found in the static situation. The interaction term *(DS*PSM)* is not statistically significant either. This indicates that no evidence is found that the dynamic situation of the game influences the effect of pressure on performance differently between men and women. Moreover, it is found that pressure does not influences male or female performance with any statistical significance.

Table 5: Splitting the sample for the dynamic level (equation 4)

Dependent Variable: GD2SM
Method: Panel Least Squares
Date: 11/28/09 Time: 15:06
Sample: 1 893
Periods included: 15
Cross-sections included: 116
Total panel (unbalanced) observations: 795

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.784140	0.071051	11.03634	0.0000
GD1SM	0.156381	0.038428	4.069458	0.0001
PSM	0.004137	0.017463	0.236924	0.8128
DS*PSM	0.028635	0.024795	1.154894	0.2485

Effects Specification			
Cross-section fixed (dummy variables)			
R-squared	0.366009	Mean dependent var	1.020126
Adjusted R-squared	0.255342	S.D. dependent var	1.210615
S.E. of regression	1.044683	Akaike info criterion	3.062527
Sum squared resid	737.7615	Schwarz criterion	3.762807
Log likelihood	-1098.354	Hannan-Quinn criter.	3.331622
F-statistic	3.307297	Durbin-Watson stat	2.355941
Prob(F-statistic)	0.000000		

The consistency found in the dynamic and static output is surprising and is caused by the variable *PSM* that does not demonstrate statistical significance in both situations. As mentioned before, only players that have a high chance of scoring a goal are selected to do so in the static play. In the dynamic situation on the other hand, players with mixed abilities and specialism's are part of the same team. Important to remember is that when a player is positioned as a defender, the possibility that the player hits the basket is practically zero. This means that in case defenders are more important in dynamic situations, the chances to score a goal are different then those in the static situation. Figure 2 demonstrated that female players score less goals in comparison to male players. In practice, one could expect that women are positioned as a defender more often than men, due to their higher level of risk-aversion compared to men (Gupta et al, 2005).

6.2.3. The effect of the relative position within rival teams

All prior equations used the variable *PSM* as an independent variable. The definition is described as: *the absolute difference in amount of goals scored between two opposing teams at half-time*. More specifically, the criterion used does not give any information on the relative position within rival teams. Due to the lack of a one-sided story in existing literature concerning the influence of a teams' position in comparison to one's opponent on performance, equation (5) is performed to test whether the fact that a team is in lead, faces a tie or is lagging behind at half-time influences the effect of pressure on performance.

Table 13 in the appendix gives the results of estimating (5). First of all, it is found that the interaction terms $(B_S * P_{SM})$ and $(B_S * P_{SM} * D_S)$ do not show statistical significance. This suggest that there exists no difference in the effect of the relative position within rival teams on performance for both sexes. Results found in Table 13 could be said to be surprising. Beforehand, it could be expected that the relative performance of a team with regards to another team should affect performance in the 2nd half. Especially, when looking at the data available at half-time and the final scores, it is remarkable that in only 13% of the matches played, teams are able to change their winning or loosing mood. In other words, the team that fell behind at half-time won the game in the end, or just the other way around, in approximately 7 out of 50 matches. One explanation that the effect of the relative position within rival teams does not seems to influence 2nd half performance, could be that players do not devote value to half-time scores, because they experience that the play is not won or lost yet. Moreover the variable *PSM* is not statistically significant for males and the interaction term *(PSM*DS)* does not show statistical significance for females. This indicates that pressure does not influence gender performance. Lastly, it is demonstrated again that goals scored in the 2nd half show a statistically significant positive relation with goals scored in the 1st half.

6.2.4. Including efficiency into the equation

No cause has yet been found that can explain the difference in absolute gender performance whenever males and females work as a team. As shown in chapter 4, Table 1 suggests that the efficiency level varies between genders. Therefore, equation (7) tests whether pressure influences gender efficiency. To be exact, it studies whether a difference exists in the influence of pressure on efficiency between genders. The outcome is presented in Table 6. Again, no statistical significance for a gender difference in the effect of pressure on efficiency

is found. When zooming in at static and dynamic level, the results found are not different from the outcome presented by estimating (7). In addition, *PSM* does not have a statistically significant influence on efficiency in the 2nd half for males. Neither does (*DS*PSM)* have a statistically significant influence on female efficiency in the 2nd half.

Table 6: Efficiency (equation (7))

Dependent Variable: E2
Method: Panel Least Squares
Date: 11/28/09 Time: 16:47
Sample: 1 893
Periods included: 15
Cross-sections included: 115
Total panel (unbalanced) observations: 729

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.183283	0.015688	11.68309	0.0000
E1	0.086952	0.043167	2.014311	0.0444
PSM	0.002129	0.003642	0.584717	0.5590
DS*PSM	-0.000412	0.005237	-0.078615	0.9374
	Effects Specification			
Cross-section fixed (dummy variables)				
R-squared	0.239383	Mean dependent var		0.208786
Adjusted R-squared	0.093733	S.D. dependent var		0.223641
S.E. of regression	0.212902	Akaike info criterion		-0.108818
Sum squared resid	27.69488	Schwarz criterion		0.634416
Log likelihood	157.6641	Hannan-Quinn criter.		0.177946
F-statistic	1.643546	Durbin-Watson stat		2.165297
Prob(F-statistic)	0.000105			

6.4. Alternative estimation method

An alternative method to study the effect of pressure on performance is estimated for this thesis as well. The main difference is that in the first method pressure is measured *at half-time* and in the alternative method, pressure is measured *at the moment a player scores a goal.* By using the binary Probit method, and given that a goal has been scored, the chance the goal is

scored by a man or a woman could be computed. Table 7 demonstrates the results of estimating (8).

Table 7: Alternative estimation method (equation (8))

Dependent Variable: F
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 12/07/09 Time: 12:24
Sample: 1 2178
Included observations: 2178
Convergence achieved after 3 iterations
Covariance matrix computed using second derivatives

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.771344	0.067767	-11.38235	0.0000
RS	0.030107	0.009296	3.238622	0.0012
H	0.261508	0.086822	3.012007	0.0026
RS*H	-0.007839	0.017969	-0.436268	0.6626

McFadden R-squared	0.007115	Mean dependent var	0.299816
S.D. dependent var	0.458283	S.E. of regression	0.456654
Akaike info criterion	1.216400	Sum squared resid	453.3495
Schwarz criterion	1.226843	Log likelihood	-1320.660
Hannan-Quinn criter.	1.220218	Restr. log likelihood	-1330.123
LR statistic	18.92660	Avg. log likelihood	-0.606364
Prob(LR statistic)	0.000283		

Obs with Dep=0	1525	Total obs	2178
Obs with Dep=1	653		

Remarkable, the results demonstrate that given a goal, pressure significantly influences the chance negatively that a goal is scored by a woman. Thus, the smaller the variable RS, the larger the pressure that is measured and accordingly the performance of women will decrease relatively compared to men. This finding confirms that a gender difference in performance under pressure exists.

Furthermore, the dummy variable H, which is '1' for the 1st half and '0' for the 2nd half, has got a significant positive effect on the chance a woman scores a goal. In contrast, the interaction term is not significant. Hence there exists no difference in the chance a given goal is scored by a female in the 1st half and 2nd half.

6.4.1. Robustness of the alternative method

Table 8 demonstrates the results of estimating (9).

Table 8: Robustness of the alternative method (equation (9))

Dependent Variable: F
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 12/07/09 Time: 12:25
Sample: 1 2178
Included observations: 2178
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.426255	0.073021	-5.837451	0.0000
RS	0.037186	0.022607	1.644902	0.1000
MS	-0.007790	0.002310	-3.372410	0.0007
RS*MS	-9.06E-05	0.000499	-0.181426	0.8560

McFadden R-squared	0.008419	Mean dependent var	0.299816
S.D. dependent var	0.458283	S.E. of regression	0.456300
Akaike info criterion	1.214807	Sum squared resid	452.6478
Schwarz criterion	1.225250	Log likelihood	-1318.925
Hannan-Quinn criter.	1.218625	Restr. log likelihood	-1330.123
LR statistic	22.39677	Avg. log likelihood	-0.605567
Prob(LR statistic)	0.000054		

Obs with Dep=0	1525	Total obs	2178
Obs with Dep=1	653		

By taking into account guidelines for statistical significance, results indicate that after the inclusion of the explanatory variable M_S, the variable pressure shows still a little statistical significance (Moore et all, 2008). Although this effect is now borderline significant, the size of the effect is similar to the effect found in the previous estimation. This result indicates that when pressure is decreasing, the performance of women will increase relatively compared to men. Again, these results indicate that a gender difference in performance under pressure exists.

Furthermore, M_S shows a negative significance and therefore suggests that as the game progresses women tend to score less. This finding is in line with the findings as shown in Figure 4 which indicate that women perform worse in the 2nd half compared to the 1st half. Moreover, the interaction term *(RS*MS)* does not show significance. This means that given a

goal has been scored, the chance that the goal is scored by a female does not vary over the course of the match.

To test whether the relative position within rival teams at the moment that a player scores a goal influences the chance a goal is scored by females is shown in Table 14 in the appendix. Results show that the explanatory variable *RS* is positive and significant. This suggests that whenever the variable *RS* is increasing and pressure is accordingly decreasing, the chance that a female player scores a goal increases relatively compared to males. Moreover, both the interaction terms are not statistically significant. Hence, whether a team is in lead, faces a tie or is lagging behind does not influence the chance a given goal is scored by a woman relative to a men. Furthermore, there is no relation between the chance a given goal is scored by a female and timing of the goal as measured by the minute the goal is scored. Moreover, the variable M_S is still negative significant and implies that as the game progresses women tend to score less. This means that, the further in the game, the chance that a woman scores a goal declines.

7. Conclusion

Female participation at the work floor has increased enormously in recent decades, with a more gender diverse workforce as a result. Today, employees often function as part of a team. Due to the gender diverse workforce, most of these teams include both males and females, Although females carry out the same tasks as men within the teams, women still get paid worse in comparison to their male teammates. It is remarkable that this unbalance remains to be present. A variety of research has been done in order to explain the differences that exist between the genders. The majority of studies argues that it is caused by factors like nature, nurture, ability and preferences. The research done so far that focuses on whether gender difference exists when working together as a team under competitive pressure is inadequate. This thesis provides evidence on the effect of competitive pressure on gender performance. It analyses a sample of 50 matches played by 10 different clubs in the Korfball league 2008-2009. Korfball is a ball game played between two mixed gender teams.

Two research methods have been used to investigate the main question. In the first method, the effect of competitive pressure is measured by means of comparing the goals scored in the 1st half and 2nd half between men and women. Competitive pressure is defined as the absolute difference in the number of goals scored between two rival teams at half-time. Performance is defined as the amount of goals scored per individual in the 1st half and in the 2nd half. The sample analysis was done by means of an OLS regression. The main finding of the first research method indicates that the difference in the effect of pressure on performance between men and women is not statistically significant. Furthermore, when taking into account the static and dynamic level separately, no statistically significant difference in the effect of pressure on performance between men and women could be found either. In other words, no evidence is found that the situation of the game causes a difference in the influence of the effect of pressure on performance between genders. Moreover, no evidence is found that the relative position within rival teams influences the effect of pressure on performance. Lastly, no evidence is found in favour of a gender difference in the effect of pressure on performance when looking at gender efficiency.

With the use of the second method, the effect of competitive pressure on gender performance is measured by means of comparing the chance that a goal is scored by a female to the chance that a goal is scored by a male. Competitive pressure is defined as the absolute difference in

amount of goals scored between two opposing teams at the moment a player scores a goal. In the alternative method, performance is measured in the same manner as in the first method. The sample analysis was done by means of a Probit analyses. The second method does confirm the expectation that a gender differences does exist. The main finding of the alternative research method indicates that a gender difference in performance under pressure exists. Given that a goal is scored, pressure has a significantly negative influence on the chance that the goal is scored by a woman. The results consequently indicate an inverse linear relationship: the larger the amount of pressure that is measured, the smaller the performance of women becomes relative to men. After performing a robustness check by taking into account the minute a player scores a goal, the effect of pressure became smaller, but is still statistically significant. Again this result indicates that when pressure is increasing, the performance of a woman will decrease relatively compared to men. Similar to the first method no evidence is found that the relative position within rival teams influences the effect of pressure on performance.

The results found by the two methods are contradicting each other. The fist method finds no evidence in favour of a gender difference in performance under pressure whereas the alternative method finds evidence in favour of a gender difference in performance under pressure. One explanation for the variation in this outcome could be the difference in the measure of pressure that was used in both methods. In the first method, pressure is measured at match level compared to pressure that is measured at player level in the second method. The measure of pressure used in the second method is preferred for the reason that it could be interpreted as a more personalised measure.

This thesis provides insights in gender performance under pressure when playing as a team. Due to the contrasts found between the two research methods, no clear explanation is found to answer the hypotheses that were stated in the introduction questioning whether gender equality really is an objective within reach. Subsequently, if generalisable, the evidence of a gender difference in the effect of pressure on performance found in method 2 might indicate the existence of gender differences in team work situations. Whether this improves or harms gender equality has to be investigated in future research.

8. Limitations and directions for further research

This thesis provides insights on whether a gender difference exists in performance whenever males and females play together as a team that is exposed to competitive pressure. While former research on gender differences was mainly based on individual performance, this thesis researched gender performance within a team.

This study is the first to use data on Korfball. Consequently, it could be questioned to what extent results based on sport matches are convertible to the workplace. It could be argued that sport performance mostly results from physical factors and that work related performance results from intellectual ability. No one–sided story exists on this topic yet. Therefore, the generalisation of results to real life issues might lead to incorrect conclusions. Moreover, this study focuses on whether pressure influences the number of goals scored. This means that the focal point of the study are players in attack positions. Whenever the performance of defenders is affected by pressure as well, the results found in this thesis will be distorted. Unfortunately, it was not possible to correct for this effect.

The existence of physical differences between the sexes is well-known. Nevertheless, whether these exist in the Korfball sport is open for discussion. By observing matches, no physical difference could be identified. No gender difference is observed in the speed of throwing or in the average distance to the basket chosen by gender when attempting to score a goal. In addition, after questioning several players, the overall conclusion is that both genders treat the opposite gender as equal. Players declared, patently obvious, that the choice to throw a ball to a teammate is never based on gender. When physical difference are present between sexes, it could influence gender performance measured in this study.

Next, it is questionable whether a selection effect within the data occurred. It could be suggested that Korfball is more popular amongst females. Based on this, it could be expected that female potential is more abundant compared to males. Whenever many females want to play and along with that competition within gender is high, then the relative ability to play among females could be higher compared to men in this dataset. This could cause a bias when interpreting the results found.

Abundantly clear are the results found concerning absolute performance. Males outperform females not only on the total goals attempts, but also the total goals actually scored. One explanation for the absolute difference in gender performance could be that females face a higher level of risk aversion compared to males. The fact that males more often try to hit the basket, will partly declare why men score more often than women. The possible importance of risk on performance is not taken into account in this study.

In this research, a distinction is made between dynamic and static situations at play. This is a well-considered choice based on data described in chapter 4. Figure 2 shows that males are selected to play static situations more often than females. This means that static situations are not divided equally. Preconceptions as: 'men are better in sports than women' could be an explanation for the fact that males are chosen to play static actions more often. Irrespective of the reason, it is notable to say that prejudices are not taken into account in this study.
Furthermore, the dataset could be considered as a limitation in itself. It covers a selection of matches played in the Korfball league 2008-2009. It could be questioned whether using a larger dataset could lead to different results. Moreover, when extending the dataset, it is possible to control for the importance of the match. It is logical to think that whenever two teams play for the championship, circumstances will be different compared to a situation in which no team is directly rewarded for winning the match. A question that arises in this context is whether relative team performance influences gender performance.

In conclusion, this study provides insight into gender performance when playing as a team under competitive pressure. Data is used covering one competition year. A comprehensive study that analyzes a larger sample over a larger time would perhaps provide us with more solid insights to generalise conclusions and overcome some of the (possible) issues described in the previous paragraph. Furthermore, a study that analyses not merely mixed team performance under pressure, but also includes single-sex team performance under pressure as well, which will provide us with additional insights into gender performance within teams.

References

Adams, R.B., Ferreira, D., (2007) *Gender Diversity in the boardroom,* Working Draft: March 15

Alchian, A.A., Demsetz, H., (1972), *Production, Information Costs, and Economic Organization,* The American Economic Review, Vol. 62, No. 5. (Dec., 1972), pp. 777-795.

Andreoni, J., Vesterlund, L., (2001), *Which is the fair sex? Gender differences in altruism,* The Quarterly Journal of Economics, February 2001, Vol. 116, No. 1, Pages 293-312

Betrand, M., Hallock, K.F., (2001) *The Gender Gap in Top Corporate Jobs,* NBER working paper series no. 7931.; Cambridge: National Bureau of Economic Research.

Booth, A.L., Nolen, P.J., Park, W., (2009), *Choosing to compete: How different are girls and boys?* Discussion Paper No. 4027

Brown-Kruse, J., Hummels, D., (1993), *Gender effects in laboratory public goods contribution: Do individuals put their money where their mouth is?*, Journal of Economic Behavoir & Organization, Vol. 22 (1993), 255-267. North-Holland

Cadsby, C.B., Maynes, E., (1998), *Gender and free riding in a threshold public goods game: experimental evidence,* Journal of Economic Behavoir & Organization, Vol. 34 (1998) 603-620

CBS, (2002), *The life of women and men in Europe: A statistical portrait of women and men in all stages of life.*

Croson, R., (2000), *Feedback in voluntary contribution mechanisms: an experiment in team production*, Research in Experimental Economics, Volume 8, pages 85-97.

Croson, R., Gneezy, U., (2009), *Gender differences in preferences,* Journal of Economic Literature*, 47(2): 448–74.*

Gupta, N.D., Poulson, A., Villeval, M.C., (2005), *Male and female competive behavoir; experimental evidence,* Centre National de la Research Scientifique, Working Paper No. W.P. 05-12

Delfgaauw, J., Dur, R., Sol, J., Verbeke, W., (2009), *Tournament Incentives in the Field: Gender Differences in the Workplace*, Tinbergen Institute Discussion Paper

Eckel, C.C., Grossman, P.J., (2003), *Men, Women and risk aversion: experimental evidence,* forthcoming The Handbook of experimental Economics Results

Gilligan, C., (1993), *In a different voice: Psychological theory and women's development,* Harvard University Press, Revised 1993

Gneezy, U., Niederle, M., Rustichini, A., (2003), *Performance in competitive environments: gender differences,* Quarterly Journal of Economics, August 2003, pp.1049-1074

Gneezy, U., Rustichini, A., (2004), *Gender and competition at a young age,* The American Economic Review Paper and proceedings, May, pp. 377-381

Gneezy, U., Leonard, K.L., List, J.A., (2008), *Gender differences in competition: evidence from a Matrilineal and Patriarchal society,* National Bureau of Economic Research, Working Paper 13727

Ivanova-Stenzel, R., Kubler, D., (2005), *Courtesy and Idleness: Gender Difference in Team Work and Team Competition,* IZA Discussion Paper No. 1768

Ledyard, J.O., (1994), *Public Goods: A survey of experimental research,* Social Science Working Paper 861, Forthcoming in The Handbook of Experimental Economics.

Maccoby, E.E., (1990), *Gender and relationships: A development account, The American psychologist,* The American Psychologist Association, Vol. 45, No. 4, 513-520

Marwell, G., Ames, R., (1979), *Experiments on the provision of public goods I: Resources, interest, group size, and the free rider problem,* American Journal of Sociology, **84** (1979), pp. 1335–1360.

Moore, D.S., McCabe, G.P., Duckworth, W.M., (2008), *The practice of Business Statistics*, W.H. Freeman & Company

Nalbantian, H.R., Schotter, A., (1997), *Productivity under group incentives: An Experimental Study,* The American Economic Review, Vol. 87, No. 3, pp. 314-341

Nicolai, N.J., (2009), *Chronische stress, sekse en gender,* Tijdschrift voor psychiatrie 51 (2009) 12

Niederle, M., Vesterlund, L., (2007), *Do women shy away from competition? Do men compete too much?* The Quarterly Journal of Economics, August 2007, Vol. 122, No. 3, Pages 1067-1101

Niederle, M., Segal, C., Vesterlund, L., (2008), *How costly is diversity? Affirmative action in light of gender differences in competitiveness,* NBER Working Paper No. W13923

Nowell, C., Tinkler, S., (1994), *The influence of gender on the provision of a public good*, Journal of Economic Behaviour & Organization, Vol. 25 (1994) 25-36

Pindyck, R.S., Rubinfeld, D.L., (1997), *Econometric Models and Economic Forecasts,* McGraw-Hill Education – Europe, fourth edition.

Vogelzang, B., (2004), *Econometrics: Theory and Applications with EViews,* Financial Times Press

Appendix

Table 9: Inclusion interaction terms in equation (1)

Dependent Variable: G2SM

Method: Least Squares

Date: 11/26/09 Time: 13:20

Sample (adjusted): 1 891

Included observations: 797 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.925613	0.151818	6.096880	0.0000
DS	-0.491996	0.200271	-2.456655	0.0142
G1SM	0.583346	0.058800	9.920792	0.0000
PSM	-0.012292	0.028964	-0.424400	0.6714
DS*PSM	0.040854	0.039098	1.044923	0.2964
G1SM*PSM*DS	0.014837	0.019635	0.755642	0.4501
G1SM*DS	-0.395861	0.110424	-3.584916	0.0004
G1SM*PSM	-0.005398	0.010158	-0.531422	0.5953

R-squared	0.338626	Mean dependent var	1.328733
Adjusted R-squared	0.332758	S.D. dependent var	1.579498
S.E. of regression	1.290211	Akaike info criterion	3.357475
Sum squared resid	1313.404	Schwarz criterion	3.404460
Log likelihood	-1329.954	Hannan-Quinn criter.	3.375528
F-statistic	57.71015	Durbin-Watson stat	1.874475
Prob(F-statistic)	0.000000		

Table 10: Inclusion quadratic terms in equation (1)

Dependent Variable: G2SM

Method: Least Squares

Date: 11/26/09 Time: 14:24

Sample (adjusted): 1 891

Included observations: 797 after adjustments

	Coefficient	Std. Error	t-Statistic	Prob.
C	1.026306	0.159511	6.434069	0.0000
DS	-0.839353	0.213058	-3.939561	0.0001
G1SM	0.464436	0.031994	14.51620	0.0000
PSM	0.035992	0.057339	0.627704	0.5304
DS*PSM	0.013510	0.081298	0.166183	0.8681
PSM*PSM	-0.004468	0.004238	-1.054235	0.2921
(PSM*PSM)*DS	0.002843	0.006047	0.470191	0.6383

R-squared	0.320244	Mean dependent var	1.328733
Adjusted R-squared	0.315081	S.D. dependent var	1.579498
S.E. of regression	1.307190	Akaike info criterion	3.382380
Sum squared resid	1349.908	Schwarz criterion	3.423492
Log likelihood	-1340.879	Hannan-Quinn criter.	3.398176
F-statistic	62.03029	Durbin-Watson stat	1.847253
Prob(F-statistic)	0.000000		

Table 11: Efficiency; Splitting the sample for the static level

Dependent Variable: ES2

Method: Panel Least Squares

Date: 11/29/09 Time: 13:31

Sample: 1 893

Periods included: 14

Cross-sections included: 85

Total panel (unbalanced) observations: 153

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.496157	0.092491	5.364372	0.0000
ES1	0.170245	0.119269	1.427395	0.1583
PSM	0.019036	0.019289	0.986863	0.3274
DS*PSM	-0.033529	0.040247	-0.833090	0.4078

Effects Specification
Cross-section fixed (dummy variables)

R-squared	0.611692	Mean dependent var	0.621569
Adjusted R-squared	0.091958	S.D. dependent var	0.414370
S.E. of regression	0.394859	Akaike info criterion	1.273699
Sum squared resid	10.13437	Schwarz criterion	3.016696
Log likelihood	-9.437959	Hannan-Quinn criter.	1.981733
F-statistic	1.176932	Durbin-Watson stat	3.701720
Prob(F-statistic)	0.246361		

Table 12: Efficiency; Splitting the sample for the dynamic level

Dependent Variable: ED2

Method: Panel Least Squares

Date: 11/29/09 Time: 13:29

Sample: 1 893

Periods included: 15

Cross-sections included: 131

Total panel (unbalanced) observations: 694

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.171760	0.015735	10.91606	0.0000
ED1	0.040735	0.043513	0.936161	0.3496
PSM	0.001445	0.003924	0.368313	0.7128
DS*PSM	-0.003250	0.005642	-0.575935	0.5649

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.181971	Mean dependent var	0.178386
Adjusted R-squared	-0.012311	S.D. dependent var	0.206866
S.E. of regression	0.208135	Akaike info criterion	-0.129628
Sum squared resid	24.25930	Schwarz criterion	0.747449
Log likelihood	178.9808	Hannan-Quinn criter.	0.209549
F-statistic	0.936633	Durbin-Watson stat	2.431855
Prob(F-statistic)	0.672991		

Table 13: Method 1; the effect of the relative position within rival teams

Dependent Variable: G2SM
Method: Panel Least Squares
Date: 12/14/09 Time: 14:12
Sample: 1 894
Periods included: 15
Cross-sections included: 116
Total panel (unbalanced) observations: 797

	Coefficient	Std. Error	t-Statistic	Prob.
C	0.968401	0.086495	11.19606	0.0000
G1SM	0.212065	0.038964	5.442543	0.0000
PSM	-0.005192	0.023614	-0.219851	0.8261
PSM*DS	0.046801	0.033664	1.390213	0.1649
PSM*BS	0.012831	0.028972	0.442881	0.6580
PSM*BS*DS	-0.027541	0.040694	-0.676773	0.4988

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.509854	Mean dependent var	1.328733
Adjusted R-squared	0.422846	S.D. dependent var	1.579498
S.E. of regression	1.199955	Akaike info criterion	3.341423
Sum squared resid	973.3678	Schwarz criterion	4.052067
Log likelihood	-1210.557	Hannan-Quinn criter.	3.614469
F-statistic	5.859834	Durbin-Watson stat	2.274268
Prob(F-statistic)	0.000000		

Table 14: Method 2; the effect of the relative position within rival teams

Dependent Variable: F
Method: ML - Binary Probit (Quadratic hill climbing)
Date: 12/07/09 Time: 12:39
Sample: 1 2178
Included observations: 2178
Convergence achieved after 4 iterations
Covariance matrix computed using second derivatives

	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.425533	0.073030	-5.826805	0.0000
RS	0.042922	0.023069	1.860607	0.0628
MS	-0.007746	0.002311	-3.352374	0.0008
RS*MS	-0.000100	0.000500	-0.200371	0.8412
RS*L	-0.012855	0.010149	-1.266592	0.2053

McFadden R-squared	0.009023	Mean dependent var	0.299816
S.D. dependent var	0.458283	S.E. of regression	0.456216
Akaike info criterion	1.214987	Sum squared resid	452.2728
Schwarz criterion	1.228041	Log likelihood	-1318.121
Hannan-Quinn criter.	1.219760	Restr. log likelihood	-1330.123
LR statistic	24.00470	Avg. log likelihood	-0.605198
Prob(LR statistic)	0.000080		

Obs with Dep=0	1525	Total obs	2178
Obs with Dep=1	653		

Figure 7: Histogram; Normality test equation (1)