Essays on economic behavior, gender and strategic learning

Patrik Gränsmark
Para Rocio, Irene y Patricia
por hacerme reir, cantar y bailar.
Contents

Acknowledgements

Introduction

Paper 1: Strategic Behavior across Gender: A Comparison of Female and Male Expert Chess Players

Paper 2: Gender Differences in Time Preference and Inconsistency among Expert Chess Players

Paper 3: Beauty Queens and Battling Knights: Risk Taking and Attractiveness in Chess

Paper 4: Strategic Learning in Repeated Chess Games
Acknowledgements

Many people have assisted me in producing this PhD thesis in economics and it would be wrong to try to take all the credit for it. First, I would like to thank several chess players who have participated in one way or another. These players are: Evgenij Agrest, Inna Agrest, Svetlana Agrest, Susanna Berg, Patrik Berggren, Nina Blazekovic, Pia Cramling, Niclas Hjelm, Magnus Holm, Emilia Horn and Anders Livner. A special thanks to Luis Couso who has encouraged me and shared my joy along the way of the making of this thesis. Finally, this thesis would not exist had it not been for the chess data and I would like to express my deepest appreciation to Fredrik Stark and Chessbase who equipped me with the data necessary to pursue my research ideas.

Furthermore, I would like to express my gratitude to some colleagues who have read and commented on my research work. In particular, these people are Magnus Johannesson, Åsa Rosén, Anders Stenberg, and the participants at the SOFI seminar series. I am also grateful for administrative support from all the staff, in particular Ante Farm, Anne-Maj Folmer-Hansen and Ingela Arvidsson.

I would like to thank my supervisor, Eskil Wadensjö, who has read numerous versions of my papers. His comments are always excellent and delivered promptly. The most noticeable things about Eskil are his good mode and the fact that he always seems to have all the time in the world for me although I know that is not the case. When I enter into his office he always receives me (and I am sure, everybody else) with human warmth. These things have allowed and stimulated me to build up my confidence and to pursue research that has the intention to be independent and innovative. What more can one ask from a PhD supervisor!

Two new and highly welcome additions to my list of friends and colleagues are Anna Dreber and Robert Östling. Currently I have the great pleasure to work with and learn from Anna who literally spreads energy around her in whatever she does. Robert is showing a large amount of patience when kindly answering my never ending stream of questions. To both of you, thank you!

There is one person who deserves a very special attention. I have learnt economics from books, papers, exercises, lectures and computer programs. But more than anything I have learnt from my dear brother-in-arms, Christer “don Quixote” Gerdes. With joy, delicacy, accuracy and patience he has instructed me along the way and I am convinced that this thesis would
not have been as good or enjoyable to write without him. In the beginning of this year we attacked our first windmill together, and with success I might add. I hope we will have the opportunity to take on numerous windmills together also in the future. You are a great inspiration to me and being your friend and colleague is a pure pleasure!

The person who taught me how to play chess was my uncle, Lennart Gränsmark, with whom I started to play when I was about five or six years old. I lost all the time so I didn’t really see the fun of it. But one day when I spent one of many weekends at my grandparents’ house the balance was altered. He had just returned from the pub when I asked him to play a game with me, which I happened to win (whether he let me win or was affected by the Swedish mediocre lager is still unclear). Anyway, thank you, uncle, for teaching me to play chess! When talking about my uncle and don Quixote I cannot resist bringing up one of the most frequently told anecdotes in my family. While still a child, my uncle didn’t know how to say windmill (väterkvarn) instead of which he said “vanevärld” which means “world of illusions”.

Finally, I would like to address my wife Rocio. But what could I possibly say that I have not already said to her? Since I tend to take her for granted far more than I should, the answer is: Everything! Anything! I know that I am too abstract-minded to always say out loud what I think about her so I will take the opportunity to express my feelings for her here and now. Rocio, you are the light of my life, my joy, my happiness! If you continue to understand and support me as you have until this day, I could not ask for more in life. And if you sometimes think that I am just too much to take, remember that women are supposed to be less aggressive than men.

Stockholm, December 2010
Introduction

This thesis consists of four independent empirical essays. The papers have two common themes. First, they all rely on the same data set which builds on international expert chess games. Second, the papers are all about economic behavior in one way or another. The data are rich in both variation and number of observations, with clear outcomes at the same time as they contain an almost perfect record of all expert games played in the last half century. In sum, it is a valuable and rather unique data set for the study of economic behavior. Undoubtedly, the largest advantage of the data is the existence of the Elo rating which is an objective measure of a player’s chess skill.

Economic behavior depends to a large extent on the agents’ economic preferences which are important building blocks for both theory and empirics. Unfortunately, economic preferences are often very difficult to measure. There are five well defined concepts of economic preferences: altruism, impatience, rationality, risk taking and time consistency. These concepts, often referred to as deep preferences, have formal definitions and have been studied in many empirical studies. There are still other concepts that have not yet been defined in a satisfactory way, but although they lack the theoretical foundation of the deep preferences they are nevertheless important and the interest for them is growing. Cooperation, obedience to authority, competition and confidence are some examples. If women and men differ in economic preferences it will of course affect many areas of society, not least policy making. This thesis considers gender differences in risk taking in paper 1 and 3, impatience and time consistency in paper 2, whereas paper 4 studies the updating of beliefs about the opponent’s preferences.

Below I give a brief summary of the setup and findings of each paper of the thesis, which is followed by a discussion of chess competitions and how they may affect the results of the papers.

Paper 1: Strategic behavior across gender: A comparison of female and male expert chess players

This paper aims to measure risk behavior among expert chess players with focus on gender differences. It investigates whether there are general gender differences in risk taking. Furthermore, as chess is a game between two players, it is possible to study if the behavior changes depending on the sex
of the opponent. Finally, we analyze if potential behavioral changes influence performance.

The study employs a panel data set on international chess with 1.4 million games recorded over a period of 11 years. The structure of the data set allows us to use individual fixed-effect estimations to control for aspects such as inmate ability as well as other characteristics of the players. Most notably, the data contains an objective measure of individual playing skill, the so-called Elo rating, which comes a long way in controlling for gender differences in productivity.

As there are three outcomes in chess, a win, a draw (a tie) and a loss, it is well suitable for studying risk behavior. This follows as a game starts in a saddle point equilibrium and the players can choose to remain in this equilibrium and split the payoff or to break the balance and play for a win with the risk of losing.

To estimate risk behavior we carried out a small scale survey among eight expert chess players where we asked them to categorize 500 standardized chess opening strategies as being either risk loving, neutral or risk averse. An opening strategy in chess is an individualized development scheme for the chess pieces regarding where and when a piece should be moved. These openings are prepared by a player in advance and reflect, among other things, the level of risk the player prefers. The proxy of risk is created from both white’s and black’s perspectives which implies that we have an individualized measure of risk taking. We require that at least 75 percent of the chess experts coincide to categorize a strategy to be either risk loving or risk averse.

In line with previous research, we find that women are more risk averse than men. Although such gender differences have been found in other studies, it is quite remarkable to find these differences in such a competitive and rational environment as international expert chess. A novel finding of the present paper is that men choose more aggressive strategies when playing against female opponents even though such strategies reduce their winning probability.

Paper 2: Gender Differences in Time Preference and Inconsistency among Expert Chess Players

We have all experienced moments of regret at leaving unpleasant tasks for later although we know we would be better off in the long run by doing them now. This is also true for pleasant tasks, or rewards, which we tend to carry out, or consume, earlier than we would prefer in the long run. Such acts are said to be due to self-control problems as we are just too tempted by the present utility to care about the long-term utility. We also know that people differ in their degree of impatience as some people seem to be able to wait patiently while others want instant action.
This paper presents empirical findings on gender differences in time preferences (impatience) and time inconsistency (self-control problems). The study is based on international chess data from 1.5 million expert games. Controls are included for age, nationality, risk taking and playing skill where the latter accounts for gender differences in productivity. I also include the risk control created in paper 1.

A player can influence how long they want the game to last. There are various examples of players who choose to sit on their hands to avoid making a move too fast, without sufficient reflection. In this paper, impatience is estimated by considering preferences for different game durations.

In chess there is a time control limit at the 40th move, where a player must make 40 moves in two hours. Apart from being too impatient, a notorious issue in chess is to avoid spending too much time on each move since this would lead to a loss of the game if the 40 moves are not made in the two hours available. Numerous players have made themselves famous for spoiling winning positions due to bad self-control as regards time consumption. Time inconsistency is measured by exploiting the 40th move time control, where over-consumption of thinking time is inefficient as it produces unnecessary losses.

The results reveal that men are significantly more impatient while women are significantly more time inconsistent. Moreover, the gender difference in impatience increases with expertise while the difference in inconsistency decreases.

Paper 3: Beauty Queens and Battling Knights: Risk Taking and Attractiveness in Chess

In this study we explore the relationship between attractiveness and risk taking in chess. We examine whether people use riskier strategies when playing with attractive opponents, whether this affects performance, and whether there are gender differences in the reaction to an attractive opponent.

We use a large international panel dataset on chess competitions which includes a control for playing skill. We combine this data with results from a large survey on an online labor market where participants were asked to rate the photos of 626 expert chess players regarding physical attractiveness. To estimate risk taking, we use two independent measures. First, we employ the risk measure created in the first paper, i.e. concerning the choice of opening strategies. Second, we take advantage of the fact that risk averse players, when confronting equally strong opponents, may benefit from accepting a draw while the game is still in the saddle point equilibrium as this assures the expected payoff with certainty rather than gambling for a win with the risk of losing.
Our results suggest that male chess players choose significantly riskier strategies when playing against an attractive female opponent, although this does not improve their performance. Women’s strategies are not affected by the attractiveness of the opponent. Our two risk measures produce very similar results which strengthen the conclusions.

**Paper 4: Strategic Learning in Repeated Chess Games**

This paper examines if expert chess players in repeated chess games with the same opponent learn about the opponent’s type and adapt the choice of future strategies accordingly. In addition, it shows how matching background characteristics, such as gender, age, nationality and risk preferences affect the choice of strategy. The study employs a large international panel dataset with controls for age, gender, nationality, risk preferences and playing skill where the latter accounts for productivity.

In chess there are three possible outcomes: a win, a draw or a loss. A draw can be offered by a player and accepted or rejected by the opponent at any stage of the game. By offering a draw while the game is still in the saddle point position (usually called an arranged draw), a player may decrease the risk. There is, however, a first-mover disadvantage when proposing an arranged draw. A cost falls upon the player offering the draw if the draw offer is rejected. This is because by offering a draw, you give away private information about your preferences against this particular opponent at this particular moment. For this reason, players could benefit from learning about the opponent’s type before offering an arranged draw. Strategic learning is measured by analyzing whether the probability for an arranged draw between two players in earlier periods increases the probability for a future arranged draw.

The findings show that chess players do indeed learn about the opponent’s type and update their beliefs accordingly. They also show that more recent outcomes have a greater influence than outcomes further back in time which proposes that the learning model should be weighted in favor of more recent experience. Moreover, players with similar background characteristics coordinate better than players of different gender or nationality but this difference decreases as the players learn about their opponent’s type. This suggests that screening discrimination decreases when players learn about the type of the opponent.

**Chess competitions**

The dataset used in the papers of this PhD thesis contain chess games from different forms of competitive events. The form of the event affects for instance the level of risk the players are willing to take. In a knock-out tournament the first aim is often not to lose. As long as you do not lose you are
still alive in the tournament. In an all-meet-all tournament (Round Robin system) you have to do better than a draw on average to win the tournament. Another typical form of competition is the Swiss system with usually nine rounds where the players play against a player with the same amount of points in each round. The implication is that if you lose today you will meet a weaker player tomorrow than if you win today. Thus, with the Swiss system risk should be of lesser importance at least in the first half of the tournament. In Europe in particular, there is also a high number of team-play competitions (Wade system, Scheveningen system, Olympiads, Schiller system) where the main objective is usually to avoid to lose as you don’t want to let your team down.

There are two categories of competitive play as regards gender: Those events that are open for both men and women and those where only women may participate. The goal of the latter form is to stimulate more women into playing chess. The implication is that female players have access to more competitive events than male players and this is also seen in the data as women play slightly more games than men on average.

Could it be that these circumstances are driving the gender differences found in the papers? Or expressed differently, since the type of competitive form of play affects the level of risk (and probably more variables than this), could it be that women simply prefer a different type of competitive play where the preferences for risk are lower?

There are several arguments against such an underlying explanation. First, if women choose more risk averse competitive events, then this per se is a signal that they prefer to compete with a lower degree of risk. Second, if women choose more risk averse events then this should be reflected in their choice of opening strategy. However, we include a control for the opening choice of the opponent (opponent playing risk averse), which should account for a potential gender difference in the choice of competition. Third, we find similar patterns for both amateurs and professionals (and we also include controls for Elo). Nevertheless, the available choices of form of competitive play at professional and amateur level are very different, i.e. at lower levels there are rarely all-play-all events whereas the Swiss system is quite rare among the world elite. Fourth, the fact that we find that male players choose significantly riskier strategies when playing against attractive female opponents is unlikely to be driven by different preferences for competitive play, unless there is some correlation between the choice of competitive play and attractiveness. So far, there are no indications of this. Finally, we control for individual fixed effects which should account for the time constant difference between men and women as regards the choice of competitive events.

It should be stressed that there are no indications that men and women actually choose different competitive settings. But even if they do so, in the light of the reasons given above I find it unlikely that such selection should be driving the results of the papers.