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File ID 450469
Filename 1: Introduction

SOURCE (OR PART OF THE FOLLOWING SOURCE):
Type Dissertation
Title Essays in behavioural economics
Author T. Buser
Faculty Faculty of Economics and Business
Year 2012
Pages 111
ISBN 978 90 361 0312 1

FULL BIBLIOGRAPHIC DETAILS:
http://dare.uva.nl/record/424690

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Chapter 1

Introduction

If this thesis has a unifying theme, it is that all chapters are essentially about individual differences in economic preferences. Most of the economic literature takes preferences as given. Economists use them as the building blocks of their models, estimate them in lab experiments and correlate them with life outcomes. But we only rarely ask about their origins. How come that fundamental preferences such as risk aversion, reciprocity, inequality aversion and altruism vary so strongly across individuals? Are they biologically predetermined or can we shape them through upbringing and education?

This question is an important one. As Chapter 5 of this thesis illustrates, economic preferences influence some of the most important life decisions, including the choice of study major and career, and it is therefore important to know how they are determined. This is the premise of Chapters 2 to 4. In these chapters, we correlate physical markers for hormonal and neurological differences with choices in laboratory experiments. A significant correlation, we argue, is evidence that nature plays a role in shaping our economic preferences.

In Chapter 2, we investigate the impact of hormonal fluctuations on competitiveness. Previous lab studies have found that when given a choice, men are generally attracted to competition while women shy away from it.[1] One can easily extrapolate this to choices in the labour market and it becomes obvious that the gender difference in the taste for competition could be an explanation for gender differences in career choices. But why is it the case that men are more attracted to competitive environments than women? Is it the different upbringing that girls receive from parents and educational institutions or is there an innate difference in competitiveness? One important biological difference between men and women consists in the differential exposure to male and female sex hormones. Testosterone levels are much higher in men while women are exposed

[1] See Niederle and Vesterlund (2011) for an overview.

to much higher levels of oestrogen and progesterone. Can these hormonal differences partially explain the gender difference in competitiveness?

We take a step towards answering this question by taking advantage of a natural experiment in the exposure to female sex hormones which is going on all around us, namely the menstrual cycle. Women who do not take hormonal contraceptives are subject to strong and predictable fluctuations in progesterone and oestrogen (plus a number of other hormones). Women who take hormonal contraceptives are subject to exogenous variations in sex hormone levels as well, as the levels of oestrogen and progesterone decline dramatically during the seven-day pill-break. Using a simple and well-established design where subjects choose between piece-rate and tournament pay for a simple arithmetic task[2], we show that hormone levels strongly predict the likelihood of making the competitive choice of entering the tournament. Women who take the pill are roughly twice as competitive during the pill-break, when hormone levels are low, compared to the pill intake phase, when hormone levels are high. Women who experience a natural cycle are roughly half as competitive during the days following ovulation than during the rest of the cycle. Together, these effects hint at a negative impact of the hormone progesterone on competitiveness.

Social preferences such as trust, altruism and reciprocity also vary strongly between individuals. Again one can ask to which extent these differences are biologically determined. In Chapters 3 and 4, we let subjects participate in a range of social preference games commonly used in the economic literature (the trust game, the ultimatum game, the public good game and the dictator game) and correlate their choices with physical markers for underlying neurological and hormonal differences. We argue that a significant correlation would indicate that there is a partial biological basis for social preferences.

In Chapter 3, we concentrate on the effects of prenatal hormone exposure. The extent to which we are exposed to the hormones testosterone and oestrogen in utero varies strongly between individuals within each gender. The strength of exposure is thought to have permanent effects on the structure of the brain, and consequently behaviour and preferences later in life. Stronger prenatal exposure to testosterone is, for example, thought to lead to a brain which is worse at empathising but better at dealing with systems.[3] Curiously, the relative strength of testosterone to oestrogen exposure also determines the relative length of the index and ring fingers, which is fixed before birth.[4] By simply asking our subjects whether they have a longer index or ring finger, we can therefore obtain a crude proxy for the neurological differences associated with prenatal hormone exposure. We find that subjects with finger ratios indicating a stronger exposure to testosterone are less generous in all games. We speculate that a negative effect of prenatal testosterone exposure

[2] See Niederle and Vesterlund (2007).

[3] See Baron-Cohen et al. (2004) for an overview.

[4] See Manning (2002) for an overview.

on empathy lies behind these results. We also ask the female subjects a range of menstrual cycle questions and find that, like competitiveness, social preferences vary over the menstrual cycle.

In Chapter 4, we correlate the same social preference data with handedness. Left-handers differ neurologically from right-handers (and these differences vary between men and women).[5] We find that left-handed men are significantly more generous when recipients can reciprocate and exhibit stronger positive reciprocity themselves. Left-handed women, on the other hand, are significantly less altruistic. Information on handedness is available in surveys and we can therefore check whether our results carry over to behaviour outside of the lab. Using Dutch and American survey data, we find significant effects of handedness on self-rated trust and altruistic behaviour including donating money and doing volunteer work. Combined with the results presented in Chapter 3, this is evidence that there is a neural basis for social preferences.

Chapter 5 deals with the consequences rather than the origins of individual differences in economic preferences. Here, we delve deeper into the subject of gender differences in competitiveness. The initial finding of a gender gap in competitiveness[6] has spawned a sizeable and still growing literature based on the extrapolation of the lab findings to labour market settings. If women dislike being in competitive environments, this could cause them to pick different careers and could ultimately be an explanation for labour market differences between men and women. We test the validity of this extrapolation by correlating an experimental measure of competitiveness with the first important career choice of secondary school students in the Netherlands. At the age of 15, these students have to pick one out of four study profiles: a science-oriented profile, a health-oriented profile, a social science-oriented profile and a humanities-oriented profile. These profiles are a strong predictor of the probability of going to university and of the chosen university major. Choices of boys and girls show clear differences. Boys concentrate in the science-oriented profile, which is widely regarded as the most prestigious and challenging profile. Girls concentrate in the less prestigious health- and humanities-oriented profiles. We replicate the finding that boys are much more competitive than girls. We also find that competitiveness significantly affects profile choice. Gender differences in competitiveness can account for around 20 percent of gender differences in career choices. This supports the extrapolation of laboratory findings on competitiveness to labor market settings and suggests that differences in competitiveness are indeed partially responsible for the different career paths of men and women.

[5] See McManus (2002) for an overview.
[6] See Niederle and Vesterlund (2007).