Nijmegen School of Management
Department of Economics and Business Economics
Master's Thesis Economics (MAN-MTHEC)

Influence of social forces in the form of authority bias and conformity bias on the degree of individuals' risk-aversion

By Erik Okushko (1060831)

Nijmegen, 30 August 2022

Program: Master's Program in Economics
Specialisation: Economics, Behaviour and Policy
Supervisor: Nolte, S.

Radboud Universiteit

Abstract

This paper studies experimentally how authority and conformity biases influence individuals' degree of loss aversion. Participants' risk-preferences are measured by Hoult-Laury lottery allocation and risk self-evaluation tasks. The experimental design includes three conditions: two treatment groups designed to elicit the biases and a control condition. The research avoids direct deception on purpose to bypass the usage of ambiguous methodology which caused multiple ethical issues in previous studies. A significant positive relationship is found between the authority bias and individuals' degree of loss-aversion when measured by Hoult-Laury switching point. It provides evidence that risk-preferences of individuals can be altered by an authority opinion. The conformity bias impact on participants, however, was not proven to statistically significant. In addition, both of the biases do not significantly influence subjects choices when loss-aversion is measured by self-evaluation.

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1 Motivation

Even though people oftentimes prefer to envision themselves as individual thinkers, their opinion is influenced a lot by the judgments of others. Either concisely or even without realizing it, agents tend to rely on the wisdom of the crowd or authoritative opinion while making decisions. This allows them to save effort and still achieve a desirable outcome under the condition that the public and authoritative experts are competent in what they are doing. Conformism and obedience to authority are tendencies of human behaviour which are well-known at this point and are being utilized by marketers and public policymakers. While the possible reasons behind the authority and conformity biases are extensively covered in the literature, their direct effects on different aspects of human behaviour remain unclear (Milgram, 1974; Cialdini & Goldstein, 2004).

Being able to assess risk rationally is crucial for financial as well as day-to-day decision-making. In this research, I aim to investigate if the aforementioned cognitive biases can manipulate people's risk preferences through risk aversion. Besides having effort-saving benefits, reliance on others in making decisions poses a threat. I will study empirically if subjects can take riskier and, based on the expected value, less profitable decisions under the effect of authority and conformity biases. Providing significant evidence for such a phenomenon would suggest tremendous inefficiencies due to social and authority opinion diffusion. It would mean that people could internalize distorted risk perception under the influence of illegitimate experts or a mistaken majority. This might have fruitful implications for public policy. Studying those biases in different contexts in this and future research seems to be of crucial necessity if we are to make substantial progress in understanding the mechanism behind shaping and reshaping attitudes, functioning of public sentiment as well as the operation of propaganda.

2 Introduction

Traditional economic theory is grounded on the rationality assumption and utility maximization as the primary goal of economic agents' behaviour. Rational agents are assumed to possess all the necessary knowledge relevant to making economic decisions, stable and logically consistent preferences, and skills to select the most optimal decision among all available alternatives (Simon, 1978). However, the observed behaviour of market participants differs significantly from what is predicted by the theory. In the real world, people may lack the information or abilities necessary to make optimal decisions and can be influenced by various psychological biases. This puts agents' rationality under question.

The first scientist to extensively elaborate on the limitations of the perfect rationality assumption and challenge deeply entrenched in Economics homoeconomicus concept was Simon (1990). He proposed an

alternative approach to economic decision-making based on his bounded rationality conception. Agents are subject to bounded rationality because their thinking capacity is limited as well as the amount of time they allocate to making decisions, and full information is rarely available. Considering those constraints, the final choice is likely to be satisfactory rather than optimal. This is why behavioural economists use the term "satisfiers" instead of traditional "optimizers" to describe economic agents (Barros, 2010).

Imperfectly rational individuals use different heuristics to reduce the complexity of day-to-day tasks like probability assessment or even simpler ones such as doing arithmetic calculations. Simply put, heuristics can be described as mental shortcuts that help people make decisions quickly without spending too much time analyzing all the possible aspects of those decisions (Tversky & Kahneman, 1974). They are often based on individuals' personal experiences. Sometimes heuristics can generate good approximations for making a decision while reducing the effort of making that decision. This boosts the efficiency of the decision-making process by allowing to reach optimal outcomes at lower costs. However, they might also result in a systematically biased perception which, on the contrary, would hinder the efficiency of decision-making and generate losses. For example, according to the "price heuristic", people are likely to consider higher-priced items to be of a correspondently higher quality. Nonetheless, price is only one of the dozens of other characteristics attributed to a consumer good. Therefore, limiting product quality assessment to one specific aspect will likely result in a systematic error in decision-making (Dale, 2015).

In this research, I focus on two specific phenomena: authority and conformity biases. People's desires to obtain as much information as possible at the lowest cost, be accepted by society and vulnerability to authoritative pressure impede decision-making. As discussed throughout the thesis, human opinion, perception and attitude can be manipulated and tailored towards a specific goal not pursued by the influenced individual. This manipulation can be achieved by varying institutional settings on various levels. I study risk perception manipulation specifically due to its tremendous implications for economic outcomes. The ability to assess risks accurately ensures that a person can arrive at an optimal investment allocation. However, the possibility of influencing that ability is an obstacle to efficient resource allocation. It is also a potential tool for those who possess authority or have power over social opinion to pursue their opportunistic goals and not only in the risk domain. I start by discussing those biases in detail by analyzing studies designed to reveal them. Afterwards, I discuss the different risk assessment methods, describe the adopted methodology and finish by presenting and elaborating on the results of my empirical research.

3 Literature overview

3.1 Authority bias

Authority bias occurs when actors prioritize an authority figure's opinion over their personal one and are more likely to be influenced by that opinion. That bias often comes from a belief that authorities have better expertise and knowledge and thus can make a better decisions. Moreover, high reliance on an authority opinion leads to obedience. So, people can undoubtedly follow instructions provided by the authority without even trying to evaluate the directions given to them (Sahi, 2017).

Reliance to authority and obedience are essential elements of social structure. The presence of some form of authority is a necessary requirement for society to function. Social interaction is fundamentally characterized by unequal power distribution, which implies that some people carry more influence than others (Grimes, 1978). For example, managers have power over their subordinates, parents over their children and, generally speaking, individuals in authority have power over others inferior to them. Social power is commonly defined as the ability to establish conformity even when influenced individuals may dislike and resist imposed changes (Keltner et al., 2003). An authority figure, according to Weber (1981), is a person who enjoys a higher probability of their commands being obeyed by other individuals. Consequences of power disparities could be seen at every level of the social organization, including formal and informal institutions. It affects resource allocation, goal formation, and the constitution of personal and professional connections, along with multiple other societal systems.

While some forms of obedience serve plenty of productive purposes, others could be destructive. As Snow (Nadelhoffer et al., 2010) noted, for many people, obedience might be a profoundly entrenched behavioural tendency comparable to a potent impulse capable of overriding ethical beliefs, moral values and sympathy for others. The ability of those in authority to provoke obedience in a destructive context was experimentally studied by Stanly Milgram (1963). Milgram's interest in the subject came from his desire to understand how people in authority with undeniably cruel and devastating intentions manage to find their way to spread their ideology and produce obedience. In particular, he was focused on Nazi Germany, ruled by Adolf Hitler, who ordered to kill millions of people during his rule during the times of World War II. Around 6 million Jews, along with numerous ideological dissidents were executed under his direction. Hitler also instructed to kill civilians who had mental or physical disabilities, were homosexuals or belonged to "inferior" races, which could worsen the national gene pool according to the Nazi Germany ideology supported by the immoral theory of Eugenics (Russell & Gregory, 2015).

The most famous variation of Milgram's experiment was structured as follows. The experiment participants were a group of 40 men within the age range of 20 to 50 years old. The researchers hired them via a newspaper advertisement. Each of them was individually invited to a laboratory by an experimenter

and introduced to an experimenter's confederate who played a victim. Then both of them were given a pretext designed to justify the means of the experiment. They were told that the experiment was meant to test the relationship between punishment and learning. The experimenter said that there was very little information on the subject because no legitimately scientific studies involving the interaction between real people had been conducted.

The subject and a victim then drew slips of paper to be assigned roles in the experiment. But the drawing was rigged in such a way that the naïve subject always got the role of the teacher, and the victim was assigned the role of the learner. The learner's job was to memorize a list of word pairs read by the teacher. Then the teacher would read the first word from each pair on the list for the learner to identify which one goes next. For example, if the word pair was blue-sofa, the teacher would say the word blue and the learner would have to identify sofa as the second word in the pair to answer the question correctly. Each time the learner answered incorrectly, the teacher was to give him an increasingly severe electric shock. Thus, the learner was strapped into a fake electric chair. Using the straps was justified by a need to prevent excessive movements of the learner while receiving the shock.

The learner gave shocks to the learner by using an instrument panel. It consisted of 30 switches ranging from 15 to 450 volts. All switches were clearly labelled with a corresponding voltage and a verbal designation next to them. Those designations described the severity of shock starting from "slight shock" for 15 volts and ending with "danger: severe shock" followed by "XX" for the voltage above 375. The exact grouping of voltage in relation to the verbal designation is illustrated in table 1. The "teacher" was given a sample shock of 45 volts to improve the experiment's legitimacy and demonstrate that the shocks were indeed painful. Nonetheless, the teacher was told that the shocks were not strong enough to cause permanent tissue damage.

Voltage	Verbal designation
15 - 60	Slight sock
75 - 120	Moderate shock
135 - 180	Strong Shock
195 - 240	Very strong shock
255 - 300	Intense shock
315 - 360	Extremely intense shock
375 - 420	Danger: severe shock
435 - 450	XX

Table 1. Verbal designations in correspondence to voltage range group

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designation next to them. Those designations described the severity of shock starting from "slight shock" for 15 volts and ending with "danger: severe shock" followed by “XX” for the voltage above 375. The exact grouping of voltage in relation to the verbal designation is illustrated in table 1. The "teacher" was given a sample shock of 45 volts to improve the experiment's legitimacy and demonstrate that the shocks were indeed painful. Nonetheless, the teacher was told that the shocks were not strong enough to cause permanent tissue damage.

In fact, the learner did not receive any shock and only acted to do so. He also gave correct answers only occasionally and made mistakes on purpose, so the teacher would be asked to give him a shock. Since the learner was sitting in a different room, the teacher could not see his reaction. But after the 300-volt shock was administrated, the learner started pounding on the wall loud enough for the teacher to hear and then stopped replying to questions. The experimenter instructed the teacher to consider the absence of a response as a wrong answer and continue giving shocks to a victim up to a 450 volts point. If the teacher expressed his unwillingness to continue, the experimenter responded with a sequence of standardized lines. Standardization was essential to ensure that each subject was treated the same way. The lines were executed one by one, and if the fourth line was not convincing enough for a subject to go on administrating shocks, the experiment was terminated. All the lines used by the experimenter are presented in table 2.

The dependent variable of the study was the average number of socks administrated by subjects. Generally, this value could vary from 0 to 30 per subject. It will equal 0 if the teacher refuses to give the victim a sock even the first time and 30 if he proceeds with the socks until the maximum voltage is reached. A subject who discontinues following the experimenter's commands and causes the termination of the experiment before administrating the thirtieth shock is considered to be a defiant subject. One who complies with all the orders and executes shocks until the maximum voltage is reached is an obedient subject.

Line 1	Please continue.
Line 2	The experiment requires that you continue.
Line 3	It is absolutely essential that you continue.
Line 4	You have no other choice; you must go on.

Table 2. Experimenter’s standardized responses to subjects’ refusal to continue

Interestingly, before the experiment was conducted, Milgram described the procedure to 14 Yale University seniors who majored in psychology to ask them to forecast the study results. Specifically, they were requested to plot the distribution of obedience for 100 American participants of diverse backgrounds and fit within the age group from 20 to 50 years old. All participants consistently estimated that only a negligible minority of around 3% would use the final value on the shocking scale. Milgram himself

expected subjects to quit relatively quickly. He intended to later replicate the experiment in Germany, where, taking into account American perception of Germany after multiple World War II crimes, including the holocaust, Milgram expected subjects to turn more switches. However, the experiment's results with the American population sample were insightful enough, so Milgram never went to Germany (Russell & Gregory, 2015).

All of the participants agreed to give intense level shocks to the victim. However, after they reached 300 volts and the victim expressed discomfort and stopped responding, the subjects' behaviour started to vary. Five participants refused to continue beyond the 300-volt level. Nine of them surpassed that level but stopped obeying the experimenter's orders before the maximum level was reached. Nonetheless, 26 subjects followed the experimenter's instructions until the very end of the experiment and gave the victim the greatest possible shock, which was way beyond Yale seniors' estimates.

Even though the experiment participants, as any member of the modern humanistic society, were taught not to hurt another person against their will, 26 of them proceeded to give 450 volts shock to the learner. They did so under pressure maintained by the experimenter and the experimental set-up. However, the experimenter did not have any punishment devise or particular jurisdiction to force subjects to follow his commands. Financial incentive to complete the experiment was removed by paying participants in advance. They received their financial rewards up front just for showing up and were informed that they could quit the study at any moment without losing what they were paid. As it was put in the financial incentive analysis of the Milgram study: "Because participants were all volunteers and were paid in advance, you might predict that most would quickly refuse the experimenter's orders" (Dolinski & Grzyb, 2018).

Despite being obedient, subjects displayed signs of acute tension. As Milgram described, "[subjects' behavioural responses] reached extremes rarely seen in sociopsychological laboratory studies". He mentioned sweating, trembling as well as intensive lip biting as common behaviours among participants. In his article Milgram also described a particular case of a mature and self-confident businessman who was eager to proceed with the experiment at the very beginning. Twenty minutes after the experiential procedure started, he was reduced to the point of approaching a nervous collapse. According to the description provided by Milgram: "He constantly pulled on his earlobe and twisted his hands. At one point he pushed his fist into his forehead and muttered, "Oh, God, let's stop it." And yet he continued to respond to every word of the experimenter and obeyed to the end." Thus, it is evident that the obedience tendency overrode not only instilled moral values but even the feelings of deep psychological discomfort caused by internal resistance.

Besides the first and most famous Milgram experiment, he conducted multiple variations of the initial experimental procedure. He designed them to reveal and explore specific situational aspects that

could affect subjects' obedience. By changing different properties of the experimental set-up related to either the experimenter or the learner (in one case to the teacher as well), it became possible to see which of them were particularly significant in affecting participants' behaviour (Haslam Kose et al., 2014). Most of them have been mentioned for the first time in his book Obedience to Authority: An Experimental View (1974). I would like to discuss the three key factors here: proximity, location and uniform.

After obtaining high obedience in the original experiment, Milgram decided to bring the victim psychologically closer to the teacher. He introduced three additional conditions. In the first one, the set-up was such that the teacher could hear the learner. The learner, in its turn, was whining when the mild shocks were given to him and asked to terminate the experiment as soon as the 150-volt switch was turned. If the teacher continued, the confederate proceeded to scream in agony, cry and calm that his heart was bothering him. Lerner's acure resitacne confronted the subjects with the direct consequences of their actions and significantly increased the pressure put on them. In the second condition, not only could the teacher hear the complaints and screams of the confederate, but they were also placed in the same room. The learner's desk was poorly lit, though, so his face was not fully visible. The final condition, which implied the highest level of psychological proximity, involved tactile contact with the victim. The learner only appeared to receive the electric shock while his hand rested on a shock plate. After receiving a strong level of shock, the learner demanded to be let go and removed his hand from the shock plate. Despite the confederate's protests and screams, the subject had to force the learner's hand back onto the shock plate each time while requested to do so by the experimenter. As the degree of psychological proximity escalated throughout those three conditions, subjects were more and more reluctant to exhibit obedient behaviour. Nevertheless, obedience was not suppressed completely; even in the very last most extreme condition, 30% of subjects obeyed the experimenter's commands (Milgram, 1965).

The original research was conducted in a laboratory at Yale University. Milgram suspected that the professional environment of a laboratory setting and the high reputation of the university itself might have added credibility to the experiment. Therefore, the experiment was re-conducted in an old industrial building to examine the influence of location. This way, the research was no longer associated with Yale University. The percentage of fully obedient subjects dropped from 65% to 47,5%. Thus, according to the results of this experiment variation, a less credible location results in decrees in the degree of obedience (Milgram, 1974).

Another interesting factor which was manipulated in another experimental variation is uniform. In previous experiment variations, the experimenter had a lab coat on. This coat also served as an indication of his academic status. In a variation where the researcher's uniform was replaced by ordinary clothes, the number of fully obedient subjects fell all the way down to 20%. It signifies the high importance of authority being credible to achieve obedience from others. Judging by the Milgram experiment results, we

can conclude that this credibility can be obtained by adjusting both environmental design and an authority figure's appearance elements. Notably, appearance elements in the form of professional uniform seem to be more critical. Another field experiment specifically designed to investigate the power of a uniform generated similar results. Three males were recruited and dressed in different clothes. One of them was dressed in ordinary clothes, one was dressed as a milkman, and the last one was wearing a security guard uniform set. They had to go around a particular area and ask strangers on the street to follow one of the three instructions: picking up a bag, switching a side of a bus stop and giving money for a parking meter. On average, the person wearing a security uniform was obeyed two times more frequently than the other two subjects. The research concludes that the most likely explanation for this is the sense of legitimacy that uniform gives to a person wearing it (Bickman, 1974). As experimental data shows, for a person to obey and follow instructions given by an authority, they need to believe that this authority is legitimate. ,Various variables can affect this legitimacy, some of which were dissed above.

Initially, Milgram thought that the main idea of his research was to reveal the mechanism behind people shifting responsibility for their wrongdoings to superiors. However, modern researchers who analyzed his work come to a different conclusion. The key inside here is that the leaders, followers, and the institutional setting they all operate in can create a different reality where acts of aggression or cruelty could be seen as acts of goodwill, and the ones conducting them could perceive themselves as heroes (Haslam Kose et al., 2016). This might be the reason why many German citizens accepted Nazi ideology and why so many subjects of the obedience experiment went along with the experimenter's commands. The legitimate institutional setting, convincing justification and pressure exerted by an authority figure seem to create a reality in which anti-humanitarian behaviour may appear appropriate or even necessary.

Philip Zimbardo and his colleagues, conducted another famous and similarly controversial research (1973). The study aimed to empirically test the dispositional hypothesis in the prison environment. In cooperation with clinicians, scientists in psychology and criminology tried to identify the factors that cause people to engage in repeated violence or increase the chances of them doing so (Gendreauv Kose et al., 1996; Hemphill Kose et al., 1998). Two perspectives are likely to explain reoccurring violence: the first one emphasizes dispositional factors, and another one highlights situational ones. Dispositional factors can be defined as individual characteristics that impact a person's behaviour without him having control over it. Those are genetics, personality traits and temperament. Importantly, dispositional factors are static, meaning that they tend to remain fairly stable over time. In contrast, situational factors are context-dependent. They can be described as various influences that an individual is exposed to. These are ecological factors like one’s environment and the observed behaviour of others. Ecological factors are volatile and can vary greatly within one's life depending on the situational framework (Harris & Teasdale, 2017).

From a dispositional hypothesis perspective, the deficient state of the prison social institution is explained by the natural tendencies of the people in charge of it. This proposition suggests that the reason behind the inadequate quality living conditions, brutality, degradation, hatred and perpetual violence and other similar aspects attributed to the prison environment could be traced back to internal factors of the prison population. Violent tendencies are predictable to arise among prisoners. The background of most of them is characterized by a disregard for the law, social order and a propensity for aggression and cruelty. On top of that, they are involuntary kept at one location over a long time. Guards are also likely to be unsympathetic, uneducated and sadistic. They self-select themselves into the prison environment due to their "guard personality" (Mcgurk & Mcgurk, 1979).

Zimbardo aimed to critically evaluate the dispositional hypothesis. He knew its critical evaluation could not be made by observing existing prison settings. By making such an observation, it is impossible to separate the effects of the environment from the impact of the personal characteristics of the prison population. Separation of those effects in a study required a research design that would incorporate a "newly" constructed prison comparable to existing ones in terms of its interior as well as sociological domain. But fully populated by people who are indifferent to an average person who has been able to function properly within an established social structure, unlike a typical criminal.

The 21 male subjects were selected for participation in the study. Before getting approved, they had to undergo extensive psychological questionary about mental and physical health history, criminal history, family background, etc. Afterwards, participants were interviewed individually by experimenters. The subjects judged to be the most mature, mentally and physically stable, and the least prone to anti-social behaviour were chosen for participation. They were randomly assigned to the roles of guards and prisoners. The mock prison was constructed in the basement of the psychology building at Stanford University. It consisted of three prison cells, two guards' quarters, a yard with cameras to record the prison routine and an observation screen behind which researchers could follow the experiment.

Subjects were told that the roles would be assigned randomly. The financial reward for participation in the study was $15 per day, irrespectively of the assigned position. According to the signed contract, participants were guaranteed an adequate diet, medical care and financial compensation. The experimenters explicitly stated that acts of physical violence and abuse were not to be allowed. Despite that, prisoners had to give away a significant part of their freedom and fundamental civil rights.

The participants who were assigned to be guards were given minimal instructions on purpose. They were told to "maintain the reasonable degree of order within the prison necessary for its effective functioning". No specific guidelines or suggestions on which behaviour should be adopted were given. However, recommendations for the administrative routine were provided. The prisoners were to be served meals three times per day, were allowed to go to the toilets under supervision three times per day and

given two hours daily to read or write. They had to perform various tasks and were lined up three times a day for a count. In addition to that, they could have two visitors per week and some extra free time to exercise and occasionally watch movies.

To immerse the subjects into their new roles, the researchers incorporated various features to the experiment design based on observing and studying the actual prison set-up. First of all, the guards were invited to the mock prison the day prior to the beginning of the study. They were asked to help prepare the place for the prisoners' arrival to give them a taste of their future responsibilities. The day after, subjects assigned prisoner roles were arrested at their doorstep in front of their neighbours' eyes. The real police officers dropped by their houses, convicted them of made-up crimes, put them in a police car and drove them to Stanford University where the mock prison was located. It was possible due to cooperation with the local police department.

Different features were attributed to prisoners and guards to legitimize the distinctions between different roles and promote a sense of group identity. Both groups of subjects were given uniforms. However, the meaning attached to the uniform was reversed for the two groups of participants. Prisoners received oversized smocks with an identification number attached to the front and back sides. They did not get to wear underwear underneath their uniform. On their feet, they wore sandals, and a chain with a lock was attached to their ankle. They were given a stocking cap to cover their hair as well. The prisoners' clothes were designed to be humiliating and acted as a symbol of their submissiveness and dependence. The ankle chain served as a constant reminder of the oppressive environment they were put into. The cap was used to eliminate the distinctiveness associated with the hairstyle. The same effect is obtained in real prisons and the military by head shaving. The loosely fitting uniforms were tailored to make prisoners feel awkward. They were very similar to female dresses, which triggered the emasculating process. In contrast, guards' uniforms were made to highlight their superiority and power. It consisted of khaki military-style pants, a t-shirt, a police nightstick, a whistle and reflecting sunglasses. Only guards got the privilege to be called by their names. Prisoners were referred by the identification number on their uniforms.

Due to the minimal instructions provided to the participants, they were relatively free to interact in different ways. Despite that, most of their encounters were hostile, disrespectful and even dehumanizing. Guards quickly internalized their implied authority and adopted initiating behaviour, while prisoners generally acted passively. Although there were only a few cases of physical confrontations, many other forms of aggressive behaviour were regularly observed. Verbal aggression in the form of offensive remarks and insults was documented as the most common form of interpersonal contact between guards and prisoners. Notably, guards more often threatened, insulted and were way more aggressive. Aggression from the side of prisoners took place almost solely as a resistance to the guards' actions, usually followed by shifting back to passive behaviour. Guards humiliated prisoners based on their appearance and forced

them to do demeaning tasks like washing the toilets with their bare hands. One subject reported how he used to mess up prisoners' beds just to ask them to make it all over again. While prisoners were lined up for a count, guards often made them do physical exercises like push-ups or ordered them to stay in line without moving for a while. They knocked their nightsticks against the walls to interrupt prisoners' sleep. Guards suspended most of the recommended free time activities and only allowed them as a reward for submissive "well-behaving". The guards' aggressive behaviour was escalating on a daily basis. Initially, it could have been justified by the perceived threat from the prisoners. However, even after the most resistant prisoners adopted passive behaviour, guards proceeded with harassment, humiliation and cruelty.

After analyzing private conversations of prisoners, which were recorded, it was revealed that around 90% of all that they talked about was related to prison affairs. Although they could temporarily escape the reality of their position while being on their own, they went on diving right into it. They did not share much personal information and knew little about each other. Prisoners also referred to each other by their identification number, although they did not have to do it while the guards were not around. Even though they internalized their roles quickly, they did not enjoy them. Five prisoners exhibited signs of acute distress such as crying, rage and intense anxiety. Those symptoms started to develop already from the second day of the experiment. One of the subjects even got a stress rash which covered half of his body. The strong negative reaction of the prisoners led to the termination of the experiment only after six days from the start. All of the prisoners were excited by their good fortune.

As opposed to prisoners, most of the guards perceived their new responsibilities as pleasure, according to the gathered evidence. They did not mind working extra hours for no extra pay if they were asked to. Guards were never late to come to work. Some of them admitted enjoining attention which their uniform attracted while wearing it outside of work. They even made prisoners clean the prison before receiving visitors, possibly to make it look more appealing and avoid creating family pressure on the subjects to quit the study.

The outcome of this experiment is consistent with a phenomenon called role embracement (Rosenblatt, 1962). To embrace a role means to internalize the new social identity that emerged in a situation. Agents do not perceive it as role-playing while it is going on. Instead, they treat it as a job with certain responsibilities. Only when it comes to an end does their illusion break so they can reflect on their behaviour. Guards' willingness to behave as the situation requires them to without questioning the consequences of their actions is an illustration of Haney and Zimbardo's observation which was expressed in their subsequent articles. They claimed that institutional socialization is facilitated by a tendency of individuals to assume that social institutions are rationally structured. As Haney and Zimbardo put it, "We simply assume that institutional behaviour is founded on rational grounds and considered purpose". As noted in an after-study interview by one of the guards, "accommodation to the guard role was dependent

on "convincing myself that [the prisoners] were of a distinct inferior order". This rationalized his role by helping him to believe that they deserved such treatment. He was there just doing the "dirty work" that someone had to do. If not him, then somebody else (Scott-Bottoms, 2020).

This idea is also supported by Festinger's theory of cognitive dissonance (Eysenck, 1963). He argued that when a person has two conflicting cognitions in their mind, they will be driven to reduce the contradiction between the two by reshaping one or the other of these cognitions. For example, suppose an individual's job obligates them to make a public statement which that person does not believe to be true. In that case, the person will either quit the job or convince themselves that the message is true, so it is not morally wrong to communicate it to the audience. This reaction occurs because carrying two conflicting opinions causes psychological discomfort, which a person would try to avoid and thus resolve by rationalization. In the case of Zimbardo, it seems that the guards resolved the dissonance by acting harsher and harsher toward prisoners. As stated above, they must have convinced themselves that if they had to treat prisoners like that, they deserved it.

Overall, the SPE showed that violent and aggressive behaviour could be obtained by assigning roles to ordinary middle-class college students and putting them into a particular institutional setting. In less than one week, participants in the mock prison who were adequately integrated into the social structure changed their behaviour to anti-social and pathological. Since the experiment was specifically designed to eliminate the effect of personal characteristics, it is impossible to say that hostile behaviour took place because the subjects were predisposed to such behavioural patterns. On the contrary, it seems that the situation itself encouraged the subjects to change their behavioural practices. The SPE can also be seen as an extension of the Milgram experiment. In SPE, the ever presence of the experimenter-authority figure was removed. That gave guards more freedom to behave the way they wanted within the established environment. Participants were also engaged in the experiment for a way longer period of time. Once again, the study provided evidence that malicious acts occur not only due to the deeds of evil people but might be attributed to the power of social forces at play.

This study illustrates how appealing it might be for individuals to embrace their authority status. In the setting of the Stanford Prison Experiment, it quickly escalated into abusive behaviour. This process was facilitated by the suggestive environmental elements, which promoted role embracement. The more time passed from the start of the experiment; the more comfortable guards felt exercising their authority. They deliberately chose to oppress the prisoners regardless of it being unnecessary. At the same time, prisoners quickly adopted the behaviour implied by their role and acknowledged their inferior position.

There are many documented cases of authority bias affecting medical professionals. Senior clinicians who are well represented in their medical community and are naturally seen as more qualified have more power in decision-making. In some instances, they can decide to deviate from medical

protocols by referring to their personal experience. However, less competent medical professionals have been observed to be reluctant to raise their voices against their authoritative colleagues. As a result, they may be led by their naively self-confident senior associates. An example of the consequences of such behaviour is unnecessary surgeries that put patients' health at risk and lead to permanent deterioration of the patient's health state (Howard, 2018).

Similarly to the Stanford prison experiment, the institutional setting here is constructed such that less influential junior clinicians are made to adjust their actions according to the instructions of the medical practitioners superior to them, even if they make incompetent choices. They are also driven by fear of being punished by the authorities. Senior clinicians may sanction disobedient colleagues by treating them with less respect, hindering their career prospects or exercising passive aggression towards them. It is just one example of the institutional settings which potentially results in suboptimal outcome due to authority bias. This phenomenon can be frequently encountered in the workplace. It has been termed employee silence in the literature. Employee silence is defined as the avoidance of sharing suggestions, ideas or concerns with colleagues who are perceived to be in authority. The driver of silence within the organization is the fear of social as w ell as career consequences. This fear builds up by learning either indirectly through observing and hearing out personal stories or directly through personal experience (Kish-Gephar et al., 2009). For example, Milliken (2003), in his research, which includes multiple personal interviews, provides an example of an employee being embarrassed by his superior: "…when I tried to introduce some new ideas at a meeting the senior manager looked at me as if I was crazy. They made me feel dumb for sharing my thoughts. I received unkind emails in response to my suggestions. The tone was really bad. Now I take caution before I speak up…". This negative reaction exhibited by individuals with formal power occurs because they might perceive the initiative behaviour of their subordinates as an attempt to undermine or question their authority. They want to preserve their power and eliminate competition. It creates an environment which is biased towards the authority opinion.

Expectedly, authority bias also has significant implications for investment decisions. Specifically, it affects the information flow between professional and non-professional investors. Reasoning outlined by investment experts often serves as an input into amateur investors' decisions (Kose et al., 2006). Similar to the Milligram experiment and some cases of the medical community example, here, the authority is derived from one expertise or perceived expertise under incomplete information or false credibility circumstances. Since non-expert investors rely on judgments made by legitimate or perceived professionals, the quality of those judgments directly impacts the material well-being of the investing public.

Overall, two reasons behind the authority bias were outlined. Firstly, people seem to have natural difficulties resisting pressure put on them by authority figures. It becomes even more challenging for them

to do so if an authority figure can potentially act aggressive towards them or if they are capable of penalizing resistant individuals for disobedience. Secondly, actors desire to be accurate at the lowest possible cost. As well as in the case of "price heuristics" discussed earlier, people became susceptible to experts' opinions due to the use of heuristics. When the decision is too complicated or lies outside the scope of one's competence, it is convenient to rely on the opinions of seemingly more qualified agents. People want to achieve the highest pay-off and put in as least effort as possible. An interesting factor that reinforces authority bias is the expert immunity fallacy. This belief states that experts themselves are immune to biases. However, the fact of having expertise predisposes professionals to biases. For example, gaining experience and undergoing training make experts use more selective attention and focus too much on expectations arising from past experiences (Dror, 2020). Therefore, experts are likely to employ heuristics themselves, while their followers tend to exaggerate their rational abilities.

3.2 Conformity bias

Apart from an authority opinion adherence tendency, individuals tend to conform to group norms more often than not. In the literature, this behavioural pattern is known as conformity bias. It referees to people's inclination to mimic the behaviour of others around them. Agents prefer to take cues from other people's actions across various contexts rather than exercise their judgment and arrive at independent decisions. Whether they realize it or not, people adopt many fashions from their social environment (Cialdini & Goldstein, 2004). Conformity does a curtail work of transmitting the human culture by promoting swift and stable in-group cultural homogeneity. It facilitates the process of learning valuable habits and skills. Moreover, it increases the efficiency of cooperation and decreases possible tensions within a group (Henrich & Boyd, 1998). However, the consequences of conformist tendencies are not always positive. For example, people may adhere to social opinions and perceive them as accurate, even in instances when they know better.

Conformity bias, also known as the bandwagon effect, has been observed experimentally. The most famous experiment in that area was conducted by Asch (1951; Levine, 1999). A group of subjects had to judge a series of simple and structured perceptual relations. Recruited participants were shown a card with a line on it and another card with three lines of a different length. One of the lines on the second card was the exact same length as the line on the first car. The experiment's subjects fell into two categories: confederates hired by experimenters to follow the pre-given guidelines and independent participants. They were all sitting in the same room together and had to identify which line from the second card matched the first card line by saying their answers out loud one by one. The experimental session consisted of multiple rounds of "line judgment" assignments. As illustrated in the picture, the distinction was obvious (see

Appendix A). In the first round, the confederates gave the obviously correct answer to signal their reliability and provoke trust. In the second round, however, all the confederates gave the same wrong answer. Thus, independent participants had to face a conflict between what they saw and what the group reported. That individual suddenly found himself contracted by the rest of the group, and that contradiction kept repeating throughout the experiment. The errors of the majority were substantial and evident. They ranged between 0,5 and 1,75 inches. The naïve subject was placed in a minority position and was confronted with an opinion of a unanimous majority that contradicted the evidence of his senses. The experiment's goal was to quantify the majority effect and understand the psychological mechanism behind it by conducting interviews after the study.

The obtained results revealed a remarkable tendency to match the majority. Around 33% of all participants made errors identical to or in the same direction as the incorrect answers given by the majority. The magnitude of those findings becomes evident when compared to the nearly complete absence of errors in the control group. Importantly, subjects showed signs of psychological tension and discomfort while realizing that their opinion differed from that of the majority. Even independent participants, who did not succumb to the influence of confederates, appeared confused and hesitant. For example, one of the observers was constantly shaking his head and blinking, thereby questioning his senses. When he was asked after the experiment if the rest of the participants were mistaken, he answered that he was not entirely sure. Finally, when the set-up of the experiment was disclosed to him, he felt delighted and relieved.

Subjects who were particularly vulnerable to majority opinion fell into three groups. The first group claimed that they perceived the majority's estimates as correct. As experimenters concluded, in their case, the stress under the group pressure must have distorted their perception. Only a few subjects were such strongly affected. The second group came to see their perception as inaccurate in the light of the "wise" majority giving a different answer. Those subjects mostly lacked confidence and, as a result, felt a strong need to join the majority. The last group did not suffer from a distorted perception and also did not question their abilities. They joined the rest out of their vital need not to appear different from the majority. They suppressed their judgment not to appear inferior to or different from others.

Asch also conducted different variations of the experiment. In one of the variations, the "true partner" was introduced. He gave correct answers, unlike other confederates. This variation was designed to break the effect of the unanimity of the majority. The results illustrated that the elimination of the unanimity of the majority significantly increased the independence of the critical subjects. The percentage of the mistakes made in the direction of the majority dropped to 10.4. Moreover, one associate was enough to encourage the subject to stick to his perception, regardless if the overall group included three or seven confederates. Thus, if supported even by a single person, the subject will liberate himself from a majority of seven and join the minority group (Asch, 1956).

In one of his experimental variations, Milgram also studied the effect of having an ally while being influenced by an authority figure rather than peer pressure. He introduced two additional teachers to the experiment. They were also assigned learners and had to punish them each time they made a mistake. However, they were confederates. After a certain point, both refused to proceed with the experiment. In that variation, only 4 out of 40 participants followed the experimenter's commands till the end of the experiment, which is a substantial decrease compared to the initial experiment (Milgram, 1974).

Many researchers replicated Ashe's study and came up with their personal variations of the experiment. One of the most notable cases is a study of conformity to peer pressure in preschools adults (Haun & Tomasello, 2011). The behavioural patterns of one's group are instilled from a young age. Moreover, kids quickly learn skills by observing adults. In short, young children are already sensitive to signals and information provided by adults and are even capable of considering the social implications of their or others' actions. Thus, the researchers decided to study children to see how they differ from adults regarding social compliance in terms of motivation and compliance rate.

The study consisted of two experiments. It was meant to be as close to Asch original experiment as possible. Due to working with kids, however, a few adjustments had to be made. Instead of lines, they compared four replications of the same cartoon animal. Special attention was paid to recruiting participants and conducting rehearsal sessions before the actual experiment. It was made to ensure that children were capable of maintaining an attention span long enough to follow the experiment and had the mental capacities to deal with the task. Confederates were not involved in the research to avoid ethical issues. Thus, children were given books with the images used for the comparison procedure. However, one of the kids got a different book content, which contradicted the others. This, once again, created a conflict between the subjects' senses and the opinion of the unilateral majority. As a result, 37,5% of children responded in conformation with the majority opinion. The performance was virtually perfect in the control group, where all the kids got the same books. The figures obtained are pretty similar to those acquired by Asch himself. It comes in line with the argument above that people are suspectable to social opinion from a young age.

The second experiment had a similar design. The only difference was that the minority kid communicated his answer privately to the experimenter. This was done to distinguish between behavioural and social approval motivations for conformity. Adults have been shown to be following two of those motivations. Behavioural optimization, also known as informational conformity, occurs due to induvial perceiving the opinion of the majority as a credible source of information about a shared objective reality. Social conformity characterizes the motivation to adopt a majority perspective due to social benefits. It helps to minimize social conflict, facilitate cooperation and heighten the group's perception of the individual (Deutsch & Gerard, 1955).

When the requirement to voice the answer privately was dropped, the percentage of children who adopted the majority perspective decreased to 4,6%. The results show that children conformed way more often when requested to speak publicly. Such findings indicate that they mostly follow the social approval motivation. Children try to fit in and be accepted by those around them, starting from preschool age.

To give an example of informational conformity, the "elevator experiment" should be considered. There, random people were observed entering an elevator where everyone else was facing backwards. Despite this being unnatural behaviour, more than half of the people followed the herd by turning away from the exit door (Kent, 1951). This phenomenon is called an information cascade in behavioural economics. A person makes a decision based on observing what others who got to choose before him did, oftentimes ignoring his own private information. The actions of others are easily observed. The reasons for the actions taken remain unclear, though. Individuals may presume that others know what they are doing and follow their lead without critically assessing their behavioural practices. It leads to a conformity bias (Howard, 2018).

People's drive for conformity has been verified by more recent studies, which have great potential for public policymaking. It has been shown that agents are more likely to engage in socially beneficial behaviours if others are doing so, especially the ones close to them. For example, people are more likely to install solar panels if their neighbours have installed them already. Usually, agents are reluctant to adopt energy-saving technologies because they require high initial investments, which would pay off only in the long run. Nonetheless, in the solar panel case, conformity tendency overrode present bias (Bollinger & Gillingham, 2012). Similar to public policymakers, marketers exploit authority bias by involving celebrities who are often seen as opinion leaders in product endorsement campaigns (Sliburyte, 2009).

The reasons behind a conformity bias also resemble those behind an authority bias. Mimicking the actions of others is a cognitive shortcut that is expected to maximize the likelihood of taking an efficient decision on average with minimal expenses in terms of effort. Individuals also pursue the goal of affiliation and belonging. Therefore, they need to fit in in the social group they want to be a part of. Alternatively, it can also be viewed as a fear of being excluded from the community. Thus, imitating the actions of others is used to be accepted by other community members (Cialdini & Goldstein, 2004). Evidence shows that this process can occur subconsciously, meaning that people do not even realize that they might be engaged in behaviour mimicking. For example, people tend not to consciously mirror the facial expression and mannerisms of the person they are engaged in conversation with (Chartrand & Bargh, 1999).

3.3 Eliciting risk preferences

Risk is an ever-present element of a decision-making process. The degree to which people are inclined to take on risks establishes their risk preferences. Risk preferences vary within the population. Individuals are traditionally characterized as risk-seeking, risk-natural or risk-averse. Although risk preferences may differ from person to person, in standard economic theory, they are believed to be stable at the level of the individual. The stability of risk preferences entails that the same willingness to take risks is observed when measuring individual risk preferences over time. This idea has been shaping economics for many years. As Stigler and Becker wrote (1977): "One does not argue about tastes for the same reason that one does not argue over the Rocky Mountains – both are there, will be there next year too …".

The assumption of preference stability has been repeatedly challenged in the last decades. As experimental and behavioural branches of economics science became widespread, many authors came to be interested in measuring risk preferences empirically to test the standard economic theory. A new economic framework, which was extrapolated from psychology, suggests replacing the constant risk parameter previously used in economics with a distribution which is characterized by mean-variance (Fleeson, 2001). Moreover, the perfect mean level stability assumption is dropped. This new framework, which reflects empirical evidence, emphasizes the change of risk preferences over a person's lifecycle, the impact of exogenous shocks and emotional factors. There is a general tendency for individuals to become more risk-averse as they grow older. This causes a continuous decrease in the mean level of risk-preference level. The distribution around the mean of risk preferences, which could be illustrated as variances, is there due to temporarily emotional effects. Once again, as empirical findings show us, variations in an emotional state, stress levels and degree of self-control cause short-lived preference variations. In addition to that, significant exogenous shocks like the Global Financial crisis oftentimes lead people to reevaluate their risk decisions and may affect their risk perception (Schildberg-Hörisch, 2018).

It is clear that Stigler and Becker's approach, which holds on to the assumption that individuals maximize utility solely based on their preferences and constraints, neglects the behavioural direction of economics. Apart from the evidence of predictable mean change over one's life and systematic moderate variation of one's risk preferences, sudden swings are also possible. Tversky and Kahneman (Tversky & Kahneman, 1981) studied the effect of using different framings on individual risk preferences. In their famous Asian disease problem, subjects were to choose one of the two available health policies to combat the disease outbreak. The first policy is a safe option implementation of which would save 200 people out of 600 overall population. The second policy is risky; it offers a 33% chance of saving everyone and 67% of everybody dying. When the options were framed like this vast majority of the participants opted for the safe option. However, when the first policy description was rephrased to emphasize the negative

consequences of choosing this option by emphasizing the death of 400 people instead of saving 200, the percentage of people who picked the risky option rose dramatically. The safe option was selected by the majority of the participants given the gain frame, whereas the risky option was chosen by many subjects who were shown a loss frame. This research introduced the idea of context dependency into the nature of risk preferences.

In order to study people's risk attitudes, authors have developed various methodologies. Two approaches that prevail are incentivized experiments and self-reports. A typical example of a self-reported measure is the one used in the German socio-economic panel study. There, participants were asked to rate their willingness to take the risk on an 11-point Likert scale where 0 corresponded to a strong tendency to avoid risk and 10 corresponded to being extremally risk-seeking (Wagner et al., 2007). Some of the most famous experimental methodologies are Holt-Laury price list approach, Eckel and Grossman's gamble choice, Gneezy and Potter's risky investment task (Schildberg-Hörisch, 2018).

There are clear trade-offs between employing incentivized experimental measures and self-reported measures of risk preferences. Experiments are considered to be the gold standard for measuring preferences. They are designed to observe actual decision-making processes with financial incentives in a controlled setting. Experimental methods allow researchers to precisely quantify the risk under consideration by assigning probabilities to each specific outcome. Even so, experiments are time-consuming and expensive to implement in large samples. In contrast, surveys are significantly cheaper and easier to implement and administrate. But they are likely to capture respondents' risk perception on top of their risk preferences. This happens because rather than observing subjects' choices, surveys rely on their subjective opinions (Charness et al., 2013).

For the purpose of this research, a version of Holt-Laury task is used as well as a self-reported survey measure. Holt-Laury task is considered to be complex due to involving nine decisions between offered gambles with probabilities ranging from 10% to 90%, while other risk elicitation tasks, like the one developed by Eckel and Grossman, have only a single choice in between six options. However, despite being more complex, Holt-Laury method offers an efficient tool to separate noise from the valid data. Holt-Laury task provides a safe option and a risky alternative for all of the nine (or ten in some variations) presented gambles. While the safe option stays the same, the risky one's expected value continues to rise with each subsequent gamble. Thus, a logically consistent and profit-maximizing individual is expected to choose the safe option for the riskiest bets and then switch to risky options once they become too lucrative. The switching point may also never occur if a person is highly risk-averse and always prefers a certain pay-off, even when he could possibly double his monetary reward at the cost of slight risk. Alternatively, if the subject is utterly risk-seeking, he may opt for the risky options only. But if the subject goes back and forth between the options establishing different switching points, this kind of response is seen as logically

inconsistent. This happens because a particular share of the subjects fails to understand the procedure. Responses like this violate the logic of the task and are very likely to bias the results. To be able to clearly interpret obtained parameters, no more than one switching point is required. In addition to that, it is challanging to rationolize multiple switching points under standard assumptions on preferences. Thus, such behaviour is seen as an indication of confusion from the side of participants. Therefore, this data is typically removed from the analysis (Charness et al., 2013).

Some researchers suggested enforcing choice consistency. In that variation of Holt-Laury task, the participants have to choose a switching point. This, similar to Eckel and Grossman, reduces the number of required decisions to one and completely eliminates logically inconsistent choices. Nevertheless, this technique might substantially bias the results. If conflicting data is not treated as noise and not dropped from the analysis, it cannot be assumed that participating individuals understood the instructions and thus, generated data may not reflect their actual risk preferences. I suspect that the absence of a financial incentive in the research might decrease subjects' desire to read through the assignment to take their time to understand the procedure. In the financially incentivized Hoult and Laury experiment variation, the subjects' pay-off is chosen randomly out of nine gambles allocated by him. It ensures that participants pay equal attention to each of the gambles and are interested in doing so. The Holt-Laury task was chosen for this research to have a tool to eliminate the noise from the data and prevent results from being biased.

For this research, it is also essential to draw a distinction between loss aversion and risk aversion. Morison and Oxoby found those two to be different in their experimental research (Morison & Oxoby, 2014). According to the theory, the concept of loss aversion implies that an individual will be less likely to agree to a risky prospect if it involves an individual's personal endowment. This is because a person suffers a more significant utility loss by losing the resources he owns compared to losing the prospect of getting extra assets (Kahneman & Tversky, 1979). Morison and Oxoby introduced two groups in their study. In the first group, people participated in the incentivized Hoult-Laury task and got a chance to get some extra earnings based on their gamble allocation. For the second group, though, all the experiment design elements were kept the same except for the authors' attempt to create a sense of ownership. To ensure that the money given to subjects became a part of their reference state income, the experimenters had to hold two experimental sessions for the second group. The participants were asked to take part in an initial laboratory session where they all earned money and returned one week later to complete Hoult-Laury incentivized task with the earned amount at the initial laboratory experiment earnings at stake.

As a result of the study, it was revealed that subjects acted more risk-averse when they were made to believe that they were risking their own money. Thus, it is vital to pay attention to the framing of the experimental task. When the task is framed in terms of subjects risking their initial endowment, such framing is expected to trigger loss aversion. In contrast, when the experimental assignment description is

phrased in terms of potential gains without risking one's endowment, then risk-aversion is triggered. In this research, the focus is put on studying risk aversion, and the survey description is framed accordingly

3.4 Final remarks

Overall, psychologists and behavioural economists have extensively documented the pervasiveness of cognitive biases, which lead to deviations from rational choice. There is evidence that conformity and authority bias, as well as many others, impact actors' decision-making (Hayalt, 2016). In the last decade, more researchers became interested in how cognitive biases affect people's risk perception. The normative theory states that perceived risk comes from risk assessment which is based on the calculation of outcomes and their probabilities (Jia et al., 2008). However, in real-life, risk perception might be influenced by factors like the tendency to rely on one's gut feeling, emotional state, or past experiences. For example, research on biases in risk perception illustrates that people can change their risk attributed due to stress. Interestingly, that feeling of stress does not have to be related to risky activities. Different studies also suggest that risk preferences and perception can be manipulated by framing the problem (Zhang et al., 2017). Thus, risk attitudes have been indicated to be perceived and acted upon in two ways: risk-as-analysis, in which risk judgments are driven by logical reasoning, and risk-as-feelings, in which judgments of risk are the result of immediate and intuitive reactions to adverse events and dangers (Slovic et al., 2004).

In this research, I attempt to investigate if social forces, in the form of authority and conformity biases, can influence a degree of induvial risk-aversion . Even though the traditional economic theory states that risk preferences are constant and not context-dependent, conducted literature analysis shows that standard economic theory is an idealistic benchmark rather than a descriptive framework of human behaviour. Previous research on conformity and authority biases has addressed their effect on agents' ultimate decisions. They illustrated that people could provide the wrong answer, follow unreasonable behaviour, invest in expensive energy-saving technology, or even hurt another person under social pressure. However, the direct effect of analyzed biases on the individuals' risk perception has been ignored so far, identifying a gap in the literature. I intend to contribute to this topic by conducting an experimental study.

4 Research design

4.1 Research question and hypotheses

The research question I seek to answer in my thesis is formulated as follows: “How do social forces in the form of conformity and authority biases influence the degree of individuals' risk aversion? ” The hypomeres are presented below.

H1: A conformity bias has a significant effect on individuals’ degree of risk-aversion

As discussed in the literature review, social opinion influences people a lot. Individuals often rely on it by assuming that the public knows better and their own judgment is likely to be of lower quality compared to a social one. In addition, people have a natural tendency to mimic the behaviour of others and desire to be accepted by others. Therefore, I hypothesize that individuals’ attitudes towards risk can also be shaped partly by social influence. For that reason, conformity bias is expected to impact the degree of individuals’ risk aversion.

H2: An authority bias has a significant effect on individuals’ degree of risk-aversion

Similar to social opinion, the judgment of the authority figure is frequently perceived to be more accurate than an individual's personal reasoning. The authority derived from expertise is based on a perception that the authority figure is much more competent in the subject matter. On top of that, people tend to have natural difficulties resisting authoritative pressure. I hypothesize that individuals' adjust their risk preferences based on the authoritative opinion. Thus, authority bias is expected to impact individuals' risk aversion.

4.2 Methodology

The experiment was conducted utilizing an online survey administrated via Qualtrics. Initially, subjects were asked to provide personal information about their age, gender and education level (see appendix B). That data was used to get a better understanding of the participants' pool and also to add control variables into the OLS regression analysis.

A lottery allocation task popularized by Holt and Laury was used to measure participants' risk preferences (2002). In this task, subjects are repeatedly offered a choice between two kinds of lotteries: a safe lottery and a risky one. The more often an experiment participant chooses a safe option, the more risk-averse he is. As was mentioned in the task description, each additional investment is an opportunity for a subject to earn extra money. In the modified version of the Holt-Laundry task, participants can also

be told that they were provided with an initial endowment. However, this would trigger loss aversion rather than risk aversion (Morrision & Oxoby, 2014). So, the distinction is vital.

The participants were offered nine pairs of investment choices overall. Option A represented a safe investment, and option B was a risky one. Option A stayed constant throughout the experiment and offered a subject a 100% chance to get a $50 return. Option B would offerd a chance to get either $100 or $10, and the probability of getting those two returns was different for each pair of choices. With each subsequent investment allocation choice, the expected value of option B rose, making it more attractive. Thus, the earlier a participant switches to option B, the more he is willing to risk his certain return for a higher pay-off and, thus, the less risk-averse he is. All nine lottery allocation choices had to be made. The list of options is presented in table 3

Number	A	B	EV of option B
1	$50	10% chance of $100 and 90% chance of $10	19
2	$50	20% chance of $100 and 80% chance of $10	28
3	$50	30% chance of $100 and 70% chance of $10	37
4	$50	40% chance of $100 and 60% chance of $10	46
5	$50	50% chance of $100 and 50% chance of $10	55
6	$50	60% chance of $100 and 40% chance of $10	64
7	$50	70% chance of $100 and 30% chance of $10	73
8	$50	80% chance of $100 and 20% chance of $10	82
9	$50	90% chance of $100 and 10% chance of $10	91

Table 3: The Holt-Laury task design

The experimental set-up includes three groups: two treatment groups and one control group. The control group is shown a neutral statement which goes as follows underneath the Hoult-Laury task description, "**According to the pre-test** results, **52% of participants were females**". The first treatment group would be exposed to an authority opinion while taking the same survey. They would be shown the following statement: "**According to the pre-test** results, **85%** of risk-seeking **financial analysts chose option B 8 out of 9 times**". This statement is used to elicit authority bias. Assuming that most participants in the control would display loss-neutral or risk-averse preferences, authority bias is designed to provoke more risky attitudes on purpose. It is mentioned that only risk-seeking financial analysts would choose option B this often. The statement is framed in such a way as to avoid deception. It has been shown that risk-seeking preferences are uncommon among both amateur and professional investors. But this information was not intentionally written in bold to appear unimportant or even be ignored by subjects. The second treatment group would be exposed to a similar statement designed to elicit conformity bias. It

states, "**According to the pre-test** results, **85% of** risk-seeking participants **chose option B 8 out of 9 times**". The logic here is similar.

Comparable experimental design is used in studies researching priming effects. There, people are primed with smilingly irrelevant cues like colours, images, sounds, or words, either in the lab or during an online survey (Kamenica, 2012). The difference, however, is that in my research, the goal is to expose people to information designed to appear relevant on purpose. The proposed research design where the treatment group is exposed to or primed with certain information before doing a task and a control group does the same task without being exposed to that information has been adopted due to its success in research on priming. Since my study share similarities with studies on priming, I expect it to be the most suitable among possible alternatives.

In addition to the Hoult-Laury task, the participants would be required to evaluate their willingness to take risks on a scale from 1 to 10 where 1 corresponds to being completely risk-averse and 10 stands for being extremely risk-seeking. Once again, I will try to manipulate participants' risk preferences by adding certain statements below each of the tasks. Subjects in the treatment groups would be shown a comment either participants or financial analysts who participated in the pre-test rank themselves as 8. The control group would be exposed to the same neutral stamen as in the Hoult-Laury task.

After collecting the data for all three groups, it is possible to compare them and see if there are any differences between the control group and the two treatment groups. In case the random assignment is preserved, and a large enough number of volunteers participate in the survey, it is possible to subsequently attribute the difference in the outcomes to biases evoked by information exposure (Armitage, 1982).

I run four OLS regressions. The dependent variable is risk aversion exhibited by subjects. The independent variables are framings (three different bias eliciting statements) and the control variables. In the initial regression, the risk aversion would be measured by a Hoult-Laury task and in the subsequent one, by a self-evaluation survey. In addition, because there are different subjects in the experiment in each group, the independent group t-test will be used to see if the differences in the treatment and control groups are statistically significant.

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4.3 Data description

The survey was distributed on various channels to attract as many participants as possible, considering imposed time limitations. The main channel which attracted the most significant share of the subjects was “Survey Swap”. This platform allows researchers to "exchange" survey participation. This way, users of the platform are incentivized to take the surveys of others so that they will take their survey in response. The survey was also distributed via social media. It was posted on my personal LinkedIn and FaceBook accounts.

Overall, 195 participants took part in the survey. Only seven people did not agree with the terms of the study. Thirty-two participants, who make up 16,5% of the overall participants' pool, violated the logic of the Hoult-Laury task. As was discussed previously, this data was suggested to be treated as noise. Thus, it was omitted from the analysis. I hypothesize that the main reason for this is a flaw in the "Survey Swap" platform and the absence of a financial reward for participation. Even though Survey Swap users are incentivized to take surveys of others, there is no incentive for them to take their time while doing so. Therefore, some participants are expected to exercise their opportunistic behaviour by minimizing the time they spend taking the surveys of others. Users are asked to pay attention and warned that they might be banned from the platform if they do not do so. Nonetheless, according to my user experience, there is no straightforward way to report participants who provided logically inconsistent answers or did not pass the attention check.

The monetary incentive has not been used in the research. Its effect on the participants' performance is not clear-cut. On the one hand, financial incentives often improve performance in judgment tasks, which are responsive to better effort. They also reduce “self-presentation” effects and cause subjects to make more realistic choices. For example, when they get paid, participants who choose among gambles are more risk-averse, and participants in charge of money allocation are less generous. On the other hand, in auctions, games, and risky choices, incentives typically do not significantly impact the mean performance (Camerer & Hogarth, 1999). In future studies, the monetary incentive should be used to see if it can affect the results in the context of this research specifically.

Only one data unit was removed from the analysis due to resembling a mistake. One participant identified himself as 1 year old and a holder of a PhD degree. This contradictory data point, participants who said no and the ones who violated the Hoult-Laury logic were omitted from the analysis. Thus, the final data set consisted of 155 observations.

Group characteristics	Conformity bias	Authority bias	Control	Overall
Number of observations	50	52	53	155
Age				
Mean age	26.56	27.61	27.66	27.27
Gender				
Male	22	21	25	68
Female	28	30	27	85
None-binary	0	1	0	1
Prefer not to say	0	0	1	1
Education				
Primary school	1	0	0	1
High school	9	7	10	26
Bachelor's degree	24	21	20	65
Master's degree	16	21	22	59
PhD	0	3	1	4

***Table 4**. Summary statistics on demographics*

The descriptive statistics for all of the groups are presented in table 4. The group conformity bias, authority bias and control groups included 50, 52 and 53 observations, respectively. Qualtrics feature, which allows for an even distribution of participants for all the available conditions made such unselective distribution possible. The mean age of the survey participants is around 27 years, with a negligible difference across groups. Femail is the most common gender. None-binary and prefer not to say gender options are hardly represented in all three groups. In the education domain, again, similar patterns can be observed. The is only one observation with the primary school as the highest degree of achieved education, which belongs to the conformity bias group. PhD degrees are rare and primarily concentrated in the authority bias group. Bachelor's and Master's degrees are the most common. The only striking difference between groups is that the conformity bias group has the lowest number of observations with Master’s degrees. Nonetheless, well-educated subjects who hold either Master's or Bachelor's degrees still constitute most of the observations in the group. Thus, I do not expect this minor difference to impact the results. To conclude, the differences between groups are insignificant, indicating that the randomization procedure worked and the groups are comparable.

4.4 Statistical model

The statistical model employed in the research is expressed in the equation below:

$$\textbf{Risk-aversion} = B_1 + B_2 Dconformity + B_3 Dauthority + u_i$$

The degree of risk aversion is explained by intercept, three dummy variables corresponding to a particular group and an error term. Different framings added after the risk elicitation task descriptions are the only difference between survey content displayed to different groups. Therefore, the group dummy variables stand for a specific framing unique for each group. The dummy variables are set up as follows: Dconformity = 1 for the conformity bias group and takes the value of 0 otherwise; Dauthority = 1 for group the authority bias group and Dcontrol = 1 for the control group. The control group dummy variable is left out of the equation. It is done to avoid perfect multicollinearity. The dropped variable is used as a reference category, meaning that the coefficients of the treatment dummy variables left in the equation would be interpreted in relation to the omitted variable. The control group is used as a reference category to directly compare this group to the two treatment groups and quantify the effect. Since the degree of loss aversion is measured by two different indicators in the research, I use the Hoult-Laury switching point as a dependent variable in the first regression and the risk self-assessment value in the second regression.

Then the control variables are added to the equation. I add the control variables to examine if some of the respondents' personal characteristics affect their degree of risk aversion. The regression equation with the control variables is presented below:

$$\textbf{Risk-aversion} = B_1 + B_2 Dconformaty + B_3 authority + sex_i + age_i + education_i + u_i$$

Sex is a categorical variable with 4 categories which are male, female, none-binary and prefer not to say. The education variable stands for the highest achieved degree of education, and included categories are primary school, high school, Bachelor's degree, Master's degree and PhD. Similarly to the dummy variables identifying specific groups, I need to leave one variable out of the equation and use it as a reference category for both of the categorical control variables. The reference category for the highest degree of achieved education is PhD, and for the gender, it is female. Age is a simple numerical variable.

The null hypothesis states that there is no difference between groups. That would mean that adding additional information to potentially elicit social and authority biases does not impact individuals' degree of risk aversion. The equation is presented below. If the coefficients of group dummy variables are equal to 0, then there is no difference between the treatment groups and the control group.

$$H_0: B_2 = B_3 = 0$$

The alternative hypothesis implies a difference at least for one of the treatment groups compared to the control group. It would suggest that different framing included in the task description did have an effect on participants' degree of risk aversion.

$$H_1: B_2 \neq 0 \text{ and/or } B_3 \neq 0$$

Ultimately, the T-test is used as an additional tool to check for the presence of significant differences between the treatment groups and the control group.

5 Results

The regression analysis results with a self-stated attitude towards risk as a dependent variable are presented in Table 5. Initially, the control variables are not included and only the impact of different group framings is considered. Based on the coefficient, the subjects in the social conformity bias rated themselves 0.57 points higher on the risk scale on average compared to the control group. Similarly, subjects in the authority bias group went 0.14 points higher on the risk scale on average when compared to the control group. Thus, the social conformity bias seems more influential in influencing subjects' decisions. However, for both coefficients, the p-value was substantially higher than 0,05. Therefore, we fail to reject the null hypothesis by confirming that at least one treatment group coefficient is significantly different from the control group. The intercept coefficient is statistically significant and equals 5.3. It identifies the average self-stated attitude towards risk for the control group. The R2 equals 0,017, meaning that the utilized statistical model explains only 1,7% of the variance.

In the subsequent regression, the control variables, which are sex, education and age, were included. After adding the control variables there is a slight change in the treatment variables' coefficients. The coefficient of the social conformity group went down by 0.08 and amounted to 0.49 while the second group's coefficient increased by 0.04 and became equal to 0.18. Nonetheless, the treatment variables are still statistically insignificant, so once again, I fail to reject the null hypothesis. For the gender control variable, the female dummy was used as a reference category. There appears to be virtually no difference between male and female risk-self assessments. None-binary and prefer not to say categories are about two points lower; however, the number of observations for these two categories are negligible. All the gender variables are statistically insignificant, which means that individuals' risk perception does not depend on gender. A PhD dummy variable was used as a reference category for the highest level of achieved degree of education. All the participants who achieved lower education levels seem to be riskier. Despite it, there appears to be no trend of higher or lower risk self-perception depending on the higher or lower academic status. All the educational variables are statistically insignificant, indicating no relationship between the dependent variable and education within the analyzed sample. The age variable has a 0 coefficient and a high p-value; thus, it does not help explain the dependent variable variance. Adjusted R2 squared decreased by 2% and turned negative. It means that the punishment per added variable in the regression equation is severer than the marginal effect of additionally explained variance due to adding extra variables. Thus, it can be concluded that the introduction of the control variables decreased the model's explanatory power

Self-evaluation task regression without control variables			
Variable	**Coefficient**	**T-value**	**Significance**
Social conformity bias	0.57	1.58	
Authority bias	0.14	0.39	
Intercept	5.3	20.8	***
R2 = 0.017			
***p<.01, **p<.05, *p<.1			
Self-evaluation task regression with control variables			
Variable	**Coefficient**	**T-value**	**Significance**
Social conformity bias	0.49	1.32	
Authority bias	0.18	0.50	
Male	0.01	0.06	
None binary	-1.88	-0.98	
Prefer not to say	-2.07	-1.07	
Age	0	-0.08	
Primary school	0.61	0.28	
High School	1	0.94	
Bachelor’s	0.55	0.55	
Master's	0.14	0.14	
Intercept	4.9	4.06	***
Adjusted R2 = - 0,013			
***p<.01, **p<.05, *p<.1			

Table 5. *Self-evaluation task regression with and without control variables*

The regression analysis results with the Hoult-Laury switching point used as a dependent variable are illustrated in Table 6. The coefficient of the conformity bias group dummy variable is equal to -0.63. It means that on average the participants in this group switched to picking option B 0.63 points earlier compared to the control group. It is a manifestation of riskier behaviour. However, the p-value for this variable coefficient is higher than 0,05; thus, the effect cannot be acknowledged as statistically significant. The coefficient of the second treatment group signifies that the participants in that group switched to choosing the risker option almost 1 point earlier than their counterparts in the control group. The variable is statistically significant at the 0,05 p-value level. Therefore, it can be concluded that the subjects' responses in the authority bias group are different from the responses of the control group participants. It must be noted that this variable coefficient's statistical significance is conformed under a relatively low R2 value of around 4%.

Hoult-Laury task regression without control variables			
Variable	**Coefficient**	**T-value**	**Significance**
Social conformity bias	-0.63	-1.6	
Authority bias	-0.95	-2.46	**
Intercept	6.15	22.4	***
R2 = 0.017			
***p<.01, **p<.05, *p<.1			
Hoult-Laury task regression with control variables			
Variable	**Coefficient**	**T-value**	**Significance**
Social conformity bias	-0.61	-1.49	
Authority bias	-0.95	-2.35	**
Male	-0.09	-0.27	
None binary	-0.50	-0.02	
Prefer not to say	-1.0	-0.51	
Age	0	-0.27	
Primary school	0.38	0.17	
High School	-0.29	-0.25	
Bachelor’s	-0.27	-0.25	
Master's	0.12	0.12	
Intercept	6.44	4.89	***
Adjusted R2 = - 0,013			
***p<.01, **p<.05, *p<.1			

Table 6. *Hoult-Laury task regression without control variables*

After the control variables were added to the model, the treatment variable coefficients almost did not change. The authority bias dummy variable coefficient kept the value of -0,95 and remained statistically significant. The difference between male and female choices is negligible and statistically insignificant again. Participants who decided not to reveal their gender and those with non-binary gender seem to pick option B by 1 and 0.5 times more frequently on average, but the coefficients are statistically insignificant. Age has a 0 coefficient, meaning that age had no impact on participants' choices. The coefficients of education categorical variables seem random and do not follow a particular trend. The intercept coefficient remained significant and increased in value by around 0.3 points. The R2 worsened in comparison to the regression model without control variables. Thus, the regression with control variables has lower explanatory power than the one without them.

To conclude the analysis I run a series of T-tests to compare the authority bias and conformity bias groups to the control group for both dependent variables. It is an additional statistical tool used to investigate if there is a statistically significant difference between the treatment and control groups. If the T-value in the table 7 is lower than 0,05 then it can be argued in favor of the alternative hypothesis which states that difference is existent and significant.

Hoult-Laury	
Groups	**P-value**
1 to 3	0.11
2 to 3	0.02
Self-evaluation	
Groups	**P-value**
1 to3	0.09
2 to 3	0.71

Table 7. *T-test results*

The t-test analysis confirms the findings stated above. The difference between the treatment groups and control group is only significant for the group authority bias group with the Hoult-Laury switching point as a dependent variable.

6 Conclusions

In this research, I attempted to explain the variation in participants' degree of risk-aversion by different framings, which were designed to elicit conformity and authority biases. Two proxy measures of risk-aversion are used, the Hoult-Laury switching point and self-assured willingness to take risks. While the Hoult-Laury switching point is derived from a lottery allocation task, the self-assed willingness to take risks is a subjective self-reported measure.

Based on the results of the conducted statistical analysis, the null hypothesis was rejected for the regression with the Hoult-Laury switching point used as a dependent variable. The difference between the control group with neutral framing and the authority bias group is statistically significant, while the social conformity bias group coefficient p-value is too high to be proved significantly different from 0 at the 5% significance level. Since the only difference between groups is the bias framing, I argue that the reason why participants in the second group picked around 1 more option B on average is the successful elicitation of

the authority bias. This provides evidence that the social forces in the form of authority bias can influence individuals' degree of risk-aversion measured based on lottery allocation task.

If the expert opinion is perceived as exemplary and more accurate in comparison to one's own judgment, as suggested by the literature, then it makes sense for the participants to reconsider their choices. A similar effect might be obtained while people rely on the "wisdom of the crowd". I hypothesize that the financial decision context encouraged subjects to value expert or authoritative opinions higher than the one of an average person. Individuals perceive financial analysts' opinions as credibly by assuming that they have the necessary expertise based on their title. Apparently, the majority opinion did not appear to be reliable enough in the lottery allocation context for the subjects to deviate from their own asset allocation strategy.

The differences for both of the treatment groups, when compared to the control group, for the regression with the self-assessed willingness to take risks used as a dependent variable, are all statistically insignificant. This suggests that authority bias impacts people's degree of risk aversion in the context of "real" decision-making rather than self-evaluation. Self-evaluation, unlike investment allocation, does not lead to any financial consequences. Even though the monetary reward is absent in the research, it makes sense to differentiate the attitude towards approaching those two tasks. People are logically expected to follow their own judgment when they are asked to evaluate themselves because they possess more information about themselves than anybody else. However, when they are asked to allocate investments or gains, they might heed someone's advice to attempt to ensure they do it properly.

The control variables, which are sex, age and the highest degree of achieved education, were added to the regression equation but did not enhance the explanatory power of the model. This implies that those factors did not play any substantial role in explaining the variation of risk aversion among participants. In further research, different control variables should be used.

It has been shown before that people's risk preferences can be manipulated. This research, however, pioneers in studying the impact of social conformity and authority biases on the degree of risk aversion. The primary contribution of the study is the detection of a significant relationship between the authority bias and the degree of loss aversion. Unlike other research which studied authority bias, mine does not employ direct deception. It illustrates that statistically significant results in behavioural research could be obtained without directly deceiving participants.

Nonetheless, the experimental design used in my research is overly simplistic. More sophisticated methodology should be used in future studies to make bias elicitation methods which appear to be more credible. It can be achieved by taking advantage of the findings reveled in the discussed studies. As illustrated in the SPE experiment, it is possible to impose role embracement on participants by adjusting certain elements of their surroundings. Milgram also highlighted specific environmental elements which

intensified obedience exhibited by the subjects. Higher legitimacy of the authority group framing can be obtained by implementing location and uniform effects. To do so, the experiment needs to be done in person. For example, in the financial research institute where the financial specialists' opinion would be given by a person whose look suggests she is a financial analyst herself. Similar strategy should be applied to the social bias treatment group, however, it is difficult to give any distinct suggestion for the environment adjustment because the discussed literature mainly focuses on the use of confederates.

The findings of the regression analysis presented in this thesis are based on a relatively low adjusted R2 (1.7% for the Hoult-Laury regression without control variables). This means that the significant authority bias variable, although important, does not explain the majority of the variance in the degree of individual risk-aversion. The low values of R2 squared is common in social sciences because it is difficult to include all the relevant predictors to explain a dependent variable while analyzing human behavior (Moksony, 1999). So, even though the value of adjusted R2 is low, it still establishes a relationship meaning that the model has statistically significant explanatory power.

I believe that educating people about their natural susceptibility to authority and conformity biases is a necessary public policy to implement. Spreading awareness of the threat which those biases may bring would help people to resist them. It is important to mention their influence not only on individuals risk-perception but also on other domains on decision making. Most of the experiment participants in Milgram, Zimbardo and Asch experiments claimed they learned valuable lessons about themselves and others via participation. The educative public policy would seek the same goals but without potentially harming participants by using ambiguous methodology

7 Bibliography

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Appendix A

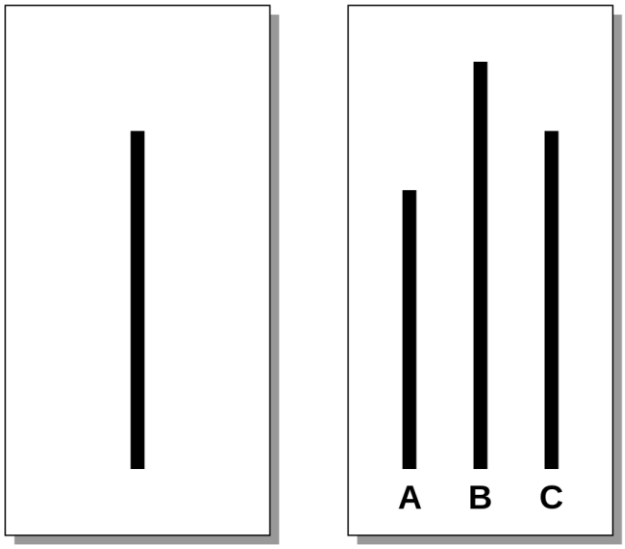

Figure A1. Asch conformity experiment

Appendix B

Online survey design

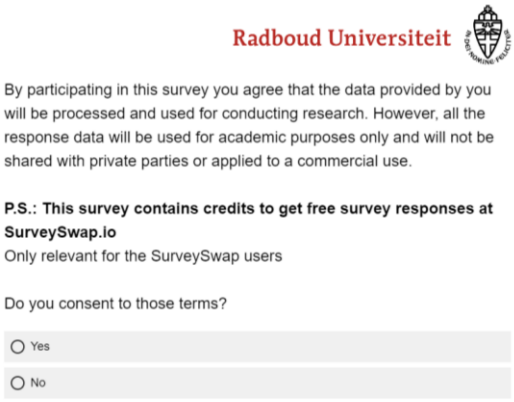

Figure B1. Terms and conditions

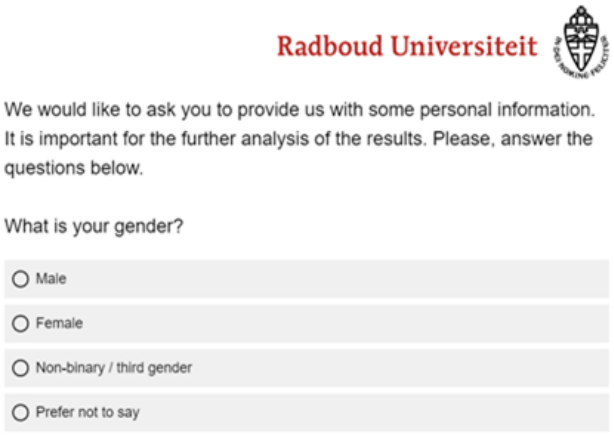

Figure B2. Gender question

What is your age?

Note: use numbers (e.g. 23)

What is your highest degree of achieved education level?

- ◯ Primary school
- ◯ High school
- ◯ Bachelor's degree
- ◯ Master's degree
- ◯ PHD

Figure B3. Age and education questions

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In this set of 9 lotteries, you are given a chance to earn a hypothetical cash prize. For each of the presented lotteries, you will choose between two options, A and B. By choosing option A you will always get a hypothetical cash prize of $50 with 100% certainty. However, if you choose option B instead, you can win either $100 or $10. Your chances to get one of those two pay-offs will be different for all 9 lotteries. For example, if you choose option B in the first lottery choice, you get a 10% chance to win $100 and a 90% chance to win $10 as illustrated in the table below. Please, choose A or B for all the lotteries below based on your preference.

According to the pre-test results, **85% of** risk-seeking **financial analysts chose option B 8 out of 9 times.**

	A	B	
1) $50	◯	◯	10% chance of $100 and 90% chance of $10
2) $50	◯	◯	20% chance of $100 and 80% chance of $10
3) $50	◯	◯	30% chance of $100 and 70% chance of $10
4) $50	◯	◯	40% chance of $100 and 60% chance of $10
5) $50	◯	◯	50% chance of $100 and 50% chance of $10
6) $50	◯	◯	60% chance of $100 and 40% chance of $10
7) $50	◯	◯	70% chance of $100 and 30% chance of $10
8) $50	◯	◯	80% chance of $100 and 20% chance of $10
9) $50	◯	◯	90% chance of $100 and 10% chance of $10

Figure B4. Hoult-Laury task, authority bias condition

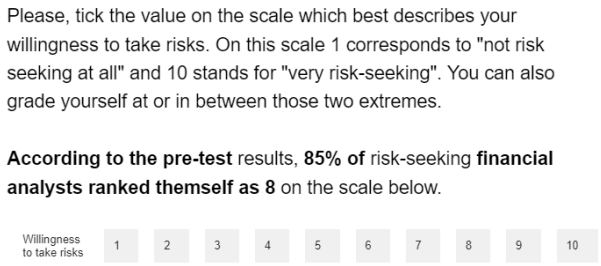

Figure B5. Risk self-evaluation task, authority bias condition

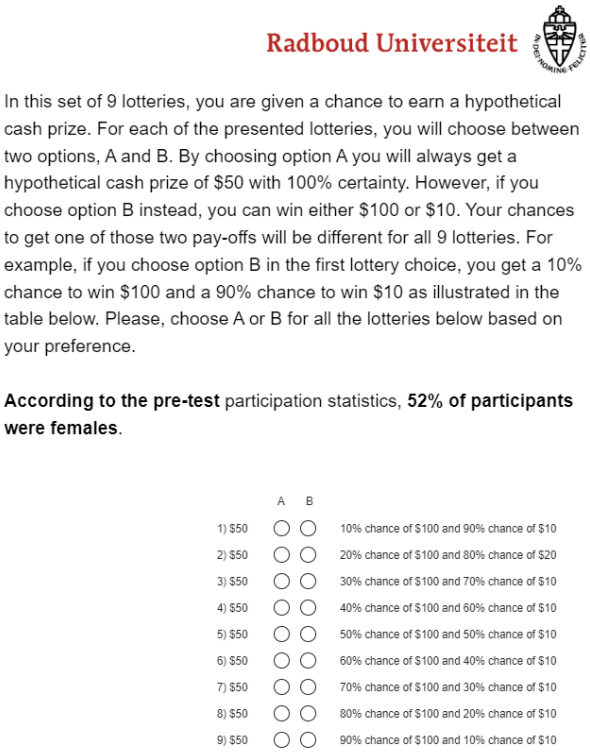

Figure B6 Hoult-Laury task, control condition

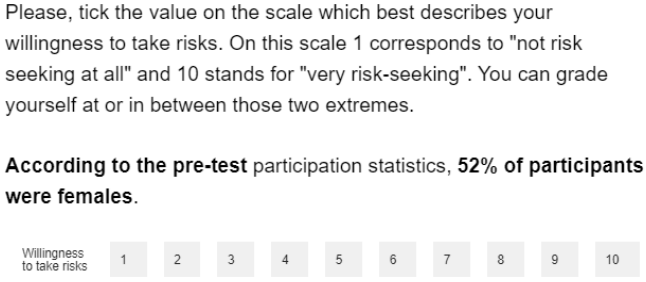

Figure B7. Risk self-evaluation, control condition

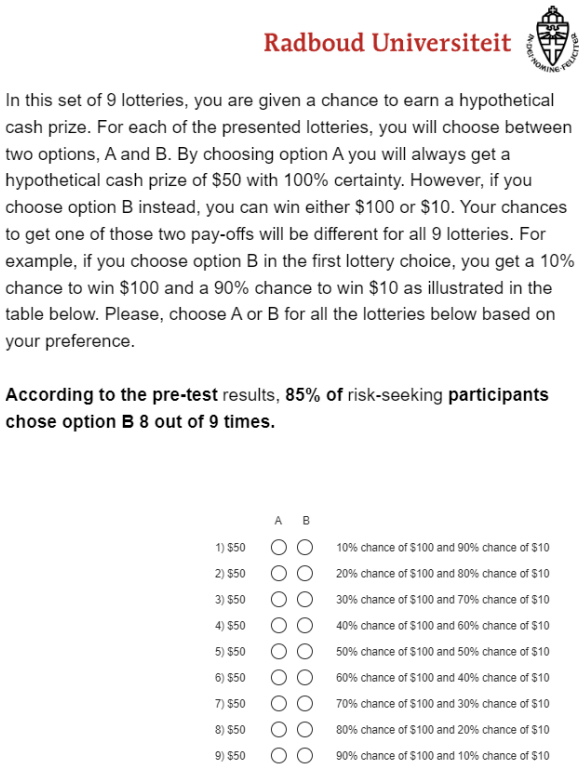

Figure B8. Hoult-Laury task, conformity bias condition

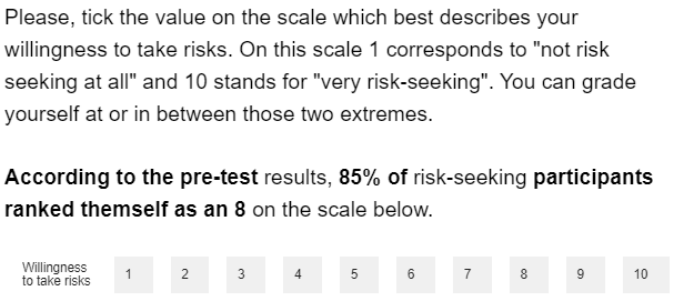

Figure B9. Risk self-evaluation task, conformity bias condition