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Faculty of Social Sciences
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MASTER THESIS

**Discrimination, Information and Cognitive
Effects: Evidence from a Field Experiment
in the Czech Rental Housing Market**

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently, using only the listed resources and literature.

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Prague, May 20, 2010

Signature

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Abstract

Aim of this thesis is to shed light on discriminative behavior of landlords in the Czech rental housing market using our data from a double blind Internet field experiment. The experimental design allows us to study the processes of choice of the landlords deciding about inviting or not inviting a particular member of a minority group to a visit of the offered flat. We control for various characteristics that may influence the resulting outcome and we try to disentangle their effects. Mainly we control for the minority group effect, for the effect of education and several cognitive factors that, according to a rich socio-psychological and behavioral-economical literature, affect the decision making. We introduce an innovative tool that allows us to study landlord's behavior using a special online mouse tracking program based on widely used MouseLab. The thesis is a part of a comprehensive research studying discrimination of minorities and the role of information in the Czech rental housing market.

JEL Classification C81, C93, D03, D83, J15

Keywords discrimination, decision making, behavioral economics, information

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Abstrakt

Cílem této diplomové práce je objasnit diskriminativní chování pronajímatelů nájemních bytů na českém realitním trhu na základě dat z námi provedeného dvojité slepého (double blind) internetového field experimentu. Design experimentu nám umožňuje zkoumat, jak se pronajímatelé rozhodují o pozvání či nepozvání zájemce z řad minoritních skupin k prohlídce nabízeného bytu. Zkoumáme mnoho různých aspektů, které by mohly ovlivnit výsledné rozhodnutí pronajímatele a měříme jejich efekty: efekt dané minoritní skupiny, různého stupně vzdělání a také různé kognitivní efekty, které mohou, podle rozsáhlé socio-psychologické a behaviorálně-ekonomické literatury, ovlivnit rozhodovací procesy. V našem experimentu představujeme inovativní nástroj inspirovaný široce užívaným programem MouseLab, který nám umožňuje studovat chování pronajímatelů pomocí sledování kurzoru myši přes internet. Tato diplomová práce je součástí rozsáhlého projektu zaměřeného na studium diskriminace a role informací na trhu nájemního bydlení v České republice.

Klasifikace JEL

C81, C93, D03, D83, J15

Klíčová slova

diskriminace, rozhodování jednotlivce, behaviorální ekonomie, informace

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Acronyms

2SLS	Two Stage Least Squares
FHA	Federal Housing Administration
LATE	Local Average Treatment Effect
LPM	Linear Probability Model
NGO	Non-Governmental Organization
OLS	Ordinary Least Squares

Master Thesis Proposal

Author	Bc. Vojtech Bartos
Supervisor	Michal Bauer, Ph. D.
Proposed topic	Discrimination, Landlords' Information Search Patterns and Role of Transaction Costs in the Czech Rental Housing Market: Field Experiment

Motivation

My diploma thesis will be a part of a comprehensive research.¹ The aim of the research is to examine discrimination in the Czech rental housing market. Based on the internet field experiment conducted by Ahmed and Hammarstedt (2008) in Sweden we want to conduct an experiment estimating the role of information and transaction costs on willingness to rent a flat to minorities. Our subjects will be real landlords, making real life choices. Internet field research is going to be conducted through sending randomly selected email answers differing only in applicants' names (indicating the nationality) to the landlords' ads on real estate websites. The level of information in the email will be randomly manipulated into three treatments described in Experimental design section. This design allows us to separate the above mentioned discrimination types and examine the impact on decision-making of landlords.

My diploma thesis studies the effect of small transaction costs in the landlords' decision-making. Using MouseLab tool (www.mouselabweb.org) I will track the search patterns of the respective landlords who will be given an op-

¹This thesis will be a part of complex project assessing discrimination on the Czech rental housing market. The project focuses on role of information, estimating slope of indifference curves btw. education and ethnicity, comparison of discrimination and effects of information across minorities, geographical distribution of discrimination, willingness to "pay" transaction costs for obtaining information and studying process of choice (which types of information are important for the rental decisions to minorities). My responsibility is for the last two topics and these are also the part of my diploma thesis. Participants on the project: Lenka Svejnova, Michal Bauer, Julie Chytilova.

portunity to visit the personal website of the virtual applicant. My aim is to find the links between how the information about the applicants is obtained (if it is obtained at all) and the probability of a positive response and/or invitation to flat showing for any respective applicant. The data collected by MouseLab and a specially programmed website may shed light on what kind of information is crucial for the decision over the response to the applicant and whether there is a different behavior with regard to respective minority groups.

The knowledge of the decision making pattern in this field may be used for the direction of the further research on discrimination in the Czech rental housing market as well as it may be helpful for the minority members in order to mitigate the level of discrimination while applying for rental housing. Moreover, the data collected on the website may extend our knowledge of distinguishing between statistical and preference-based discrimination as defined by Phelps (1972) and Becker (1957) respectively. In Hypotheses section I bring in some a priori expectations on possible results.

Experimental Design

In our study we will construct fictitious identities of two Vietnamese, two Roma, two Ukrainian and two Czech applicants (each of the same nationality will be assigned either a high school degree or will be a high school graduate) in the internet market of rental housing. We will set an email account for all the persons and will send email applications to the landlords offering rental housing in the internet with varying level of information. The only difference in all treatments will be name of the applicant.

There will be 3 treatments in the form of the email applications, based on the level of information. Of these the third treatment will be the core of my diploma thesis. Treatments are described bellow:

- The first email, called NoInfo, will contain only the necessary greeting and an expression of interest with no other information about the subject but its name.
- The second email, called Info, will contain the exact wording of the first email with some additional information such as mentioning the university degree or high school graduation, current occupation, marital status, age, employer etc.
- The third email, called WebInfo, will contain the exact wording of the

first email and there will be a link of the individual's personal website bellow the signature of the applicant. The link will be specific for every landlord so that we will be able to track his or her behavior in the website. This may help us to understand how willing are the individuals to seek additional information and how does it influence their decision making. This part will be the studied thoroughly in my diploma thesis.

The personal website contains approximately the same information as the email with additional information, even though I am not able to control for some bias caused by other factors such as graphics of the web anymore. Still, the website for all of the fictitious applicants differs in their names only. The website should serve as a laboratory itself. This is allowed by programming the website so that the information on every visit from the landlord specific address is saved in our database using the MouseLab tool. I will be counting the number of visits on the site as well as we will collect the data on the mouse tracking over the web page where the information will be hidden in boxes that can be revealed only if the cursor is dragged over the box. This tracking of the search mechanism of the landlords may help us understand what field of information matters for which group of landlords if dealing with each of the ethnic groups as we will know the order in which the pages were visited, the length of each visit and number of visits if the visit was repeated. This web page design is an important innovation compared to the existing studies and extends the use of MouseLab technology, so far mostly used in laboratory experiments, to the field.

Hypotheses

Data will need to be collected in order to confirm all the below proposed hypotheses. All of the hypotheses are based purely on a priori expectations based on previous research in the field and on expectations of my own.

1. Majority members will receive a higher percentage of positive responses from the landlords than the minority members under any of the three treatments. This would imply that discrimination is present in the Czech rental housing market.
2. Probability of a positive response to the applications of Vietnamese and Ukrainians will be approximately the same while the probability of a positive response for a Roma will be significantly lower. This would

imply that there is a different treatment for different minority groups in the Czech rental housing market.

3. If the landlord visits the personal website and navigates through the page – and hence collects information – the probability of positive response will increase if compared to the application with no information about the applicant. This would be consistent with the statistical definition of discrimination.
4. Majority of the landlords will visit the web page if given the opportunity in order to update their information. The share of landlords visiting the personal website will be higher for the landlords residing in the Czech capital city, Prague.
5. Higher level of education will make for increase of the probability of a positive response for any applicant.

Structure of the thesis:

1. Introduction and Motivation
2. Experimental Design and Hypotheses
3. Data Analysis and Experimental Results
4. Conclusions and Policy Recommendations
5. Literature

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Author

Supervisor

Chapter 1

Introduction

The aim of this thesis is to shed some light on the possible source of discrimination of minorities in the Czech rental housing market. Further it shows how the agents' – in this particular case we mean a group of landlords offering rental housing on the Internet in the Czech Republic – are willing to acquire additional information about the applicants and how their decision making process may be affected by cognitive effects. We conduct an Internet field experiment bringing innovative methods of using specially adjusted laboratory techniques in the field.¹ Yinger (1986) claims that "field experiments catch economic agents in the act of discrimination."

We believe that discrimination has serious consequences for the minorities. Especially grave is the social exclusion of the individuals. In the Czech Republic the most problematic is the ethnic group of Roma whose situation worsens up even due to the fact that they are often limited to living in *ghettos* away from the majority communities.²

Yinger (1993) claims that discrimination in the housing market has severe consequences for social and economic lives of the discriminated groups. E.g. Heckman & Masterov (2004), Carneiro *et al.* (2005) or Cameron & Heckman (2001) have shown that the social exclusion and living in poorer neighborhoods may actually lead to child's lower performance in schools and/or lower college attendance which later transfers to worse employability in the future. Ellwood (1986) finds evidence of limited access to schooling, public services and em-

¹The Oxford English Dictionary (Second Edition) defines the word "field" as: "[Field is] used attributively to denote an investigation, study, etc., carried out in the natural environment of a given material, language, animal, etc., and not in the laboratory, study, or office."

²Zpráva o stavu romských komunit v České republice (Document for the Czech Government information, in Czech only), pp. 48 – 9, December 2004.

ployment due to housing discrimination. The author also claims that housing discrimination results in lower wealth accumulation.

In the whole area of the European Union any kind of discrimination is illegal. It is the Article 21 on Non-Discrimination of the Charter of Fundamental Rights of the European Union, updated on December 12th 2007, that states that "any discrimination based on any ground such as sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age or sexual orientation shall be prohibited." The charter also grants "access to the supply of goods and services which are available to the public, *including housing*" (Italics ours) to any citizen non-excludably.

The Czech Republic has had a similar Article in its Human Rights Charter from 1991 that was updated in 1998 and later offset by the European Charter. However, the Eurobarometer survey no. 263 reveals that the Europeans consider discrimination as a widespread problem and that the situation has worsened in the last five years.³ Also in the Czech Republic the problem of discrimination is severe. The recent opinion poll on housing by Factum Invenio, a polling organization, discovered that 76% of Czechs would not like to have a Roma as a neighbor.⁴

In our experiment we study real-life and important decisions among a natural subject pool. The reason for choosing natural field experiment⁵ and not a laboratory experiment is obvious. There is a main concern that subjects in the laboratory would not be willing to reveal their true preferences and it would be virtually impossible for the experimenters to design the experiments in a way that would sufficiently replicate the characteristics of the decision making process the landlords face. For example List (2006) has shown that there is often a difference between results obtained in laboratory and in the field. Thus our subjects will not be university students but the real landlords from the rental housing market from all over the Czech Republic.

We sent email applications from fictitious applicants of different ethnic groups to the landlords offering flat or house rentals on the Internet. After

³Available online at: http://ec.europa.eu/public_opinion/archives/ebs/ebs_263_en.pdf.

⁴See e.g.: Hospodářské noviny, Feb 9th 2010: "Sousedit s Arabem by vadilo 60 procentům Čechů. Se Židem jen necelé pětina."

⁵By natural field experiment we understand the experiment as defined by Harrison & List (2004). The authors state that the natural field experiment differs from conventional laboratory experiment in the way that "*the environment [of the experiment] is one where the subjects naturally undertake these tasks and where the subjects do not know that they are in an experiment.*"

collecting the answers we evaluated the difference between the answers for different groups. Any statistically significant difference should indicate different treatment of different ethnic groups in the Czech rental housing markets, i.e. discriminative behavior.

On top of that we evaluate the effect of information about the applicant on receiving an invitation to flat showing or not. In order to learn more about the effect of information on the landlord's decision making process we manipulate the task into two separate treatments where in the first one the information is given explicitly and cost-free. In the second treatment there is a positive cost given by small transaction costs in terms of the necessity of more demanding information acquisition.

The standard economic analysis usually assumes perfect information on the markets. This strong assumption is far from being true. Stigler (1961) shows that there is a positive value of information. Any information should hence have a non-negative price and information that allows the decision maker to increase her level of utility compared to the utility level without the information should be positively priced.

Information is non-rival good and can be implemented into standard utility maximization problem because there is a price for this good. Thus there exists an optimal amount of information that the decision maker should acquire in order to behave rationally and maximize her utility.

In practice the problem arises when the price of the information is not explicitly stated in monetary terms, but the cost is rather an opportunity cost. Moreover, there is a further concern regarding uncertainty about the validity of the information given. In our experimental design we will allow the agents to update their information for which they will have to pay a small transaction cost in terms of time spent searching for the information on the fictitious personal website we have created for the purpose of our research. From our collected data we can later infer whether the landlords were actually willing to pay the small costs in order to improve their knowledge or whether the knowledge of nationality or ethnic origin of the applicants was sufficient for them in order to accept or reject the application.

In addition to that we will manipulate the way information is presented on the website. The manipulation, however, only does apply to the position of information on the website, to the different background colour patterns and different methods of depiction of information. Since the content does not change and the amount of information is equal in all the website manipulations the

underlying decision making process should remain unchanged. Yet, cognitive effects may play role in the process of information acquisition which would translate into biased process of choice. Our experimental design provides tools to study such behavioral puzzle.

The main contribution of the author of this thesis to the experimental design was the implementation of the personal website and construction of the mouse tracking technology⁶ based on the popular MouseLab tool that allows us to study the landlords' behavior online. Other parts of the experimental design were discussed with Michal Bauer, Julie Chytilová and Lenka Švejdová with whom the author participates in the comprehensive project studying discrimination and effect of information in the Czech rental housing market. The author is grateful to the co-researchers, but he takes full responsibility for the content of this thesis. It has been compiled independently as stated in the declaration of authorship earlier.

The remainder of the thesis is organized as follows: Chapter 2 reviews the literature on housing discrimination, decision making processes and cognitive biases. Chapter 3 describes the experimental design and presents the main discrimination hypotheses. Chapter 4 presents our results and Chapter 5 concludes.

⁶In cooperation with Adam Dominec.

Chapter 2

Literature Review

We base our research on the two main approaches to discrimination and try to distinguish between the two. First is the preference based discrimination as described by Becker (1957). This theory claims that people would be willing to pay more for an equivalent good if it was produced by their preferred group and vice versa for the less preferred group.

We can think of discrimination as of a coefficient of distaste d_i that enters into landlord's utility function U_i if dealing with a member of group i . For sake of simplicity the Czech applicant, i.e. the applicant of the same majority group, is assigned index 0 and it holds that $d_i > 0$ if $i > 0$ and $d_0 = 0$. When deciding about renting a flat to a particular applicant the landlord should maximize her utility function from the rental to an individual j :

$$\max\{U_i\} = \max\{r_i - E(C_i) - d_i\} \quad (2.1)$$

where r_i is a full rent, $E(C_i)$ are expected costs related to the rental to a member of group i including amortization, service payments and other possible states of the world with properly assigned probabilities. The constant d_i then decreases landlord's utility from renting her flat. In order to equalize the utilities of minority member with the majority, Czech, applicant it must hold that

$$r_i - E(C_i) - d_i = r_0 - E(C_0) - d_0 \quad (2.2)$$

where $i \neq 0$. This means that either rent for i must be higher or that expected costs related with the member of minority i are lower than these with the Czech applicant, 0. The latter would be tested by variable amount of information about the applicant and it is related to the second approach to

discrimination. The former is being controlled for in our experimental design because we do apply for the offers with explicitly stated rent.¹

The other approach is described by Phelps (1972) and Arrow (1973). They suggest that discrimination is based on prejudices that may affect the expected profits that are based on *ex ante* information. If additional information is given, the expected costs may change if priors are updated as well as noise would be reduced. This would cause change in level of discrimination.

In our simple theoretical example it means that $\forall i : d_i = 0$ and it is $E(C_i)$ that varies with additional information. Without any information it holds true that $E(C_i) > E(C_0)$ where $E(C_i)$ are average expected costs of a minority applicant while $E(C_0)$ are average expected costs of a majority, Czech applicant. Due to asymmetric information the landlord must first update her priors in order to get her expectations closer to the individual costs of rental to the individual from group i . This type of discrimination, despite that it is forbidden by law in the European Union, is *efficient*.²

Moreover, Yinger (1986) proposes additional preference based hypothesis. He claims that landlords discriminate not because of their own prejudiced attitudes, but because of the prejudiced attitudes of the group of tenants that supplies most of their business. This is done because entry of those (supposedly discriminated) people could lead to the exit of people from the majority group. We think of this hypothesis as of a subset of statistical discrimination since the landlords may already calculate with such spillover effect. The magnitude of such effect may indeed be either increased or decreased by additional information.

2.1 Previous research in housing markets

Audit studies Previous studies of discrimination in housing markets are mostly based on audit studies that used trained pairs of individuals of both the majority and minority groups for direct interaction with the landlords. There are many papers based on the regular audit of Housing Discrimination Study conducted in the USA. Roychoudhury & Goodman (1996) use the audit data

¹Already Becker concluded in his book that this approach to discrimination creates incentives for segregation. In his example of labor market minority members were better off if they matched with the employer of the same group. For the rental market this creates incentives for *ghettoization*.

²Efficient solution is reached, however, only if the expected average costs for all groups are estimated correctly. If they are not and if they are driven by prejudice, efficiency is lost.

from the Fair Housing Center, Detroit, in their study of racial discrimination in search of owner-occupied housing. The US audit data are used in Ross & Turner (2005) as well. The authors compare the data from audits from 1989 and 2000 and show that the racial discrimination persists but has declined substantially over the period, even though there are some exceptions. More specific comparison of audit studies from 1989 and 2000 has been conducted by Zhao (2005) who examines discrimination in the number of houses shown to home-seekers and finds that the discrimination of African-Americans has increased over the periods while for Hispanics it remained unchanged.

In Europe there is no governmentally organized audit such as the one conducted in the USA, yet still there are some audits organized by the economists themselves. One example of audit conducted in Europe is a recent study by Drydakis (2007) testing rental housing discrimination in Greece. The author conducts a field experiment in which pairs of trained subjects of Greek and Albanian origin apply for large number of rental houses in 122 areas via a phone call. He found evidence of discrimination and estimated that level of discrimination increases with attractiveness of the location where the apartment is located. The attractiveness was measured by the average rent levels for the given area.

Problems with audit data The flaws of audit experiments are that the data may be contaminated by non-observable effects which is undesirable. Some authors have further opposed audit experiments because of the possible demand effects³ of the trained subjects (e.g. Heckman 1998).

Field experiments There have been studies testing discrimination by using postal correspondence. The studies were mainly conducted in the labor market where resumes of fictitious characters were sent to different firms while the resumes differed in names of the respective applicants only.

³By *demand effects* or *demand characteristics* the psychological literature understands an effect when subjects participating in an experiment adjust – even if unconsciously – their behavior in order to satisfy or dissatisfy experimenters purpose. Orne (1962) notes that “if the purpose of the experiment is not clear [...] many different hypotheses may be formed by different subjects.” It is not unlikely that the subjects of audit studies were often in conflict with each others expectations of the desired outcomes of the experiment. Hence there is a scope for a bias of both unknown magnitude and sign in the results of studies using audit data. Even if subjects were biasing the data in a way to confirm the experimenters hypothesis, i.e. confirm the presence of discrimination against minorities, still it would not be possible to estimate the magnitude of each individual’s bias.

Bertrand & Mullainathan (2003) perform a field experiment in which they measure racial discrimination in American labor market by sending fictitious resumes to employers and collecting callbacks. They found significant discrimination of African-Americans and also evidence of lower effect of quality of resumes on callbacks for the African-American applicants compared to their white counterparts. Curious are their findings that there is no difference between level of discrimination by so called "Equal Opportunity Employers" compared to employers who do not state this term in their ads.

The above mentioned paper has been replicated in many latter studies with similar findings. One such replication has been conducted in 2004 in the Czech Republic by Alexander Popov. Unfortunately the experimental results were never published as a working paper or in a journal. This makes our field experiment first of its kind in the Czech Republic.

Using Internet field experiment Using the method of Internet field research as used by e.g. Ahmed & Hammarstedt (2008), Ahmed *et al.* (2008) or Carpusor & Loges (2006) and introducing random allocation into different treatments we will eliminate non-observable characteristics and demand effects influencing the decision making process. The experiment is double blind. Besides, Internet field experiment reduces costs significantly compared to the audit experiments (See Wienk *et al.* 1979).

In their paper, Ahmed & Hammarstedt (2008) found the importance of information on the level of discrimination in the rental housing market in Sweden, Ahmed *et al.* (2008) confirmed the discrimination of lesbians in the same market. Carpusor & Loges (2006) used the Internet field experiment to test discrimination based on ethnicity in names.

Recently a similar method has been used in Spanish rental housing market in Bosch *et al.* (2009) and the authors found evidence of discrimination of immigrants of North-African origin. Their paper combines the two above mentioned approaches towards evaluating discrimination in the field - audit and Internet field experiments and finds statistically significant difference between the response rates to immigrants and local inhabitants. They also confirm our concern that "Discrimination in the housing market may substantially and negatively affect the integration of immigrants in the society, and thus the economic opportunities of the newcomers."⁴ (Bosch *et al.* 2009, p. 2)

⁴The quotation continues: "For example, if immigrants are reduced to search for housing in less attractive neighborhoods, they will benefit from poorer social facilities (i.e. schools

2.2 MouseLab modification

Introducing MouseLab In our experiment we use a newly designed tool very similar to a widely used program for studying information acquisition and choice patterns called MouseLab.⁵ MouseLab is mainly used for experiments on consumer preference creation (e.g. Bettman *et al.* 1998; Payne *et al.* 1992). MouseLab allows the experimenter to observe movements of the mouse cursor above cells displayed on the monitor. The cells contain hidden information that is revealed only if the cursor is located inside of this cell. Time spent above – or *inside* – the cell and the pattern of movement between different cells on one page can help the experimenter to observe search patterns of each experimental subject. A direct predecessor of MouseLab was a method called *information display boards* that was used before the era of computers (See e.g. Jacoby *et al.* 1976; Payne 1976).

Methods of search pattern measurement Other widely used method for such experiments is eye-tracking. This method is argued to be more effective due to the fact that MouseLab ”requires the participants to make a conscious decision at each stage with regard to the order in which he looks into the information boxes” (Arieli *et al.* 2009) while the eye-tracking method may capture the un-conscious moves as well. Such tool can, however, be used in laboratory only.

The reason why we did not use MouseLab but had to develop a special new program was that MouseLab does not operate without the subject actively participating in the experiment and, consequently, knowing about being tested. Our innovative technology solves this problem and allows us to study the actual landlord’s decision making process without her actually knowing about being tracked. Obviously, using our technology we do not solve the problem of unobserved un-conscious decisions that would otherwise be solved by eye-tracking. We use this program in a personal website assigned to the applicant. The features of the website will be described in the next chapter dedicated to experimental design.

and hospitals) and access less attractive jobs.” The future direction of our research would try to introduce spacial characteristics to the regressions and we will try to estimate whether the pattern described by the authors is observable in the Czech Republic. This would indirectly test the discrimination hypothesis defined by Yinger (1986).

⁵Available online at www.mouselabweb.org.

2.3 Systemic decision making biases in individual decision making

Many psychological articles examine systemic errors in human decision making based on cognitive biases. The most well known examples of such flawed decision making are *Linda Problem*, *Disease Problem* and the *Ball and Bat game*. We will introduce these problems in the following paragraphs and later we will relate these problems to our research.

Linda problem Tversky & Kahneman (1983) present Linda: "Linda is 31 years old, single, outspoken, and very bright. She majored in philosophy. As a student, she was deeply concerned with issues of discrimination and social justice, and also participated in anti-nuclear demonstrations" (Tversky & Kahneman 1983, p. 297) and ask whether it is more probable that "Linda is a bank teller" or that "Linda is a bank teller and is active in the feminist movement". Probability theory would suggest that two independent events occur together with lower probability than one of the events alone. Yet most of the respondents have chosen the second option. This is consistent with representative heuristics⁶ which was also confirmed in later studies where the respondents added a short description of their decision making process. In general the above described problem is called *conjunction fallacy*. This logical flaw occurs when subjects tend to assign higher probability to an intersection of events rather than to one of the events separately.

Asian disease problem Authors of the previous problem also present the 'Asian Disease Problem' (Tversky & Kahneman 1985) where a serious disease is expected to kill 600 people if no program is run to prevent the disease. The participants of this experiment were divided into two separate groups where two alternative problems were presented. The first group was to choose between saving 200 people for sure or saving everybody with 1/3 probability. The other group was facing a problem of losing 400 people for sure or losing everybody with 2/3 probability. Even though both problems seem statistically identical, the responses differed significantly. While the first group was mostly in favor of the first option, letting 400 people die for sure seemed unfavorable to the other group.

⁶People tend to use a rule of thumb rather than Bayesian calculus when deciding about probability of an event to occur.

Framing The above stated problem shows how different setup of the problem may lead to different results. Such decision maker's "conception of the acts, outcomes and contingencies associated with a particular choice" (Tversky & Kahneman 1985) is called a 'decision frame' where the frame is adopted via the formulation of the problem the decision maker solves. Social norms and habits also affect the adoption of the frame. It is thus possible to have multiple frames associated with one single problem and as shown above the results for different frames of an identical problem may differ significantly. Also, as frames are assumed to be socially and culturally specific, there is a problem of frame specification. Additionally, Maher (2001) claims that because "frames consist of tacit rather than overt conjectures" it is difficult to identify frames empirically.

The ball and bat game The last well known example we introduce is a 'Ball and Bat game' where "A bat and a ball together cost \$1.10. The bat costs \$1 more than the ball. How much does the ball cost?" (Kahneman & Frederick 2002). If given limited time, subjects tend to give an intuitive answer of 10 cents. Also if sufficient time is given to the subjects, they report that their initial impulsion was to give the answer of 10 cents.

We will show that sensations are processed by the human brain by two systems out of which one is intuitive and unconscious while the other is more demanding on mental capacity and is logical and reasonable. For example Kahneman & Frederick (2002) claim that "people are not accustomed to thinking hard, and are often content to trust a plausible judgment that quickly comes to mind."

Dual process theory As said, frames affect perception of the problem by an individual and may significantly affect the results of the problem of choice. All the problems shown above are associated with lower cognitive abilities of the subjects participating in the experiment. This way of information handling is closely tied the dual processing theory.

It have been already more than 100 years when Freud introduced a theory of dual information processing that separated unconscious processes from rational thinking. The problem has been labeled and categorized as System I and System II by Stanovich & West (2000). The first system is quick and intuitive while the other is slow and governed by rules.⁷ We claim that due

⁷The authors could have found inspiration for these terms in Freud's famous Interpre-

to low willingness of people to thinking hard they tend to rely on the quick and unconscious processes rather than switching to more demanding System II processing of information. This is one of the main reasons leading to the fallacies in decision making stated in all of the above mentioned problems – be it due to framing, using rules of thumb rather than statistical inference or by a cognitive bias.

Yet, it is worth noting that System I is not necessarily less capable than System II. Despite it's primitiveness it could be developed and for example chess masters acquire over time so much experience that their processing of the game becomes effortless over time. In most of the situations we encounter daily we rely on the unconscious information processing. Still, this good and time saving system can in some cases lead to less desired results.

Kahneman & Frederick (2002) use the Systems "as a label for collections of processes that are distinguished by their speed, controllability, and the contents on which they operate." There have been many studies of dual-processes that all had a common result of distinguishing between the two Systems even if the terms were not yet coined in their work (See e.g. Gilbert 1999). For example Metcalfe & Mischel (1999) introduced a hot/cool dual system of effects affecting individual self control. We will rather stick to the more general system of perception as labeled by Stanovich & West (2000).

Priming In our experiment we randomly manipulate the way of presenting information on the personal website of the applicant. We use certain effects that should attract curiosity of landlords visiting the website but do not change the amount of information *per se*. These effects, *primes*, should only increase the accessibility of information that already exists in individual's memory. Mandel & Johnson (2002) claim that "priming can change external search, thereby influencing stimulus-based choice." Priming, as it seems, is a subcategory of framing. The method of priming we use in our experiment is called feature priming. The prime – namely a visual manipulation of the website – should be associated with a certain feature, level of importance in our case, that should consequently be weighted more heavily in the decision making process (See e.g. Yi 1990).

tation of Dreams where unconsciously operated 'primary' and logical and more realistically reasoning 'secondary' processes are defined.

Human decision making and economics Knowledge of systemically biased decision making is a crucial limitation to standard economic theory using the assumption of – on average⁸ – rationally behaving *homo oeconomicus* and should be and are being taken into account.⁹ In our research we want to test whether the landlords are consistent in their decision making or whether it can be affected by cognitive effects that do not modify the amount of information the landlord’s get about the applicant. For this purpose we construct a personal website of each of our applicants and we will discuss the design of the website and also of the underlying mouse tracking program in the next chapter.

We know that with increasing experience and with higher financial motivation the landlords should rely less on rules of thumbs but should rather act as Bayesian updaters (See e.g. Grether 1980; Hertwig & Ortmann 2001).¹⁰ Although, for example Gneezy & Rustichini (2000) have shown that microscopic financial rewards lead to even less favorable outcomes than no incentives at all. The common belief is that it is due to the fact that the subjects feel insulted by the microscopic reward. We, however, believe that the motivation for the landlords in our experiment is sufficiently high in order to make them acquire and use the information they are provided with in full as the cost of information acquisition should be much lower than possible gains from updating of the priors. Hence, the landlords are expected to behave as Bayesian updaters in our experiment.

Yet Rydval & Ortmann (2004) also show¹¹ that it is not only financial incentives but also cognitive capital effects – as proxied by IQ tests in their case – of the subjects that matter: ”ability differentials among individuals seem to account for a much greater part of performance variation than incentive effects.” Unfortunately our experimental design does not allow us for controlling for cognitive abilities of the landlords which the authors deem to be a shortcoming of most of the experiments.

Similar observations have been confirmed also by Stanovich & West (2000) who observed negative correlation between IQ and susceptibility to judgement biases. Kahneman & Frederick (2002) claim that more intelligent people ”are more likely to possess the relevant logical rules and also to recognize the applicability of these rules in particular situations.” In other words it is much easier

⁸Herewith we are allowing for random biases of the individuals.

⁹Here we refer the reader to the rich literature in the fields of behavioral and experimental economics (See e.g. Bardsley *et al.* 2009; Camerer & Loewenstein 2004).

¹⁰Compare with the footnote to representative heuristics above.

¹¹Using the data from Gneezy & Rustichini (2000).

for them to switch to System 2 and to use it efficiently in order to reach better decisions with less effort than the less intelligent people would have to exert.

More recently, Burks *et al.* (2008) found evidence of impact of cognitive skills on individual preferences in a field experiment conducted using a sample of 1000 trainee truck drivers. The authors measured the cognitive skills using IQ testing, literacy testing and a test of the ability to plan. Unfortunately our experimental design does not allow for any interaction with our subjects that would allow us to study their cognitive skills; also we found no studies relating discrimination and cognitive skills.

In other context, though, the findings confirm that cognitive effects are significant factors in shaping of individual decision making irrespective of cognitive skills (capital) of the individuals. In the study of Bertrand *et al.* (2009) the authors show that cognitive – not informative – advertising content significantly affects demand for loan take-up in South African microcredit market. In other words the individual decision making of subjects in their field experiment is also affected by other than incentive effects.

The same results are presented also in Mandel & Johnson (2002) who find that randomly manipulated background images of a website affect hypothetical student choice in a simulated Internet shopping environment in a laboratory. Basically, much of the marketing theory aims to increase sales by various cognitive manipulations – from packaging to advertising. In our experiment we want to study whether even a small cognitive manipulation may affect the landlords' decision making in the task as important as renting a flat. The design of our experiment will be described in the following chapter.

Chapter 3

Experimental Design

Inspired by Ahmed & Hammarstedt (2008) we conducted an Internet field experiment testing the sources of discrimination in the Czech rental housing market and studying landlords' decision making processes. We collected a large database of landlords and of their offers on the Internet and sent answers to these offers requesting a flat visit. Each landlord was sent one email from one of our fictitious applicants with name reminding of a minority group or with a typical Czech sounding name serving as a control group. Further, we have collected the responses of the agents in order to compare the differences between the probabilities of invitations to flat showing as a proxy for discrimination. Moreover, we created a special website that allowed us to track the process of search for information online, without the landlord actually knowing that she is being traced. Using this tool we were able to estimate the process of choice and make inference about decision making of the landlords. We discuss the experimental design in the following sections more thoroughly, but first we briefly summarize why experiments are used in economics at all and why we conducted an experiment in order to study discrimination in the Czech rental housing market.

3.1 Why experiments in economics?

Every scientific field uses experiments in order to confirm the validity of its theories. It has been argued for a long time that experimental testing of economic theories is impossible due to the fact that the world cannot be used as a laboratory. This is true also in these days, however, the economists have already advanced in bringing the world to a laboratory by conducting either

laboratory or controlled field experiments that allow them to test the validity of economic theories or to study the true causal effects of certain policies. The experiments used in economics are now very close in their design to the experiments conducted in drug testing or in psychology (See e.g. Smith 2008).

In our case we conduct a field experiment as we are aware that testing discrimination in the laboratory may lead to undesired biased behavior. Although already Tajfel (1970) has experimentally tested discrimination in a series of experiments in a laboratory environment, the groups behaved differently when facing a real racial problem than when facing a hypothetical situation. Also, as we claim, an experiment using a natural subject pool is either equal or superior to the subject pool of undergraduate students as it perfectly replicates the real decision problems.

The aim of experimental economics is to question the validity of standard economic theory and also to show how the theory is shaped by human behavior. In our experiment we want to find the answer to multiple questions: Are people – landlords – discriminating more based on their preference driven prejudices or are they rather willing to update their prior beliefs? How does such behavior differ among different minority groups? Are they willing to acquire additional information about the applicants even if they have to pay a small transaction cost? Is their decision making consistent even if the information is displayed in various ways, yet if the amount of information remains unchanged? We present our hypotheses that we want to test later in this chapter.

In order to be able to find answers to our questions we design our experiment in a proper way that is being discussed thoroughly in this chapter. It was already Ronald A. Fisher who proposed a manual on proper experimental design in Fisher (1971).¹ The design should allow the experimenter to separate the effect of the variables of our interest *ceteris paribus* by comparing groups as similar as possible that differ only in a certain treatment. For each evaluation only one variable should differ.

In our case there are multiple treatments; it is the nationality or ethnic origin of our applicants, level of information given in their application emails, their level of education and the manipulations of information on their personal websites. As we have full control over the experiment, the landlords are randomly matched with the treatments using a random number generator in order to prevent any selection bias. Our experiment is double blind as we will argue.

The experiment follows the strict rules of properly designed experiment and

¹The first edition of this book was published already in 1935.

we will show that the experiment answers our questions as fully as possible under certain constraints that are being discussed. The key issue preventing us from bringing the results closer to the desired *first best* was deception of our subjects. Separate section is dedicated to the discussion on the ethics of our experiment.

In the next sections we present the selection of our subject pool, then we discuss our treatments, data collection and the sample size. We follow the step by step rules on experimental design as proposed by Bailey (2008).

3.2 Participants

There was just one email sent to each of the landlords. This is necessary in order to control for all the possible unobserved effects. The emails were randomly sent from an email address of one of four representatives of three minority groups – namely Vietnamese, Roma and Ukrainian – and a control identity of a typical Czech. It is important to note that the identities were purely fictitious and their only real attributes were their name, email addresses and their personal websites that we also created for them for the purpose of the experiment.

We opted for the above mentioned minority groups because their populations are, after the Slovaks, the largest ones represented in the Czech Republic. We exclude Slovaks owing the common history of our states. For the sociological literature related to the problems of integration and immigration of ethnic minorities in Czech Republic we refer the reader e.g. to Mullerova (1998); Broucek (2003); Drbohlav (2004); Bancroft (1999); Ezzedienne-Luksikova *et al.* (2006).

The names of our fictitious applicants have been carefully selected after a consultation with experts from the Czech NGO Člověk v Tísni (People in Need) and from Česko-Vietnamská společnost (Czech-Vietnamese Society). Our primary focus was to assign the applicants' the names that would evoke the respective nationality. We have selected the following names:

- **Jiří Hájek** for the Czech applicant
- **Phan Quyet Nguyen** for the Vietnamese applicant
- **Gejza Horváth** for the Roma applicant
- **Oleksander Zincenko** for the Ukrainian applicant

We conducted a preliminary test in which we let the respondents assign the nationality to each of the names. The subjects were not aware of our experimental design nor were they given any other instructions. To make a comparison we included additional names. The responses were satisfying as our *a priori* beliefs were confirmed. The test was, however, not representative and performed on a relatively small sample of 60 respondents. Our motivation for this pilot test was to confirm our beliefs only.

We take into account the concern of Carpusor & Loges (2006, pp. 936-7) that the sound of the name may actually influence the landlords' decision making.² This would mean an undesired unobservable effect of different magnitude for each applicant. We do not, however, speculate on possible discrimination due to the sound of the name among the members of the same groups, hence there is no need to introduce multiple names for each group in our experiment. On top of that, the names used in our experiment were selected so that they 1) sound as neutral as possible given the respective category and 2) represent the category as much as possible.

3.3 Treatments

Additionally to the random assignment of the nationality (or ethnic group) induced by the name of each applicant we also randomly assigned a type of the email we were sending. There were three types of possible answers to the landlords' Internet offers. We call them NoInfo, Info and WebInfo. The events Info and WebInfo are further divided into two with equal probability. The first type applicant is a high school graduate while the second type applicant is assigned a college degree – Bachelor degree to be precise³ – to the individual. Below we explain the structure of our experimental treatments in detail:

1. The **NoInfo** email contains only one sentence asking for a flat showing.
2. The **Info** email adds further information on individual's level of education, his occupation, smoking habits, signals his marital status and his age.

²There is a rich literature related to the effect of names on performance. Carpusor & Loges (2006) mentions Erwin (1999); Erwin & Calev (1984); Tompkins & Boor (1980). The results are, according to the author, mixed.

³In the Czech academical environment there is a single type of Bachelor degree available. The landlords can, hence, only guess about the type of the education of the applicant if comparing with the type of job the applicant currently occupies. No mention about the field of studies is offered to the landlord.

3. The **WebInfo** email contains the same information as the NoInfo email does but adds a link to a personal website under the applicant's electronic signature.

Note that there is no difference between the wordings of the two email types except for the clickable link through which the landlord can navigate to the personal website of the applicant. The website will be described in depth later in this chapter. In principle it contains very similar information about the applicant as the Info email does. While programming the website we attempted to reduce as much of additional signaling as possible. The exact wording of the emails – both translated to English and in original Czech – are to be found in Appendix A. This leaves us with 20 basic treatments in our experiment.

3.4 Information, applicant characteristics and updating the priors

We believe that by adding information the landlords are able to update their prior beliefs, be it called prejudice or expected beliefs. Under the assumption that the landlords are Bayesian updaters, we can say in general that the variance of implicit costs of lending the flat decreases with additional information (or remains unchanged if the information does not increase the knowledge about the applicant). The effect may naturally work in favor of inviting the applicant for showing as well as the other way around. Our belief is that the information conveyed through the characteristics we include should generally lead to higher probability of invitation to showing. The following subsections describe the characteristics selected and the reason for their implementation into our experimental design.

3.4.1 Education and occupation

Both the information about the level of education and on current occupation should improve the prior beliefs on payment behavior of the applicant which is desirable. There is a common agreement that income increases with higher level of education.⁴ Moreover, e.g. Mincer (1991) has shown that there is

⁴See for example US Census Current Population Report *"The Big Payoff: Educational Attainment and Synthetic Estimates of Work-Life Earnings"* available online at www.census.gov.

a negative correlation between higher level of education and unemployment which translates into increased ability of the applicant to pay the rent on a regular basis.

3.4.2 Bad habits – smoking

Information about smoking is added due to the fact that smokers imply higher costs to the landlord. This is caused not just by the attrition of the room itself that must be fully repainted but mainly due to the attrition of the equipment of the flat. Hence the information that the applicant is a non-smoker should be greeted with delight. During our investigation we came across many rental offers targeted at non-smokers only.

In addition there are other positive effects related to non-smoking. E.g. Halpern *et al.* (2001) found evidence of increased productivity and decreased absenteeism on the workspace among never smokers compared to current smokers. Former smokers stand inbetween and over time converge towards the values for never smokers. This implies that the position of the non-smokers on the workspace is more secure. Consequently, risk of problems with payment for rent decreases.

3.4.3 Age

The age characteristic is included mainly due to the fact that the pay increases with age up to a certain level and then either decreases or stays constant until the retirement. There are also concerns about re-employability of elderly workers. Taking the facts above into account we present our applicants as males in their early 30s which should be a category already earning sufficiently high salaries while are still easy to be re-employed (See e.g. Mincer 1958, p. 294). We can think of other age related characteristics related to social behavior of groups of certain age but these may work both in favor of increasing the probability of flat showing as well as the other way around.

3.4.4 Marital status

The effect of marital status is unclear. We want to make sure that the landlords are informed about the exact number of people living in the apartment. This choice has in the result turned out to be rather doubtful as some landlords were asking about the actual number of people who will be using the flat.

3.5 Sample size and data collection process

The experiment was conducted in two rounds. The first round started on December 9th 2009 and finished on December 17th 2009. The second round started on January 4th 2010 and finished on March 31th 2010. The reason for the break were Christmas holidays that are commonly observed in the Czech Republic. In chapter 4 we show how the results varied for the pre- and post-Christmas rounds. Our overall sample size consists of 1330 listings.

We claim that the experiment is actually testing discrimination and how the landlords' decision making is affected by cognitive effects in the Czech rental housing market. This is, however, true only partially. The number of listings suitable for our experiment had to be reduced significantly due to the specific design.

First reduction comes with the selection of Internet offers only. We believe that this reduction is tenable since a majority of population has already some basic computer and Internet usage knowledge.⁵ The sample of the landlords is assumed to be even more literate than the total population due to their assumed average higher incomes. On average, higher income is accompanied by increased computer literacy according to the report on computer literacy for the Czech Republic from 2005. We cannot tell how different would the outcome be by inclusion of other advertising media such as newspaper or radio.

Second reduction comes with the selection of private offers only. This means that we exclude all offers from real-estate agents which form the majority of the offers in the Internet. We need to exclude the agencies due to two main reasons.

1. First, the real-agents may have different preferences and are interested in the short term profit only. Their possible disutility from dealing with individuals, whom they would otherwise be likely to discriminate, is dwarfed by the possibility of gaining quick profit from renting the house *"the sooner the better."*

⁵The report on computer literacy for the Czech Republic was published in 2005 for the last time and is available online at <http://www.micr.cz/scripts/detail.php?id=2578>. The report shows that 66% of the total population were able to use a computer in at least one of the 6 categories tested while 40% were able to use Internet in 2005. We believe that this number has increased significantly over the last four years due to easier use of computers and even due to higher accessibility caused by significant price drop in the field of electronics. Recent Eurostat survey shows that 45.9% of households have direct access to the Internet from their homes. The survey is available online at ec.europa.eu/eurostat.

2. Second, there are usually multiple agents from one agency operating in the market and we are worried about possible spread of the information about the experiment among them which would result into biased data due to some unobserved demand effects of the informed agents.

The third type of reduction is that we had to exclude all offers without explicitly included price in the text of the offer. This is mainly due to the fact that we cannot evaluate the effect of the response without knowing the price that would be offered to other groups.

Further we did not reply to the offers of flats with three or more rooms. This was a purely practical choice. We believe that if a single male rented a flat with such characteristics it would send a signal to the landlord that his intentions may be, in fact, to invite other people to share the flat. The common practice among the minority members in the Czech Republic is that there are many people sharing even one room. This concern has arisen even during our data collections when many landlords asked about the actual number of people who would be using the flat.

And finally the fifth reduction was purely technical. Some websites with flat rental offers have an online form for contacting the landlord directly from the site itself so that the landlord's email address is not published. We excluded the offers using this service because we could not be sure how would the forms tackle our treatment with a link to the personal website.

We assume the share of the offers responded and the offers available may be well below 10%. The reduction, however, does not necessarily mean a loss of generality. This statement is difficult to verify, though. This is why we specify all the reductions above.

3.6 Detection of untruth

We have included one important step in our experiment which enabled us to detect untruthful behavior of the landlords. We created another fictitious identity, Václav Hájek, who served as an *ideal applicant*. The assigned characteristics signal a serious man without children in his mid-fourties, nonsmoker, no pets, with university degree and working as a doctor who has just signed a longer term contract in a nearby hospital.⁶

⁶The employment has been chosen on the basis of the studies of the sociological research of the Sociological Institute of the Academy of Sciences of the Czech Republic

If a landlord replied to any of our fictitious applicants that the flat or house has already been rented or if we did not receive any answer within 14 days after sending the first email, we sent the application from the email address of this *ideal applicant*. If the response under such conditions includes an invitation for showing, we can be almost certain of untruthful behavior. The exact wording of the *teaser email* can be found in Appendix A.

3.7 Website

For the purpose of the experiment we have developed a special website that allows us to study the landlords' decision making mechanisms over the Internet. We found inspiration in the MouseLab program widely used in laboratory environment for economical experiments dealing with problems of choice (Introduced in Johnson *et al.* 1986). Both our program and MouseLab allow the experimenter to track the mouse cursor moves over pre-defined boxes on the screen that reveal the underlying information if the cursor is dragged over. Based on the process of choice the experimenter can make inference about the effect of specific search patterns of the subject on her decision making.

MouseLab, has, however, a crucial limitation that prevented us from using this tool for our experiment. Despite the tool is programmed for use in an Internet browser it is designed for laboratory use only because it must be operated by the subject directly. The data about the search process need to be confirmed by a click on a "submit" button, otherwise the technology does not update the database with the collected data.⁷ If the experimenter wants to track the mouse movement without the subject actually knowing about the experiment such limitation prevents her from using such technology.

This is the reason why we developed a new mouse tracking technology specially designed for this experiment. It allows us to monitor:

1. whether the landlords visited the website or not;
2. how long did they spend searching through the website;

(www.cvvm.cas.cz). In many consecutive studies of occupation prestige the doctors rate at the first ranks among the Czech population.

⁷This means that in the first phase the data are being saved in the computer memory and only after the subject presses the submit button the information is saved in the server in a bundle. Such approach was not viable for us as for us instantaneous saving of the data to the server – i.e. without the need for pressing the submit button and bundling of information – was crucial.

Figure 3.1: Screenshot of a sample website displayed in a regular Internet browser

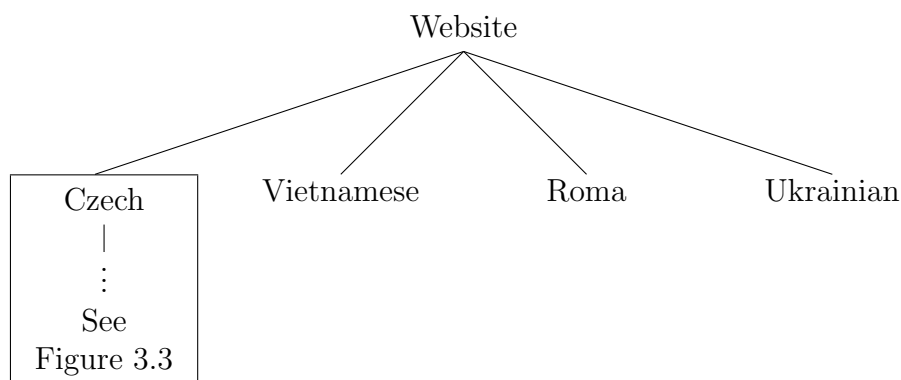


3. how long did they spend looking for information revealed after the landlord moves the mouse cursor over one of the boxes,⁸ and
4. the sequence of boxes opened by the landlord

The above described technology was used on four websites in total. There was one website assigned to each fictitious identity except for the *ideal applicant*, see figure 3.2. Figure 3.1 shows how the website is displayed in a regular Internet browser.

⁸Unfortunately, due to technological limitations our data are flawed for certain types of Internet browsers as the browsers randomly prevent the data from being saved instantaneously. The data are lost consequently and the values saved show time spent over a certain box being 0 milliseconds. At this point there is a scope for improvement of the technique.

Figure 3.2: Four websites were created for the purpose of our experiment



If the landlords were assigned to the WebInfo treatment, they received a link to the website in the applicant's email.⁹ The text of the link was equal for all the treatments for a given group, but it had an encoded link with a unique code that matched the landlord with the actions she undertook on the website. The website was also accordingly modified in order to allow us to study how cognitive effects alter the behavior and search patterns of the landlords. We modified the website in three ways: we manipulated the position of information boxes, we modified the background colours of the information boxes and we either included an icon of a diploma or a non-smoking icon instead of a text for a given category. We will discuss the reason for the respective manipulations in the section presenting our hypotheses.

Our system measures the duration of dragging the mouse cursor over the information box in milliseconds. As Posner & Petersen (1990) state, the link between the human attention system and the recognition system is initiated within the interval of 90 ms.¹⁰ Due to this fact we disregard all the observations lasting less than 90 ms that we set as a lower bound for possible information acquisition and recognition. The movements below this threshold are regarded as transitional moves that are of little interest for us. Somewhat arbitrarily we also set the upper bound for the maximum possible time to 4000 ms. Any longer time spent on the button does not provide any further learning due to limited informational value in each of the boxes.

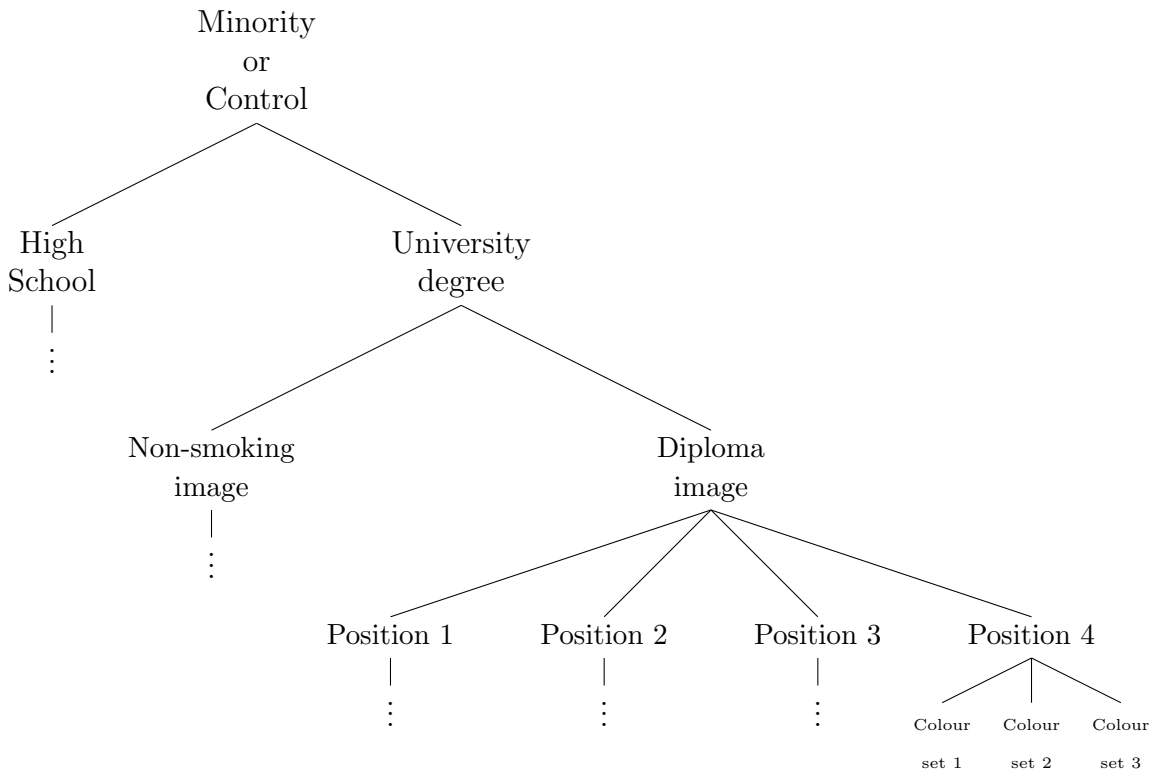
⁹See Appendix A for the exact wording of the email.

¹⁰Other studies testing the brain response duration and human cognition capabilities estimate the duration similarly at around 90 ms. Crick (See e.g. 1984); Wise & Desimone (See e.g. 1988). According to Petersen *et al.* (1987) the attention system interacts with the recognition system via the thalamus.

3.8 Randomization

Random matching between the landlords' offers and the treatment type was of high concern for us. We generated a table of randomly generated numbers between 1 and 20 assigned to one type of the treatment each. Orthogonally to these numbers we have generated an additional number between 1 and 48 that were used as a type of the website where applicable. Later we assigned the numbers one by one to the offers we found in the Internet sites offering flat rentals. The offers were regularly added from multiple websites and we collected all the available offers on each day of the data collection process. We will discuss the randomness of our sample in chapter 4.

Figure 3.3: Scheme of possible manipulations of the website



3.9 Double blind

We claim that the experiment is double blind as we do not allow for any subjective bias neither on the part of the experimental subjects, the landlords, nor on the part of the experimenters. It is the fact that the landlords make their decisions facing a real problem and they are not affected by any possible un-

observed or demand effect.¹¹ The same holds true for us as the experimenters since we are not able to manipulate the experiment in order to get results we desire as we had no control over the allocation of treatment among our subjects. The allocation was done using a random number generator. The collection of landlords' offers was done on the basis first-come-first-served, i.e. we matched the landlords with the treatments as the offers arrived without any selection rules.

3.10 Deception

We are aware of the fact that deceptive experimental design may transfer into second-guessing, losing reputation among student subjects if the experiment is conducted in the experimental laboratory (See Ortmann & Hertwig 2002). We believe that similar concerns may apply to the subjects of field experiments too.

Riach & Rich (2004) oppose the common view of deception with respect to discrimination studies. The authors refer mainly to the fact that it is very hard to find evidence of discriminatory behavior without using (deceptive) field experiments. One reaction of the American court on this issue is the following:

It is frequently difficult to develop proof in discrimination cases and the evidence provided by testers is frequently valuable, if not indispensable. It is surely regrettable that testers must mislead commercial landlords and home-owners as to their real intentions to rent or buy housing. Nonetheless, we have long recognized that this requirement of deception was a relatively small price to pay to defeat racial discrimination. The evidence provided by testers both benefits unbiased landlords by quickly dispelling false claims of discrimination and is a major resource in society's continuing struggle to eliminate the subtle but deadly poison of racial discrimination.

— Boggs *et al.* (1993, pp. 366-367)

We admit that our experimental design is deceptive despite the statement of Hey (1998, p. 397) that: "*There is a world of difference between not telling subjects things and telling them the wrong things. The latter is deception, the*

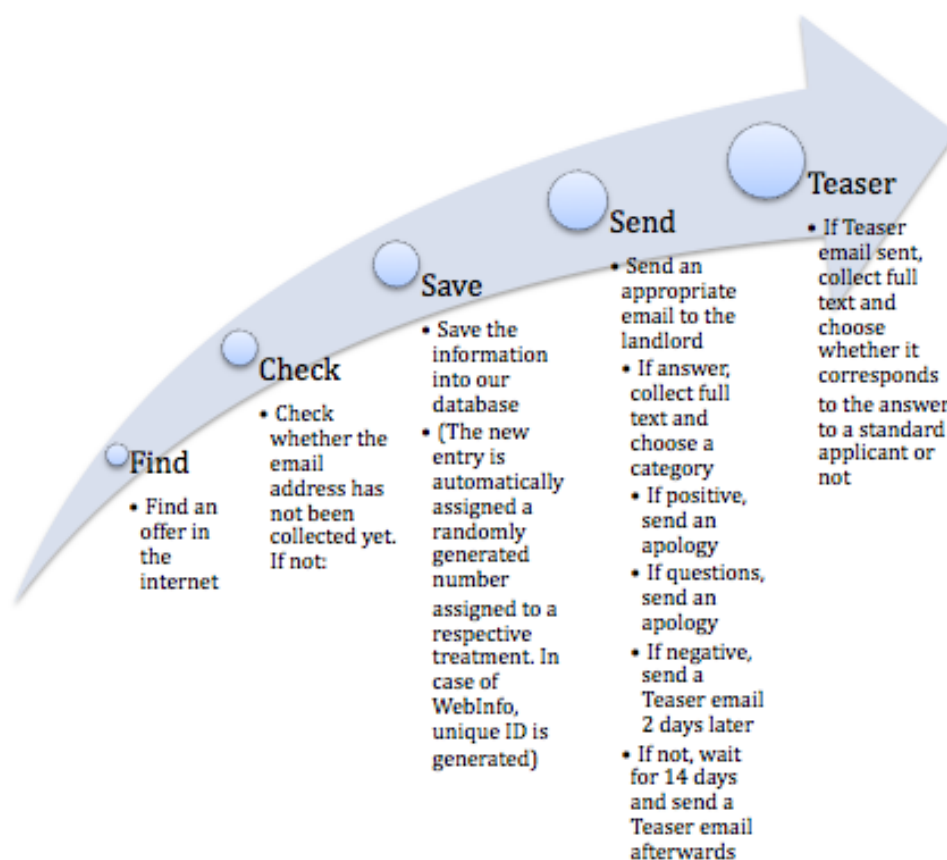
¹¹(Bertrand & Mullainathan 2003) state that audit studies are easily contaminated by such effects as "[i]t is very difficult to insure that auditors will not want to do 'a good job.' Since they know the goal of the experiment, they can alter their behavior in front of employers to express (indirectly) their own views." Our experimental designs, equally as the design in Bertrand and Mullainathan's paper, circumvents these problems.

former is not.” We believe no alternative procedure would ensure us equivalent accuracy and transparency. Ayres (1991) confirms this belief. We tried to minimize the costs of the landlords related to the experiment in terms of minimizing their time spent by answering our emails. In addition we always sent a polite reply within two days informing the landlord about our rejecting of the offer if there was any. We agree with Riach & Rich (2004) that an ethics code for economists such as a similar code for psychologists or sociologists would be welcomed.

3.11 Data collection step-by-step

The experimental design has been thoroughly described on the previous pages. In this brief section we summarize the process of data collection into 5 simple steps for the reader’s convenience.

Figure 3.4: Data collection step by step



3.12 Hypotheses

Our *a priori* hypotheses are the following:

Hypothesis 1 *Minority applicants will be invited less often to a flat showing than the Czech applicant.*

We expect different response rates and numbers of invitations to showing to minority applicants compared to the majority, Czech, applicant. This is consistent with both Becker's taste based discrimination as well as with Phelps' statistical discrimination.

Hypothesis 2 *With additional information, the applicants will be invited more often than if no information is given.*

In order to disentangle the two types of discrimination we expect that response rates and numbers of invitations to showings should increase with additional information, assuming that information delivered would be adopted positively by the landlords; this should hold true at least for the minority applicants. Hence, both the Info and WebInfo treatments should result in higher number of positive responses to our emails. This would be consistent with Phelps' statistical discrimination. The residual difference in treatment of minority members compared to the control majority group should be explained by the Becker's preference based discrimination.

Moreover, as in the WebInfo treatment case the information is not directly conveyed and the landlord has to exert some effort in order to acquire additional information. Owing to positive cost of information (See e.g. Stigler 1961), the response rates and numbers of invitations to showings should be lower for the WebInfo treatment compared to the Info treatment. Yet we expect perfect acquisition of additional information if the landlord chooses to enter the website which should result in higher response rates and numbers of invitations to showings for the WebInfo treatment compared to NoInfo treatment.

Hypothesis 3 *Roma applicant will be invited least frequently.*

Because of different attitudes of majority population towards different minorities, we expect that the differences between the response rates and numbers of invitations to showings will differ as well. Since the Roma minority is per-

ceived most negatively by the Czech society as stated in many above mentioned sociological studies, we expect the discriminatory behavior with respect to this minority to be the most significant. We make no other assumptions related to the order of the level of discrimination with respect to other minority groups. Also, we make no assumptions regarding the role of information and their inter-minority effects.

Hypothesis 4 *Applicants with higher level of education will receive more invitations than those with lower level of education.*

Due to the discussed positive effects of education (higher income, lower unemployment, more patience; see subsection 3.3.1 for more details) we expect that with higher education – in our case college degree – should result in higher response rates and numbers of invitations to showings compared to the lower level of education – high school graduation in our case. We expect this positive effect of education to be present under both Info and WebInfo treatments. We make no assumptions regarding the inter-group effects of education.

Hypothesis 5 *Effect of additional information about the applicant from a minority group on landlords' response rates will be higher compared to the majority, Czech applicant.*

If Phelps' and Arrow's approach to discrimination applies to the Czech rental housing market, landlords should update their priors about the minority applicants while the Czech applicants are, we assume, not discriminated irrespective of the level of information about themselves they pass on to landlords. We would call this effect a *positive discrimination* as if this hypothesis is confirmed, it would mean that the minority groups are treated *better* in terms of reducing the discriminatory gap by conveying more information.

Hypothesis 6 *Visual manipulation of information on the personal website of the applicants will have no effect on landlords' decision making.*

As stated above, we intend to measure the marketing – or nudging – effect of visual manipulation of information given on the website. The standard economic theory would predict that preferences should be stable and coherent. Hence, we remain conservative at this point and assume that the manipulations of the website do not have any effect on landlords' decision making processes

assuming that the level of information given by the website remains constant. We presume that irrespective of the way of presenting information the landlords should always exert the highest effort and once they enter the website, they collect all the offered information. We believe that decision about renting a flat to a stranger should be decided upon after all available information is collected. Yet we are well aware of the rich literature in behavioral economics presented in the literature review in chapter 2 that disproves our above stated beliefs about stable preferences and perfectly rational decision making.

Behavioral approach towards Hypothesis 6 Stanovich & West (2000) introduce two concepts of individual decision making: System 1 and System 2. System 1 generates impressions (As in Kahneman 2002) and decision in certain task is fast, automatic and effortless. System 2, on the other hand, is more rational and intentional and generates judgement. It is effortful, slow and controlled. Usually both the Systems are present and their share differs in magnitude of each. Simple problem is usually solved mainly using System 1 while crucial decisions involve mainly System 2. We refer the reader to chapter 2 where the concepts are described more thoroughly.

Kahneman (2002) states that people are "not accustomed to thinking hard" and tend to base their decisions on quick and effortless decisions. This may lead to errors such as in Kahneman & Frederick (2002) who test cognitive self-monitoring. In one of the examples the authors show that great share of very bright students from Princeton university solve incorrectly the earlier introduced Ball and bat game.

Similar reliance on System 1 outcomes leads the decision makers to biased perception of cognitive sensations, in our case for example visual modifications of the website. Thus the Hypothesis 6 should not be fully valid if the above stated concern is taken into account. We should expect that some share of the landlords' decision making falls subject to the seemingly irrational – or effort saving – and automatic System 1 and the visual modification of the website should hence have some nudging effect.

As stated earlier in this chapter the visual modifications of the website are 1) varying location of information boxes on the website, 2) varying colour representation of each of the boxes, and 3) icon representation of either a non-smoking image representing the "bad habits" information box or a diploma image representing the "education" information box. Our adjusted Hypotheses 6 taking into account all the above stated should be defined as follows:

1. The icon representations will attract focus of the landlord and it should be among the first information acquired on the website for this respective landlord as image representation is processed with less effort than a text. This is, actually, one of the reasons for the widespread use of icons or pictograms in general (See e.g. Marcus 2003).
2. Second, the information presented in red coloured boxes will attract focus of the landlord and will be taken into account as relatively more significant information than information presented in other boxes. This will lead to different treatment of applicants who present their less important characteristics in red coloured boxes compared to the applicants presenting more important characteristics in red coloured boxes.¹²
3. Finally we make no assumptions regarding the location of the information boxes on the website as we are a priori not fully aware of which location is more favorable and which is less as all boxes should be visible if the website is opened on a regular computer (and not, for example, on a mobile phone).

¹²Red, green and blue while red is assumed to be most enticing colour while green is assumed to be the most serene one. For example red is predominant colour in the selection of the logos of 100 world's largest companies in Fortune Magazine's annual 500 ranking from 2009. Green colour is present only in a small share of the company logos, mostly of energy companies stressing out their green policies in fighting climate change. Blue colour lies in between.

Chapter 4

Model Estimation and Results

This chapter presents our experimental results. We use mainly probit estimation¹ in order to evaluate various effects on the variable of our interest, which is whether the landlord invites the applicant to showing, or not. The explained variable is a binary variable *result* that equals 1 if the answer is positive in a way that it states either direct invitation to showing or at least asks for a phone number for further contact with the applicant. Value of 0 for the variable stands either for no answer at all or for a negative answer.

Probit estimation There are several assumptions that need to be satisfied in order to use probit estimation correctly:

1. The explained variable is a binary variable.
2. The error term follows standard normal distribution, $\varepsilon \sim N(1, 0)$.
3. None of any two explanatory variables are correlated with each other.

If these assumptions are satisfied we can build a probit model of the following form:

$$Pr(Y = 1|X) = \Phi(X'\beta) \quad (4.1)$$

Probit regression is used for estimation of binary response models and uses a method of maximum likelihood estimation assuming the standard normal probability density function in computation of maximum likelihood estimators. The estimates calculated using this method are consistent.

¹Probit was introduced by Bliss (1935) in his study of pest mortality. Now it is widely used in toxicology, sociological studies.

Table 4.1: Frequencies of observations by treatment

	NoInfo	Info		WebInfo	
		High School	University	High School	University
Czech	89	67	56	71	50
Vietnamese	92	62	58	56	51
Roma	104	70	63	67	56
Ukrainian	85	65	43	61	64
Total	370	264	220	255	221

In practice the model estimates variable y of our interest using an unobserved continuous latent variable $y^* \in (-\infty, +\infty)$ and the conditions (1)-(3) stated above. For y^* it holds that:

$$y^* = X'\beta + \varepsilon, \quad \varepsilon \sim (0, 1) \quad (4.2)$$

but we can observe only an indicator y that is related to y^* in the following way:

$$y = \begin{cases} 0 & \text{if } y^* < 0 \\ 1 & \text{otherwise} \end{cases} \quad (4.3)$$

4.1 Summary statistics

Table 4.1 shows the summary statistics of our sample. We have approached 1330 landlords in total during the two periods. In the 2009 pre-Christmas period we have approached 223 landlords and the remaining 1107 landlords were approached after the beginning of the year 2010 in the first three months of the year. The treatments described in the previous chapter have been randomly distributed using a random number generator that assigned the treatment to each observation collected. In total, the Czech applicant applied to 333 apartments, the Vietnamese applicant to 319, the Roma applicant to 360 apartments and the Ukrainian applicant to 318 apartments.²

²Please note that the data used in this thesis are only a subsample of total data collected for our comprehensive project because the data collection is still ongoing in the time this thesis is being finished. Thus the differences in numbers of emails sent from each applicant type. The differences, however, do not bias our results in any way due to random matching of treatments with landlords. We will discuss the randomization of our data later in this chapter.

Table 4.2: Frequencies and summary statistics of key landlord and apartment characteristics

Female Landlord	660	(49.62%)
Landlord w/ Czech sounding name	1238	(93.08%)
Apartment size	46.19 m ²	
Apartment price	8817.28 CZK	
Price of services	1987.68 CZK	
Apartment located in Prague	62%	
One room + kitchenette	368	(27.67%)
One room + kitchen	245	(18.42%)
Two rooms + kitchenette	440	(33.08%)
Two rooms + kitchen	277	(20.83%)

Collected data We have collected maximum possible information about the landlords and about the apartments offered by them for rentals. The information includes the location of the apartment (we include both name of the city and street where it is possible; in our estimations, however, we differentiate whether the apartment is located in the cosmopolitan capital city of Prague or not), type and size in square meters and the price divided into price for rental itself, for the services if it is separable and a for a security deposit if applicable. Out of these variables we construct a variable of price per square meter. In our estimations we use a logarithm of this variable in order to reduce its variance. The variable is called *logapt_sizeprice*.

We also include information about equipment of the apartment and about the date when the offer has been posted for the first time on the Internet. The last mentioned variable, however, couldn't be used in our estimation, as it is hard to learn whether the provided date is indeed the date of first occurrence of the offer or not.

The data collected about the landlords themselves contain two dummy variables. The first one is equal to one if the landlord's name reminds of a female name. The other equals one if the landlord's name sounds Czech and zero if it is a foreign name. Unfortunately the design of the experiment does not allow us to collect more data nor does it allow confirming whether the name is foreign or local indeed. Yet, we believe that the distribution of errors would be fairly randomly allocated; hence we include the variable in our estimations.

Means and extremes of observable characteristics In our sample 62 per cent (835) of offered apartments are located in Prague or in very close surrounding. The average size of the apartment offered is 46 square meters and the price paid for the apartment is slightly above 8800 CZK. Additionally almost 2000 CZK is paid for the services. The resulting price per square meter is about 235 CZK. The cheapest apartment, located in Jaroměřice, would cost 4200 CZK for a 40 square meter apartment. On the other end the most expensive apartment we applied for was a luxurious 123 square meter apartment in Prague for 29600 CZK. In terms of price per square meter the cheapest was an apartment in Olomouc costing less than 54 CZK. The most expensive was an apartment in the centre of Prague with the price of 697 CZK. The variation of prices is significant.

There is also a great difference in prices in the area of the capital city and in other areas. The average rental price in Prague is 9993 CZK compared to 6833 CZK in other areas. In terms of price per square meter the difference is 279 CZK in Prague and 190 CZK elsewhere on average. So that our results are not biased we include a variable that captures this effect given by factors not related to our research question. This is a dummy variable *prague*.

Robustness checks In table 4.3 we show that there are very little differences across the means of the observable characteristics³ indeed due to the design of the experiment that randomly matches treatments – applicants – with our subjects – landlords. If there were no differences among the groups at all, we could have made our inference by comparison of means we present in tabular form before testing each of our hypotheses. This feature of randomized experiments is discussed e.g. in Duflo *et al.* (2008).

³Standard errors are presented in parentheses if not stated otherwise.

Table 4.3: Summary statistics of observable characteristics used in
probit specifications by applicant's name

	Czech	Vietnamese	Roma	Ukrainian	Pooled
Female landlord = 1	0.48 (0.50)	0.46 (0.49)	0.52 (0.50)	0.47 (0.49)	0.48 (0.49)
Landlord w/ Czech sounding name = 1	0.93 (0.25)	0.94 (0.24)	0.92 (0.27)	0.93 (0.25)	0.93 (0.25)
Apartment size	45.36 (14.41)	46.07 (15.16)	46.44 (14.22)	46.90 (14.12)	46.19 (14.47)
Apartment price	9009.53 (2907.23)	8755.40 (2846.86)	8918.58 (2979.12)	8563.36 (2957.02)	8817.28 (2926.11)
Price of services	1983.33 (1225.28)	2000.57 (1230.72)	1949.39 (1302.17)	2022.67 (1193.07)	1987.68 (1239.26)
Security deposit = 1	0.27 (0.49)	0.29 (0.51)	0.29 (0.49)	0.27 (0.49)	0.28 (0.50)
Security deposit in CZK	2763.51 (6291.36)	2855.64 (6463.03)	2852.10 (5612.56)	2438.96 (5160.15)	2731.99 (5896.74)
Price per square meter	254.26 (77.75)	247.51 (78.40)	244.69 (71.59)	235.85 (71.99)	245.65 (75.13)
Equipped apartment = 1	0.16 (0.36)	0.17 (0.37)	0.18 (0.38)	0.19 (0.39)	0.17 (0.37)
Located in Prague =1	0.64 (0.47)	0.62 (0.48)	0.63 (0.48)	0.62 (0.48)	0.63 (0.48)
One room + kitchenette = 1	0.29 (0.45)	0.29 (0.45)	0.24 (0.42)	0.29 (0.45)	0.28 (0.44)
One room + kitchen =1	0.18 (0.38)	0.19 (0.39)	0.20 (0.39)	0.17 (0.37)	0.18 (0.38)
Two rooms + kitchenette = 1	0.31 (0.46)	0.30 (0.45)	0.37 (0.48)	0.34 (0.47)	0.33 (0.47)

We tested for the equality of means among all the observable characteristics of the apartment with respect to the nationality or ethnic groups, their education levels as well as with respect to the email and website content groups. For the testing we have used the standardized two-group mean comparison test, the t-test for the continuous variables and chi-squared test for the discrete variables. The reason why we did not use t-test for the discrete variables was that we could have tested for multiple groups at once while this was not an option for the t-test. The results of both tests give very similar results.

Despite the attempt of sample randomization by the design of our experiment we found few significant differences in means of some observable variables among some groups. This is also the reason why it would be incorrect – in some cases – to base our inference purely on the simple comparison of means. However, the differences are only marginal in most of the cases, hence the comparison of means we present in the summaries may help the reader in understanding the different inter-group treatment.⁴

In order to take even the very small differences into consideration we run robustness checks by constructing probit models including all the observable characteristics. The models let us obtain the true effect of our variable of interest because the remaining variance is captured by the coefficients of observable variables.

In the next paragraphs we present a short description of testing methods we use. This part is not related to the topic of this thesis and hence can be skipped if the reader is not interested in technicalities. However, as stated, the description is rather vague and for technical details and proofs of the statistical tools used in this thesis, please follow e.g. Greene (2002).⁵

T-test The t-test is a test introduced by Student (1907)⁶ in which the test statistic follows Student's t distribution given that the null hypothesis, H_0 , is not rejected. In our case we are testing whether two means are equal while the samples are unequal and we better assume unequal variance.⁷ Our null versus alternative hypotheses are:

⁴The exact differences are to be found in the log file on the attached CD.

⁵We also refer the reader to a great upcoming statistical textbook by Viatcheslav Vinogradov, Ph.D. (in memoriam) written for CERGE-EI, Prague, students of graduate course in Statistics I.

⁶Student was a pen name of William Gosset, a chemist working for the Guinness brewery in Dublin.

⁷The calculation with equal variance would be calculated in the same way, hence we choose the more general approach.

$$\begin{aligned} H_0 & : \quad \bar{X}_1 = \bar{X}_2 \\ H_A & : \quad \bar{X}_1 \neq \bar{X}_2 \end{aligned} \quad (4.4)$$

where \bar{X}_i is a mean value of the tested variable for the group i . The test statistic is calculated as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad (4.5)$$

where s_i^2 is the estimate of variance and n_i is the sample size for the given group. The distribution is approximated by the Student's t distribution with d_f degrees of freedom, where for d_f it holds that:

$$d_f = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{\left(\frac{s_1^2}{n_1}\right)^2}{n_1-1} + \frac{\left(\frac{s_2^2}{n_2}\right)^2}{n_2-1}} \quad (4.6)$$

The calculated test statistic $t(d_f)$ is then compared to the tabulated p-value of true two-tailed Student's distribution with d_f degrees of freedom and inference about the equality of means is made.

Pearson's chi-squared test The Pearson's χ^2 test was introduced first in Pearson (1900). It allows to test whether two or more samples are drawn from the same population distribution, i.e. whether the frequencies of the outcomes are equal among the groups. Thus we no longer compare the means of the samples, but we compare the frequencies "drawn". The hypothesis H_0 in this case is that the frequencies are unequal among the groups implying that they are drawn from two different distributions. The two outcomes are thus assumed to be statistically independent. H_A , on the other hand, says that they are not.

The test statistic⁸ is calculated as follows:

$$X^2 = \sum_{i=1}^r \sum_{j=1}^c \frac{(F_{ij} - \bar{F}_{ij})^2}{F_{ij}} \quad (4.7)$$

Where c and r are numbers of columns and rows of the contingency table that is being tested, F_{ij} is the observed frequency for the given cell and \bar{F}_{ij} is the expected frequency calculated as:

⁸Common practice is to call the test statistic for χ^2 test with a capital letter, X^2 . Hence we follow the common notation.

Table 4.4: Response rates and frequencies by type and applicant's name

	None	Negative	Positive	Invitation	
Czech	51 (15%) ¹	30 (9%)	10 (3%)	242 (73%)	333
Vietnamese	128 (40%)	35 (11%)	17 (5%)	139 (44%)	319
Roma	136 (38%)	50 (14%)	17 (5%)	157 (43%)	360
Ukrainian	90 (28%)	39 (12%)	20 (6%)	167 (54%)	318
Total	405	154	66	705	1330

¹The figures out of parentheses are exact numbers of observations collected. In parentheses we state the shares of responses as a percentage of all responses for the respective group. Sum of percentages in each row sum up to 100%. Percentages rounded.

$$\bar{F}_{ij} = \frac{\sum_{k=1}^c F_{ik} \sum_{k=1}^r F_{kj}}{N} \quad (4.8)$$

The number of degrees of freedom is calculated as:

$$d_f = (r - 1)(c - 1) \quad (4.9)$$

After we obtain the test statistic we compare it with the tabulated values for χ^2 distribution with d_f degrees of freedom and we make our inference.

Summary statistics of response rates Let us now present the statistics of landlords' responses. Table 4.4 shows the aggregate response rates irrespective of further treatment types. The numbers in parentheses are shares of respective response type out of total responses for the given group. The differences between the results for Czech and Roma or Vietnamese are striking. The difference between the responses for the Czech and Ukrainian applicant are high.

Noteworthy is that there is not a great difference between the negative response rates but the most striking is the difference between the rates of no responses. It seems not only as if the landlords were not willing to reveal their preferences to the applicants by telling them that they are not willing to accept foreigners as their tenants. They may have felt uneasy by just telling them lies by not responding to our emails. Actually, there was just a negligible part of landlords who stated in their offers that they do not accept foreigners or that they accept Czechs or Slovaks only and there was only one landlord who replied that he is not accepting the applicant because of his presumed foreign origin.

One may argue that the dramatic difference in rates of no replies to our

emails may be – even if only partially – that the emails sent from email addresses with foreign sounding names could be marked by the spam filters of landlords' email clients more often as unwanted messages than the ones sent from the addresses with Czech sounding name. We conducted a pilot test before the start of the experiment and we rejected this concern since not a single email sent from any of our four email addresses was marked as spam by either of the five most commonly used email clients – Seznam.cz, Centrum.cz, Volny.cz, Gmail.com and Hotmail.com.

For our further calculations we construct a simplified variable of responses, which is a binary variable. The variable takes the value of one if the response type is either positive or if it is a direct invitation to showing. If the response is negative or there is no response at all, the variable takes the value of zero. The variable is called *response* and is a dependent variable in all our estimations.

Teaser emails It is also interesting to compare the shares of consistent teaser emails among the groups. The teaser emails, as discussed more thoroughly in chapter 3, are emails sent by an *ideal applicant* that we sent from a different email address if our regular applicant received either no response after two weeks or two days after receiving negative response. The teaser email is assumed to be consistent if the answer does not differ from the answer given to our regular applicant, i.e. if we receive a negative or no answer for our applicant then the consistent answer to the email sent to our teaser applicant would be either negative or no response. Table 4.5 presents the differences among the groups.

The difference between the consistency of responses for the Czech applicant and the applicant with a foreign sounding name is striking just by simple comparison. The t-test testing equality of means of consistent teaser emails for the Czech applicant and pooled applicants with foreign sounding names confirms the difference. Also all the pairwise tests for the Czech applicant and respective minority group applicant show significantly lower mean – i.e. share – of consistent teaser email responses to the latter group in all three cases.

Worth of noting is the reversed order in the shares of consistent teaser email responses received by the minority groups. The Roma minority has the highest share of consistent responses while the Ukrainian applicant receives the lowest share. As we have shown in the summary statistics and as we will confirm later in this chapter, the Roma applicant received the lowest share of positive responses to his email application while the Ukrainian applicant received the

Table 4.5: Consistent teaser emails by group

	Number of teaser emails sent	Consistent teaser emails received	
Czech	89	74	83.15%
Vietnamese	168	99	58.93%
Roma	180	110	61.11%
Ukrainian	135	76	56.30%

Note: By consistent teaser email we understand that the landlord responded to the email sent by our *ideal* applicant in the same way as to our regular email. This would mean that we have not received any answer or that the answer was negative. The results show significant difference between consistent – truthful – answers to Czech and to minority applicants.

highest share among the minority groups. The reason is little puzzling for us as we would expect the percentages to be positively correlated with the percentages of negative responses for the respective groups. Possibly it is due to the length of the two weeks waiting period if no response for the regular email is received. Yet, if this was the case then larger share of no responses for Vietnamese would predict also the highest share of consistent emails due to this effect.

In the following sections we will test the validity of our *a priori* hypotheses presented in chapter 3.

4.2 Do minority members receive less positive responses than majority Czech applicants?

We construct a probit model in order to test our Hypothesis 1. The model is constructed as follows:

$$Pr(response_i = 1) = \Phi(\alpha + \beta \times minority_i + X_i' \gamma + \varepsilon_i) \quad (4.10)$$

The coefficient of our interest is β . The highly significant coefficient of *minority*⁹ in table 4.6 shows that having a foreign sounding name decreases the probability of positive response very significantly. The average probability of getting positive response for a person with typical Czech name is estimated

⁹We construct a new dummy variable *minority* that is equal to one if the applicant is either Vietnamese, or Roma, or Ukrainian.

Table 4.6: Minorities invited less often than Czech applicants

Dependent variable: response	Czech vs. minority
Minority group = 1	-0.235*** [0.0291]
Female landlord = 1	0.00505 [0.0287]
Landlord's name Czech = 1	-0.0968* [0.0539]
log(Apt. Price per sq. meter)	0.0215 [0.0656]
Apartment equipped = 1	-0.0697* [0.0389]
Security deposit = 1	0.00564 [0.0457]
log(Security deposit)	0.00209 [0.00578]
Apartment in Prague = 1	-0.0521 [0.0383]
Apartment 1+kitchenette = 1	-0.0827* [0.0478]
Apartment 1+1 = 1	-0.0601 [0.0474]
Apartment 2+kitchenette = 1	0.0425 [0.0413]
Observations	1234

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

to be *ceteris paribus*¹⁰ 23.5 percentage points higher than if the name sounds foreign. If we use linear probability model (LPM) estimation¹¹ instead of probit estimation we obtain similar result. This confirms our hypothesis that Czech applicant will be treated differently than the minority members. The other variables denoted as matrix X are the observable characteristics of both the offered apartment and the landlord.

In order to confirm our results we also use the Fisher's exact test method.

¹⁰Other variables are held at their means.

¹¹This method is applicable in this case as we are interested in average marginal effects and not in marginal effects on low or high parts of the distribution. LMP and probit should give approximately the same results as long as the we are interested in average values of the explained variable. Linearity is problematic in extreme parts of the distribution. The LPM is easy for computation and the inference is simple since the estimated coefficients are also the true effects which is not the case if we use probit estimation. Basic LPM has the following form: $Pr(Y = 1|X) = X'\beta$. The probability $Pr(Y = 1|X)$ could also be interpreted as a latent, unobserved, variable Y^* .

Our variable *minority* is taken as a treatment and we test whether the effect of having a foreign name does or does not affect the response rates; the later being the null hypothesis of the testing method. We reject the null hypothesis both if testing using the binary *response* variable as well as if we construct a 2x4 contingency table using the less aggregated variable *type_response*. The enumerated p-value equals 0.000 in both cases. This implies very significant difference between the effect of being in the treatment or in the control group, i.e. being a minority or not. This confirms our results obtained using probit or LPM estimation.

4.3 Does additional information increase probability of positive response?

In order to test our second hypothesis that including additional information about the applicant has an effect on response we construct a set of probit models:

$$\begin{aligned}
 Pr(response_i = 1) &= \Phi(\alpha + \beta \times pooledinfo_i + X_i' \gamma + \varepsilon_i) \\
 Pr(response_i = 1) &= \Phi(\alpha + \beta \times info_i + X_i' \gamma + \varepsilon_i) \\
 Pr(response_i = 1) &= \Phi(\alpha + \beta \times webinfo_i + X_i' \gamma + \varepsilon_i)
 \end{aligned}
 \tag{4.11}$$

Variable *info* and *webinfo* are equal to one if the landlord was matched with Info or WebInfo treatment respectively. Variable *pooledinfo* is equal to one if either of the afore mentioned treatments is present. The effect of additional information seems to be insignificant, but slightly positive because of the positive sign of the coefficient for *pooledinfo* dummy variable. The estimates are to be found in table 4.8 in column (1).

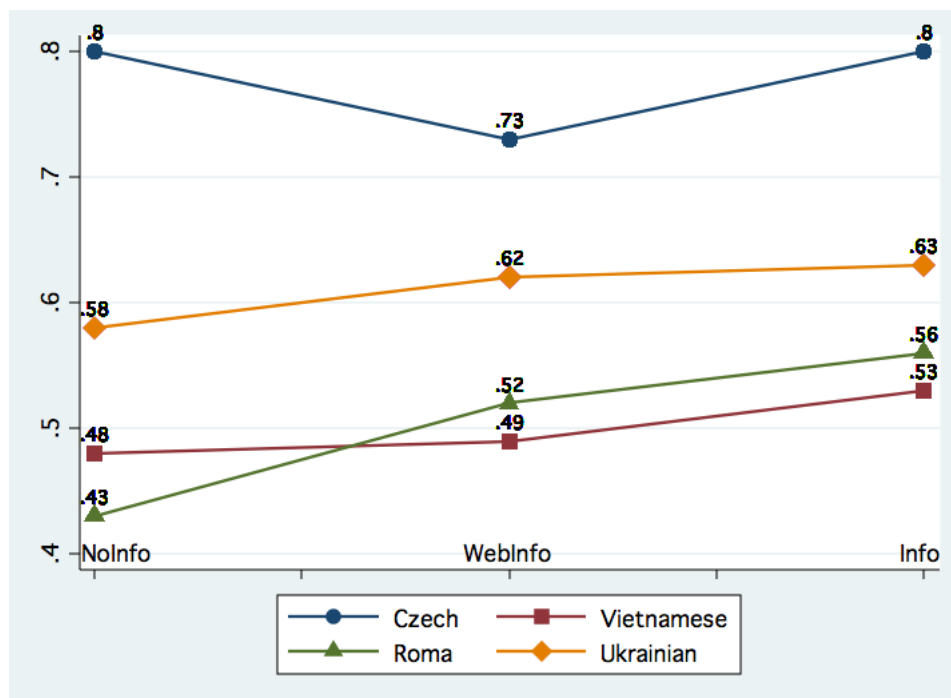
Further we distinguish between the two treatments where in the first, Info, we include additional information about the applicant directly into the body of the email sent to the landlord, while in the second, WebInfo, we include a link to the personal website described in previous chapter at the end of the email containing no additional information about the applicant. We compare these groups with the NoInfo treatment in table 4.8 in columns (2) and (3) respectively. As we can see in both cases there is a positive effect of information

Table 4.7: Response rates by treatment and level of information about the applicant

	Response	NoInfo	Pooled Info	Info	WebInfo
Pooled	Negative	45.51%	38.96%	36.99%	40.96%
	Positive	54.49%	61.04%	63.01%	59.04%
Czech	Negative	20.23%	23.77%	20.33%	27.28%
	Positive	79.77%	76.23%	79.67%	72.72%
Vietnam	Negative	52.18%	48.90%	46.67%	51.40%
	Positive	47.82%	51.10%	53.33%	48.60%
Roma	Negative	56.73%	45.73%	43.61%	47.97%
	Positive	43.27%	54.27%	56.39%	52.03%
Ukraine	Negative	42.35%	37.77%	37.04%	38.40%
	Positive	57.65%	62.23%	62.96%	61.60%

Note: This table shows the rates of positive and negative responses conditional on our experimental treatments. The treatment Pooled Info consists of pooled Info and WebInfo treatments. The upper two rows called Pooled show the average response rates for all groups pooled together.

Figure 4.1: Positive response rates by group and treatment



Note: This figure shows the shares of positive responses for the respective groups under our three basic treatments – NoInfo, WebInfo and Info. NoInfo is on the left, WebInfo is in the middle and Info is on the right. Czech applicant is denoted by points (blue), Vietnamese by squares (red), Roma by triangles (green) and Ukrainian by diamonds (yellow).

on probability of getting positive response. Yet, the effect is significant only if we compare the NoInfo and Info treatments.

We also include our general results obtained in the first column of the table restricted for the respective groups in columns (4) to (7). Neither of the coefficients is significant. However, all coefficient are in the desired direction of more positive responses with more information except for the Czech applicant.

If we separate the two treatments and estimate our model using the data only for WebInfo and Info respectively, we obtain an almost significant effect for the Roma with an increase by 11.25 percentage points between NoInfo and Info treatments. This effect becomes significant if we restrict the number of observable characteristics in our model. This would imply that additional information may significantly improve the position of the Roma applicant. Any other effect remains insignificant. For the convenience of the reader we include table 4.7 and figure 4.1 where the results are easy to compare. Please, especially note the difference between the response rates for the Roma and the Vietnamese applicant and the level of information in their application email. We will discuss this result in the next chapter.

We were surprised by the very low effect of information on response rates. Even if we test for difference between probabilities of positive responses for a Czech giving no information about himself, NoInfo treatment, and any of the minority members stating additional information about themselves directly in the body of the email, Info treatment, the negative effect of being a minority remains strongly significant. This would mean that the landlords are in general engaging in preference based rather than in statistical discrimination. Such knowledge is rather alarming. Yet still there are some effects that could decrease the level of discrimination of minorities that we will discuss further in this chapter.

Table 4.8: Positive effect of information on response rates by treatment and applicant's name

Dependent variable: response	(1) Pooled Info	(2) NoInfo vs. Info	(3) NoInfo vs. WebInfo	(4) Czech	(5) Vietnamese	(6) Roma	(7) Ukrainian
Info and WebInfo Pooled = 1	0.0426 [0.0318]			-0.0734 [0.0521]	0.0582 [0.0653]	0.0818 [0.0615]	0.0334 [0.0665]
Info = 1		0.0654* [0.0356]					
WebInfo = 1			0.0174 [0.0362]				
Female landlord = 1	0.00583 [0.0284]	0.0117 [0.0356]	-0.0135 [0.0362]	-0.00479 [0.0501]	-0.00459 [0.0601]	-0.00947 [0.0570]	0.0616 [0.0589]
Landlord's name Czech = 1	-0.0887 [0.0544]	-0.0579 [0.0689]	-0.162** [0.0679]	-0.0953 [0.0781]	-0.152 [0.118]	-0.00997 [0.112]	-0.140 [0.111]
log(Apt. Price per sq. meter)	0.0513 [0.0652]	-0.0276 [0.0817]	0.0728 [0.0832]	0.188* [0.112]	0.00305 [0.135]	0.0562 [0.138]	-0.0730 [0.131]
Apartment equipped = 1	-0.0678* [0.0384]	-0.111** [0.0469]	-0.0601 [0.0515]	-0.0670 [0.0701]	-0.0612 [0.0829]	-0.0513 [0.0762]	-0.0669 [0.0767]
Security deposit = 1	0.00520 [0.0456]	0.0146 [0.0584]	-0.0191 [0.0601]	0.0265 [0.0680]	-0.0142 [0.0914]	0.0128 [0.102]	-0.0191 [0.0954]
log(Security deposit)	0.00228 [0.00577]	0.000979 [0.00728]	0.00288 [0.00746]	0.00660 [0.00875]	0.000728 [0.0115]	-0.00460 [0.0127]	0.00629 [0.0125]
Apartment in Prague = 1	-0.0573 [0.0381]	-0.0135 [0.0489]	-0.0626 [0.0486]	-0.107* [0.0634]	-0.103 [0.0753]	-0.000548 [0.0799]	-0.0621 [0.0784]
Apartment 1+kitchenette = 1	-0.0900* [0.0472]	-0.0422 [0.0591]	-0.166*** [0.0594]	-0.173* [0.0883]	-0.0113 [0.0970]	-0.0327 [0.0977]	-0.172* [0.0993]
Apartment 1+1 = 1	-0.0636 [0.0468]	-0.0604 [0.0592]	-0.117* [0.0596]	-0.153* [0.0917]	-0.0823 [0.0925]	0.0542 [0.0897]	-0.0960 [0.103]
Apartment 2+kitchenette = 1	0.0316 [0.0411]	0.0368 [0.0526]	-0.00375 [0.0524]	0.0206 [0.0695]	0.0434 [0.0858]	0.114 [0.0823]	-0.0404 [0.0897]
Observations	1234	789	780	309	297	336	292

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Moreover, even though there is a very significant difference¹² between response rates from landlords who visited applicant's website and those who did not we claim that this is not a true effect of the website and information about the applicant conveyed by it. Visiting the website separates the landlords who are interested in further contact with the applicant and those who are *a priori* not willing to accept or are perfectly sure about inviting the applicant without any knowledge except for the name of the applicant.¹³ In the following subsection we will estimate the true effect of visiting the website on response rates using a method designed for estimation of effects of partial compliance that solves the selection problem mentioned above.

4.3.1 Estimating the true effect of visiting the personal website

We are interested in estimating the true effect of obtaining information from the personal website on landlords' response rates. In this case running a probit regression and estimating the marginal effect of *web_visited* would result in significantly biased results.

If we run the following model:

$$Pr(response_i = 1) = \Phi(\alpha + \beta \times web_visited_i + X_i' \gamma + \varepsilon_i) \quad (4.12)$$

we obtain the estimate $\hat{\beta} = 0.495$ and standard error of 0.132 which implies strong significance. This would mean that visiting the website significantly increases probability of positive response. We can obtain a similar result also if we run the same regression for the respective nationalities and ethnic groups separately. However, the conclusion omits the basic fact that assumption of independence of right hand side variable and error term is violated.

It is easy to imagine that landlords who are willing to accept the applicant, or at least to contact him, would exploit the opportunity to visit the website in order to acquire additional information. On the other hand, landlords who are sure about rejecting the applicant would not bother to visit the website

¹²Fisher exact test p=0.000 in pooled results, maximum 0.67 for the Roma if tested for respective groups

¹³The separation is obvious as the share of negative responses increases substantially for the group of non-visitors compared to NoInfo treatment.

at all. This makes for a strong selection bias that results in overestimation of coefficient $\hat{\beta}$. The assumption of $cov(T_i, \varepsilon_i) = 0$ is violated.

This results in loss of control over our random assignment of the treatment. In other words there is a non-random selection of visiting the website and we remain only with random assignment of *opportunity to visit the website* that is given only to those landlords who are assigned to the WebInfo group – those being sent an email with the link to the personal website. The actual treatment – visit of the website – is distinct from the randomly manipulated variable. E.g. Duflo *et al.* (2008) call this particular case *partial* or *imperfect compliance* and offer a remedy for the biased result obtained by using probit or LPM models for the correct estimation of the causal effect.

We will show that using the *webinfo* variable as an instrument for *web_visited* will lead to desired result revealing the true effect of visiting the website on response rates. Let us think of the following model of treatment effect:

$$Y_i = \alpha + \beta \times T_i + \varepsilon_i \quad (4.13)$$

T_i is a binary variable taking the values of 0 or 1. Value of 1 implies that the individual i is being treated. Assuming that $E[\varepsilon_i] = 0$ we can estimate the treatment effect as $\hat{\beta} = Y_{1i} - Y_{0i}$. This would be true if it held that $cov(T_i, \varepsilon_i) = 0$. In our case, as we have stated, this assumption is violated. We find the solution in finding a variable Z_i that satisfies the necessary conditions of an instrument:

$$cov(Z_i, T_i) \neq 0 \quad (4.14)$$

$$cov(Z_i, \varepsilon_i) = 0 \quad (4.15)$$

Luckily the design of our experiment that randomly allocates the *opportunity to visit the website*, WebInfo treatment, offers such instrument – variable *webinfo* – that satisfies both conditions (4.15) and (4.14). We keep using our notation of Z_i for our instrument. Since the variable is binary, we can easily rewrite the equation (4.13):

$$\hat{\beta} = \frac{E[Y_i|Z_i = 1] - E[Y_i|Z_i = 0]}{E[T_i|Z_i = 1] - E[T_i|Z_i = 0]} \quad (4.16)$$

This is a Wald estimator that was introduced by Wald (1940) in a paper describing errors on variables. Imbens & Angrist (1994) show that this esti-

mator is a correct estimate of local average treatment effect (LATE).¹⁴ In our case we can interpret the coefficient as the effect of information available on the personal website of the applicant on probability of positive response by the landlord compared to the same group of landlords who are not offered the opportunity to visit the website and remain uninformed about the applicants' characteristics – they are assigned to the NoInfo treatment.

Table 4.9 shows the results of the two stage least squares regression (2SLS). In the first stage we construct instrument Z_i by using the estimates of *web_visited* that is explained by *webinfo* and all other observable characteristics of the landlord and offered apartment (Following e.g. Angrist & Krueger 2001). This newly generated variable called *adjweb_visited* is used in the second stage. We can see that there is no longer any significant positive effect of information. Rather there is an interestingly strong negative effect of visiting the personal website of the applicant on landlords' response rate in the case of the Czech applicant. The result in column (2) – the only significant one – is striking. The other results show slightly positive effect that is, however, insignificant. This is consistent with our claim we stated earlier in this chapter that the discrimination in the Czech rental housing market is driven by landlords' preferences rather than being statistical in terms of Phelps' theory. The negative coefficient for the Czech applicant is little puzzling for us and we will elaborate on it more thoroughly in the discussion in the next chapter.

4.4 Is Roma applicant the most discriminated one?

In this section we will show that our applicant representing the Roma minority has the worse prospects in his attempts to rent an apartment in the Czech rental housing market. We construct another probit model explaining the binary variable *response*.

$$Pr(response_i = 1) = \Phi(\alpha + \beta \times roma_i + X_i' \gamma + \varepsilon_i) \quad (4.17)$$

In this case the coefficient β of the variable *roma* is of our key interest. In

¹⁴Local average treatment effect is a treatment effect for a specific group of individuals with identical characteristics. Conclusions based on LATE estimators are valid for such subpopulation only and cannot be generalized. One of the famous examples of using LATE can be found in Card (1993) who estimates the effect of years of schooling on income using an instrument of proximity to college. The effect, however, is estimated for the group of individuals from poorer families who intend to drop out of school as early as possible. Hence, one cannot make any inference about any other subpopulation except for the one mentioned.

Table 4.9: Local average treatment effect of visiting applicant's website on landlords' response rates using 2SLS approach (Instrumental variable: opportunity to visit the website, WebInfo)

2SLS, Dependent variable: response	(1) Pooled	(2) Czech	(3) Vietnam	(4) Roma	(5) Ukraine
Website visited = 1	0.0159 [0.0998]	-0.445* [0.240]	0.0685 [0.203]	0.145 [0.172]	0.100 [0.207]
Female landlord = 1	-0.00927 [0.0349]	-0.0239 [0.0735]	-0.0336 [0.0751]	-0.0416 [0.0782]	0.0703 [0.0717]
Landlord's name Czech = 1	-0.154** [0.0652]	-0.212* [0.120]	-0.0616 [0.167]	-0.237* [0.136]	-0.166 [0.134]
log(Apt. Price per sq. meter)	0.0316 [0.0796]	0.258* [0.149]	-0.136 [0.178]	0.190 [0.180]	-0.0727 [0.167]
Apartment equipped = 1	-0.0569 [0.0500]	-0.0365 [0.114]	-0.0201 [0.105]	-0.0523 [0.0997]	-0.127 [0.0930]
Security deposit = 1	-0.0135 [0.0576]	-0.129 [0.131]	-0.0936 [0.107]	0.0901 [0.122]	0.129 [0.0879]
log(Security deposit)	0.00242 [0.00705]	0.00804 [0.0149]	-0.000476 [0.0136]	-0.0110 [0.0151]	0.00423 [0.0121]
Apartment in Prague = 1	-0.0485 [0.0470]	-0.146 [0.103]	-0.0246 [0.100]	-0.0735 [0.0980]	-0.0649 [0.0909]
Apartment 1+kitchenette = 1	-0.148*** [0.0567]	-0.156 [0.109]	-0.162 [0.127]	-0.119 [0.117]	-0.0820 [0.117]
Apartment 1+1 = 1	-0.111** [0.0561]	-0.144 [0.113]	-0.242** [0.117]	-0.0569 [0.114]	0.0381 [0.121]
Apartment 2+kitchenette = 1	0.0115 [0.0488]	0.000614 [0.0910]	0.0163 [0.108]	0.0555 [0.105]	0.0882 [0.106]
Vietnamese applicant = 1	-0.270*** [0.0479]				
Roma applicant = 1	-0.285*** [0.0465]				
Ukrainian applicant = 1	-0.152*** [0.0471]				
First stage (Dependent variable: Web visited = 1)					
WebInfo	0.343*** [0.02281]	0.276*** [0.0450]	0.354*** [0.0498]	0.403*** [0.0485]	0.341*** [0.0460]
Observable characteristics	yes	yes	yes	yes	yes
Observations	780	192	182	212	194

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Note: Visit of the website is endogenous. Exogenous source of variation is found in randomly allocated *opportunity to visit the website*, WebInfo treatment, that is randomly matched with the landlords. WebInfo is used as an instrument for the visit of the Website (As in Duflo *et al.* 2008). 2SLS method is used. The results from the first stage are presented only partially. For complete results, please see the log file on the appended data CD.

the first column of table 4.10 we show how different the probabilities of response for the Roma minority differ from the probabilities of other applicants. There is a very significant negative coefficient that tells that having a typical Roma name decreases on average the probability of positive response on average by 13 percentage points compared to other applicants. The result, however, has not very high predicative value because it does not say anything about the relative measures of discrimination among the other groups.

This is the reason why we also compare the effect of being a member of Roma minority versus being Czech, Vietnamese or Ukrainian in columns (2)-(4) respectively. We can see that the Roma minority is disadvantaged compared to any group in our experiment except for the Vietnamese. We confirm our results by using the Fisher's exact test where the p-values are 0.000, 0.000, 0.818 and 0.011 for general difference, difference between Czech and Roma, Vietnamese and Roma and Ukrainians and Roma respectively. All but the third p-value results in rejecting the null hypothesis of no effect of treatment, i.e. being Roma, on the outcome. Approximately the same results are obtained if we use the variable *type_response* instead of the binary variable *response*. We discuss the possible reasons in the last chapter of this thesis.

4.5 Does higher education of the applicant imply more positive responses?

Our fourth Hypothesis relates to yet another treatment related to possible improvement of *a priori* expectations about the group member based on his level of education. In our experiment we let our fictitious applicants be either university graduates or high school graduates. We construct a model where we try to estimate whether there is a significant difference between the applicants with different level of education.

$$Pr(response_i = 1) = \Phi(\alpha + \beta \times higheduc_i + X_i' \gamma + \varepsilon_i) \quad (4.18)$$

Variable *higheduc* equals to one if the applicant is assigned university graduation; it is a variable of our interest in this case. The results are presented in table 4.11. The first column describes the general model where we include all the observations in which the information about the applicants was available irrespective of nationality or ethnic origin. For the WebInfo treatment it means that the website was actually visited by the landlord before the response was

Table 4.10: Different treatment of Roma minority compared to other groups

Dependent variable: response	(1) Roma vs. Other	(2) Roma vs. Czech	(3) Roma vs. Vietnamese	(4) Roma vs. Ukrainian
Roma applicant = 1	-0.130*** [0.0321]	-0.269*** [0.0367]	-0.00140 [0.0402]	-0.110*** [0.0400]
Female landlord = 1	0.00988 [0.0285]	-0.00805 [0.0397]	-0.0194 [0.0406]	0.0191 [0.0406]
Landlord's name Czech = 1	-0.0930* [0.0537]	-0.0434 [0.0745]	-0.0644 [0.0796]	-0.0621 [0.0778]
log(Apt. Price per sq. meter)	0.0530 [0.0654]	0.124 [0.0921]	0.0507 [0.0950]	-0.0259 [0.0934]
Apartment equipped = 1	-0.0678* [0.0386]	-0.0735 [0.0555]	-0.0511 [0.0556]	-0.0542 [0.0544]
Security deposit = 1	0.00917 [0.0455]	0.0150 [0.0622]	0.00926 [0.0669]	0.0111 [0.0704]
log(Security deposit)	0.00190 [0.00576]	0.00154 [0.00787]	-0.00325 [0.00833]	0.000100 [0.00888]
Apartment in Prague = 1	-0.0588 [0.0382]	-0.0450 [0.0540]	-0.0458 [0.0545]	-0.0135 [0.0556]
Apartment 1+kitchenette = 1	-0.0952** [0.0472]	-0.100 [0.0670]	-0.0306 [0.0671]	-0.0954 [0.0682]
Apartment 1+1 = 1	-0.0613 [0.0469]	-0.0328 [0.0646]	-0.0120 [0.0646]	-0.0163 [0.0665]
Apartment 2+kitchenette = 1	0.0371 [0.0410]	0.0703 [0.0554]	0.0766 [0.0582]	0.0434 [0.0596]
Observations	1234	645	633	628

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

sent to us – or was not sent at all.¹⁵ For the Info treatment we include all observations.

We find strong evidence of positive returns of education in terms of more equal opportunities in rental housing for two out of three minority groups. The Vietnamese and Ukrainian applicant with university degree have on average 17.49 and 16.3 percentage points higher probability of receiving a positive response than their high school graduate counterparts, respectively.

However, the Roma minority that faces the highest level of discrimination in general, as shown in the previous section, does not benefit from higher education. Despite the negative sign of coefficient, the difference is insignificant and we estimate on average only 3.99 percentage point more positive responses for the Roma applicant with university degree compared to the applicant with high school graduation. We will discuss this result in the next chapter.

It seems as if education level of applicants was important for the landlords in their decision making. On average the effect of having completed university degree increases the probability of positive response *ceteris paribus* by 8.09 percentage points compared to an applicant with completed high school. As we have shown, the effects differ significantly among the groups. The strongest effect is observable for the groups of Vietnamese and Ukrainian. The Roma and Czech applicants do not benefit from education at all.

We also use the same model excluding the observations where we didn't receive any response even to our teaser email sent 14 days after sending the standard email and not getting any response. The effects do not qualitatively change and the coefficients of our key variable are just magnified. Even statistical significance is magnified, which is expectable. We do not include the results but the STATA code can be found on the appended CD. In table 4.12 we present the response shares for respective groups, treatments and levels of education. The results partially confirm the estimates of our model.

¹⁵Earlier in this chapter we argue that there is a problem of endogeneity in the WebInfo treatment. However, in this case we already estimate the results for those who actually visited the website without *a priori* knowing what level of education the applicant has. The results are thus valid for this particular group of landlords.

Table 4.11: Does level of education of applicant affect response rates?

Dependent variable: response	(1) Pooled	(2) Czech	(3) Vietnam	(4) Roma	(5) Ukraine
University = 1	0.0809** [0.0393]	0.0124 [0.0566]	0.175** [0.0836]	0.0400 [0.0807]	0.163** [0.0827]
Female landlord = 1	0.0465 [0.0398]	0.0279 [0.0583]	0.0738 [0.0871]	0.0716 [0.0785]	0.0532 [0.0875]
Landlord's name Czech = 1	-0.00897 [0.0750]	-0.0260 [0.0940]	-0.117 [0.155]	0.210 [0.144]	-0.212* [0.119]
log(Apt. Price per sq. meter)	0.0779 [0.0917]	0.167 [0.131]	0.127 [0.210]	0.0323 [0.183]	0.0574 [0.179]
Apartment equipped = 1	-0.0639 [0.0517]	-0.106 [0.0896]	-0.0512 [0.119]	-0.0326 [0.105]	0.0568 [0.108]
Security deposit = 1	-0.000224 [0.0611]	0.337*** [0.124]	0.00684 [0.133]	-0.00593 [0.133]	-0.227* [0.131]
log(Security deposit)	0.00449 [0.00798]	-0.00671 [0.0126]	0.0134 [0.0173]	-0.00570 [0.0171]	0.0110 [0.0170]
Apartment in Prague = 1	-0.0971* [0.0511]	-0.143** [0.0621]	-0.208** [0.105]	-0.00893 [0.109]	-0.0628 [0.115]
Apartment 1+kitchenette = 1	0.0224 [0.0640]	-0.195 [0.133]	0.178 [0.131]	0.148 [0.137]	-0.165 [0.136]
Apartment 1+1 = 1	0.0120 [0.0621]	-0.200 [0.142]	0.0419 [0.129]	0.177 [0.112]	-0.123 [0.147]
Apartment 2+kitchenette = 1	0.0648 [0.0558]	-0.0128 [0.0897]	0.0975 [0.123]	0.199* [0.114]	-0.166 [0.127]
Vietnamese applicant = 1	-0.275*** [0.0592]				
Roma applicant = 1	-0.268*** [0.0579]				
Ukrainian applicant = 1	-0.165*** [0.0631]				
Observations	607	149	150	170	138

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Note: The model is estimated using only the observations where education level was observable to the landlord. This was possible in the Info treatment and for those landlords who visited the applicant's website in the WebInfo treatment.

Table 4.12: Response rates to applicants by level of their education, by groups and by treatments

	Pooled Info			Info			WebInfo		
	High School	University		High School	University		High School	University	
Pooled	Negative	38,00%	30,95%	38,26%	35,45%		37,21%	17,57%	
	Positive	62,00%	69,05%	61,74%	64,55%		62,79%	82,43%	
	P-value ¹	0.068		0.571			0.008		
Czech	Negative	18,52%	18,92%	17,91%	23,21%		21,43%	5,56%	
	Positive	81,48%	81,08%	82,09%	76,79%		78,57%	94,44%	
	P-value	1.00		0.506			0.295		
Vietnamese	Negative	50,59%	35,21%	53,23%	39,66%		43,48%	15,38%	
	Positive	49,41%	64,79%	46,77%	60,34%		56,52%	84,62%	
	P-value	0.074		0.148			0.143		
Roma	Negative	42,71%	40,91%	41,43%	46,03%		46,15%	28,00%	
	Positive	57,29%	59,09%	58,57%	53,97%		53,85%	72,00%	
	P-value	0.881		0.604			0.249		
Ukrainian	Negative	38,64%	26,23%	41,54%	30,23%		30,43%	16,67%	
	Positive	61,36%	73,77%	58,46%	69,77%		69,57%	83,33%	
	P-value	0.158		0.309			0.467		

¹P-value for Fisher exact test for the respective subsamples of general population, Info treatment and WebInfo treatment.

Note: Percentages are shares of responses for respective treatments separated by education level. Percentages for negative and positive responses sum up to one for each group, treatment and level of education. The row 'Pooled' pools all our groups together. The results for respective groups separately are presented in following rows. Column 'PooledInfo' pools both Info and WebInfo treatments. The results for Info and WebInfo are presented in the following columns. For the webinfo treatment we present response rates of those landlords who actually visited our website. Those who did not visit the website could not separate the two education levels.

4.6 Is level of discrimination negatively correlated with amount of information about the applicant?

As we have already shown in table 4.8, there is a slightly positive effect of information on response rates if information is stated directly in the body of the email.

The findings, however, do not provide any information on how discrimination level is affected by the respective treatments. Following Ahmed & Hammarstedt (2008) we construct two *difference in differences*¹⁶ models where we separate three effects in each. First, the effect of being a minority compared to the control of our Czech applicant, Jiří Hájek. Second, the effect of the particular treatment, Info or WebInfo, compared to the control NoInfo treatment. And finally the interaction of the two. For this purpose we generate another set of dummy variables *minority*info* and *minority*webinfo*. These two variables stand for the difference in levels of discrimination under the particular treatments. According to our hypothesis the results should show positive and significant coefficients for both variables and the effect should be stronger for the model comparing NoInfo and Info treatments compared to the model comparing NoInfo and WebInfo treatments. The resulting models have the following form:

$$\begin{aligned}
 Pr(response_i = 1) &= \\
 &= \Phi(\alpha + \beta \times minority_i + \gamma \times info_i + \delta \times minority * info_i + X_i' \lambda + \varepsilon_i) \\
 Pr(response_i = 1) &= \\
 &= \Phi(\alpha + \beta \times minority_i + \gamma \times webinfo_i + \delta \times minority * webinfo_i + X_i' \lambda + \varepsilon_i)
 \end{aligned}
 \tag{4.19}$$

The results are presented in table 4.13. For the convenience of the reader we also include the results obtained for the models represented by equations 4.11 in columns (2) and (4). We can see that both *minority*webinfo* and *minority*info* are positive. Yet it is only *minority*webinfo* where the resulting level of discrimination of minorities is reduced compared to the level of discrim-

¹⁶We use the term *difference in differences* for a probit estimation that includes interaction terms. The authors of the above mentioned working paper, however, use this term for a similar type of model. We follow their notation.

ination under NoInfo treatment. Yet, if we compare the results either with our results in table 4.8 or with column (2) in table 4.13 we notice that the effect on responses positive but insignificant. This result is given by the fact that the share of positive responses for the Czech applicant drops under WebInfo treatment compared to NoInfo. All above stated results remain robust both in their significance as in their signs even if we estimate both models for the respective minority groups separately.

4.7 Do cognitive effects affect landlords' decision making and search processes?

In this section we will test whether the landlords are consistent in their decision making irrespective of minor cognitive modifications that we introduce. By modifications of the applicants' personal website without modifying the amount of information given, we test whether decision making or information processing or both are affected. *A priori* we would like to learn that no such seemingly negligible effects have any impact on landlords' decision making processes. However, as we state in the motivation in chapter 2, human brain allows for certain *systemic* cognitive biases that are in conflict with assumed rational behavior. Although, if we learn that there are no changes in behavior due to these seemingly minor changes in experimental design, we may be assured of robustness of our results that would allow for future comparison.

Before we get to the testing of our last hypotheses themselves, we present summary statistics obtained from the data from our experimental personal website of the respective applicants. In total, 476 landlords were approached with an email with a link directing them to the applicants personal website. This website could have been visited by clicking on the link if the landlord was willing to obtain some additional information by navigating on the site. There have been 121 emails sent by the fictitious Czech applicant, 107 by the Vietnamese, 123 by the Roma and 125 by the Ukrainian applicant. It is worth of reminding that the body of the email did not contain any information except for the name of the applicant, the content was exactly the same as in the NoInfo treatment.¹⁷ All the information could have been acquired by navigating on the website only.

The shares of landlords entering the websites differ significantly with re-

¹⁷See appendix A.

Table 4.13: Effect of additional information on levels of discrimination using difference-in-differences approach

Dependent variable response	(1) WebInfo vs. NoInfo (Diff-in-Diff)	(2) WebInfo vs. NoInfo	(3) Info vs. NoInfo (Diff-in-Diff)	(4) Info vs. NoInfo
Minority group = 1	-0.343*** [0.0531]		-0.327*** [0.0515]	
WebInfo = 1	-0.155* [0.0792]	0.0174 [0.0362]		
Info = 1			-0.0378 [0.0807]	0.0654* [0.0356]
Minority x WebInfo = 1	0.207** [0.0868]			
Minority x Info = 1			0.121 [0.0882]	
Female landlord = 1	-0.00869 [0.0367]	-0.0135 [0.0362]	0.0153 [0.0361]	0.0117 [0.0356]
Landlord's name Czech = 1	-0.173*** [0.0667]	-0.162** [0.0679]	-0.0757 [0.0687]	-0.0579 [0.0689]
log(Apt. Price per sq. meter)	0.0447 [0.0848]	0.0728 [0.0832]	-0.0340 [0.0820]	-0.0276 [0.0817]
Apartment equipped = 1	-0.0523 [0.0519]	-0.0601 [0.0515]	-0.111** [0.0475]	-0.111** [0.0469]
Security deposit = 1	-0.00880 [0.0622]	-0.0191 [0.0601]	0.0234 [0.0577]	0.0146 [0.0584]
log(Security deposit)	0.00116 [0.00766]	0.00288 [0.00746]	-0.000777 [0.00722]	0.000979 [0.00728]
Apartment in Prague = 1	-0.0589 [0.0492]	-0.0626 [0.0486]	-0.0300 [0.0488]	-0.0135 [0.0489]
Apartment 1+kitchenette = 1	-0.157** [0.0611]	-0.166*** [0.0594]	-0.0415 [0.0602]	-0.0422 [0.0591]
Apartment 1+1 = 1	-0.113* [0.0604]	-0.117* [0.0596]	-0.0485 [0.0598]	-0.0604 [0.0592]
Apartment 2+kitchenette = 1	0.0121 [0.0530]	-0.00375 [0.0524]	0.0538 [0.0530]	0.0368 [0.0526]
Observations	780	780	789	789

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 4.14: Website modification frequencies by groups

	Total	Czech	Vietnamese	Roma	Ukrainian
No-Smoking icon =1	0.510 (0.500)	0.479 (0.501)	0.570 (0.497)	0.472 (0.501)	0.528 (0.501)
Position 1 =1	0.237 (0.426)	0.272 (0.447)	0.224 (0.419)	0.203 (0.404)	0.248 (0.433)
Position 2 =1	0.235 (0.424)	0.239 (0.428)	0.196 (0.399)	0.317 (0.467)	0.184 (0.389)
Position 3 =1	0.279 (0.449)	0.289 (0.455)	0.336 (0.475)	0.228 (0.421)	0.272 (0.447)
Position 4 =1	0.248 (0.432)	0.198 (0.400)	0.242 (0.430)	0.252 (0.436)	0.296 (0.458)
Colour 1 =1	0.306 (0.461)	0.272 (0.447)	0.346 (0.478)	0.268 (0.445)	0.344 (0.477)
Colour 2 =1	0.355 (0.479)	0.355 (0.480)	0.364 (0.483)	0.349 (0.479)	0.352 (0.479)
Colour3 =1	0.338 (0.474)	0.371 (0.485)	0.290 (0.456)	0.382 (0.488)	0.304 (0.462)

Standard errors in parentheses.

spect to the nationality or ethnic origin of the applicant. While for the Czech applicant 26.4% landlords visited the page, for the Vietnamese it was 33.6%, for the Roma 41.5% and for the Ukrainian the share was 32.8%. The negative correlation with the rate of discriminative behavior with respect to respective groups is obvious. The pairwise difference between the Roma and Czech is highly significant ($p < 0.0001$ in Pearson χ^2 test, equal results are obtained by t-test and Fisher exact test) while the overall difference of all groups is just slightly insignificant with $p < 0.101$ using Pearson χ^2 test. This implies that the willingness to search for additional information is higher for the landlords dealing with the Roma applicant. We shall elaborate on this more in the next chapter.

In table 4.14 we present the frequencies of various treatments by respective nationality and ethnic groups. Using groupwise Pearson χ^2 test for testing for independence of distributions we find that for all variables except for Position2 we can reject the null hypothesis stating that the distributions are independent indeed. For Position 2 we get $p = 0.062$. Yet if we exclude the Roma applicant, null hypothesis is rejected with $p = 0.531$. Hence, randomization in this part of the experiment was successful, landlords are entering the website irrespective of the pre-selected treatment.

In the following subsections we shall test our hypotheses. We use the data on

search patterns obtained from the respective websites. It is worth of noting that due to the reasons stated earlier we have excluded all the mouse movements over the information boxes lasting less than 90 ms as well as we have set the upper bound for the mouse movements to 4000 ms. The upper bound is exceeded in 332 out of 3913 observations of mouse-over movements. These observations are adjusted according to our rule. There are 1486 transitional observations that were dropped because they are of no interest to us.

4.7.1 Testing effect of icon representation on search patterns and decision making

In the section dedicated to our hypotheses we state that icon representation of information should attract substantially more attention than the text representation and we give several reasons for it. Our data provide puzzling results. In general we observe that on average the non-smoking icon – see figure 4.2 – has attracted the landlords for the first time of their visits as late as 3.99 in a row versus 3.79 in a row for no icon representation for this type of information. For the diploma icon representing educational status – see figure 4.3 – that the respective average orders are 3.55 versus 3.57. The results are quite robust among the groups where for Czech applicant’s website the ranks are 3.94 to 4.14 for the bad habits and 3.07 to 2.70 for education, for the Roma it is 4.39 to 4.18 and 4.40 to 4.32 and for the Vietnamese 4.44 to 3.75 and 3.40 to 3.15. The results differ only for the Ukrainian with ranks of 3.30 to 3.62 for the bad habits representations and 3.06 to 4.00 for the education representation. Thus we can infer that icon representation in general attracts attention of our subjects less than the text representation which would contradict our hypothesis. We were not successful in priming the landlords to visit the information selected by us earlier than in the other case. This is true, except for the case of Ukrainian where the predictions would be exactly the other way around, confirming our hypothesis as the only group. The differences are, however, statically insignificant in most cases using the t-test.

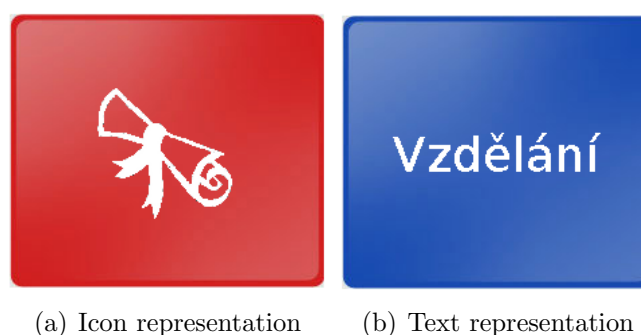
We shall also ask whether certain icon representation has stronger effect than the other in shaping the landlords’ decision making about the responses sent to the applicants. We construct a probit model:

$$Pr(response_i = 1) = \Phi(\alpha + \beta \times imgnosmoke_i + X_i' \gamma + \varepsilon_i) \quad (4.20)$$



(a) Icon representation (b) Text representation

Figure 4.2: Representations of "Bad habits"



(a) Icon representation (b) Text representation

Figure 4.3: Representations of "Education"

where the coefficient of our interest is β . The model is estimated using the observations where landlords actually visited the website and in the matrix X we control for all the observable characteristics as in the models in previous sections. As we can see from the data in table 4.15, coefficient β is insignificant in the general model for all groups pooled together as well as for the separate regressions for respective groups. Due to the small number of observations for the Czech applicant the model specification broke down and we cannot make any conclusions for this particular model. Specification with limited number of observable characteristics, however, estimates insignificant coefficient too and by comparison the limited model gives results almost equal to the results of our full model.¹⁸ The results for the Ukrainian applicant are not stable either and the full model is not completely determined. If we reduce the number of observable characteristics in the model, the coefficient of *imgnosmoke* is insignificant too.

We can conclude that there is, in general, no prevailing effect of either

¹⁸By limited model we mean model including the variable of our interest, log of price per square meter, prague and security deposit dummy. For other characteristics, however, the results do not differ significantly either.

Table 4.15: Effect of icon representation on response rates

Dependent variable: response	(1) Pooled	(2) Czech	(3) Vietnam	(4) Roma	(5) Ukraine
Non-Smoking icon = 1	0.0357 [0.0789]	-0.142 [0.233]	-0.388 [0.274]	0.118 [0.172]	0 [0]
Female landlord = 1	0.0210 [0.0781]	-0.134 [0.303]	0.236 [0.225]	0.0264 [0.157]	0 [0]
Landlord's name Czech = 1	-0.168* [0.0993]		0.169 [0.193]	-0.226 [0.184]	
log(Apt. Price per sq. meter)	0.144 [0.187]	0.126 [0.0971]	-0.722 [0.619]	0.546 [0.436]	0 [0]
Apartment equipped = 1	0.0601 [0.0979]		0.183 [0.345]	0.0169 [0.159]	0 [0]
Security deposit = 1	-0.0184 [0.143]		-7.121*** [2.657]	3.843 [2.608]	1 [0]
log(Security deposit)	0.00478 [0.0181]		0.787*** [0.301]	-0.413 [0.278]	0 [0]
Apartment in Prague = 1	-0.105 [0.105]	-0.0129 [0.118]	0.184 [0.231]	-0.260 [0.202]	0 [0]
Apartment 1+kitchenette = 1	-0.0103 [0.126]	-0.933* [0.498]	0.597** [0.291]	0.111 [0.168]	0 [0]
Apartment 1+1 = 1	0.0375 [0.114]		-0.104 [0.188]	0.227 [0.175]	0 [0]
Apartment 2+kitchenette = 1	0.00740 [0.108]	-0.977*** [0.237]	0.513* [0.306]	0.180 [0.138]	0 [0]
Vietnamese applicant = 1	-0.273** [0.136]				
Roma applicant = 1	-0.319*** [0.122]				
Ukrainian applicant = 1	-0.147 [0.131]				
Observations	153	17	35	46	37

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

icon representation in shaping the landlords' decision making with respect to different behavior in response rates to our fictitious applicants. For this part we reject our hypothesis.

4.7.2 Priming effect of red background

This subsection wants to answer the question whether there is any priming effect of background colour in our experimental design. Our *a priori* belief was that people would tend to take information presented on more expressive background colour (red in our case) as more important and that they would

display the information presented on such expressive background earlier than if such information was presented with less expressive background (green or blue). They will also spend more time hovering their mouse cursor over these boxes. We give the reasoning for our assumptions in previous parts of this thesis.

On the applicants' websites we modified the background colours in 3 different distributions. We present the colours from the upper left box to bottom right box. Please, see the snapshot of our sample website in figure 3.1.

- **Colour1:** Green, Red, Blue, Blue, Green, Red
- **Colour2:** Blue, Green, Red, Green, Red, Blue
- **Colour3:** Red, Green, Blue, Blue, Red, Green

For the purpose of our testing we include also the manipulations with information positioning on the website. Effect of positioning will be tested in the next subsection. Information was distributed in 4 different ways. We present the information distribution from the upper middle box to bottom right box.¹⁹

- **Position1:** Education, Bad habits, Marital status, Job, Age
- **Position2:** Bad habits, Marital status, Education, Job, Age
- **Position3:** Education, Marital status, Bad habits, Job, Age
- **Position4:** Marital status, Age, Bad habits, Job, Education

In our sample of 160 landlords who visited the website, 52 observed the distribution of Colour1, 52 observed Colour2 and 56 observed Colour3. Average number of observations per colour distribution and group is 13.33. Due to the very low number of observations that would not provide us with sufficient data for robust inference we do not separate the respective groups and make our inference for all the groups pooled together.

First, it is worth noting that any of the colour distributions does not have a significant effect on response rates *per se*. If we run probit regressions with dummy variables switching the colour distributions both pooled and separated for the respective groups, we find no effect of any of these distributions. In two cases our models break down, namely for the Czech and Ukrainian groups. We

¹⁹The upper left box provides no information, it is a welcoming box only.

Table 4.16: Mean rank of first non-transitory visits of informational boxes by background colour distribution

		Colour		
		(1)	(2)	(3)
Position	Top middle	2.84 (0.307)	3.26 (0.324)	2.96 (0.319)
	Top right	3.25 (0.386)	2.82 (0.321)	3.31 (0.368)
	Bottom left	3.80 (0.479)	4.06 (0.290)	4.22 (0.477)
	Bottom middle	3.24 (0.303)	3.82 (0.279)	3.62 (0.462)
	Bottom right	5.25 (0.492)	4.63 (0.348)	4.78 (0.479)

Note: The respective figures are the mean values of the first occurrence in a sequence of non-transitory moves of mouse cursor over the information boxes by an individual landlord.

do not include the regression results in a table but the results can be found in the log file on the appended data CD.

We tested for significant differences between mean durations spent with mouse cursor pointed on the boxes with respect to background colour distributions. For most of the boxes we found no significant difference except for the upper middle box, where there is significant difference between time spent over the box between Colour2 and Colour3 treatment (Two sided t-test $p=0.012$). In both cases, however, the colour of the box is green and hence no conclusion can be made. Another significant difference occurs for the bottom middle box between Colour2 and any other colour distribution (Two sided t-test $p=0.052$ for Colour3 and $p=0.071$ for Colour1). The information box on this position for this particular distribution has a red background. However, the same box has a red colour background also under the distribution Colour3. Additionally, for all colour distributions there is a single category, Job, placed on the bottom middle position on each applicant's website. This would mean that based on our observations, colour manipulations make for no systemic change in landlords' decision making and we can confirm our hypothesis for this part.

Further we ask whether the different background colour affected search patterns of landlords. The mean values of rank of first visits of the respective boxes with respect to background colour distribution are presented in table 4.16. The figure would be equal to one if every landlord navigated her mouse cursor on the particular box as her first non-transitory move on the website. Standard

errors are in parentheses below.

The results do not show any clear pattern that would predict systemic change in landlords' behavior. Though there are particular trends such as in the first row where the lowest mean rank stands for the box with red coloured background if compared to other colour distributions. However, there are also trends that would predict different behavior such as fourth row where the red coloured boxes are visited later than the differently coloured boxes on average. The two sided t-tests confirm our claim that there is no systemic difference between the respective colour distributions that would predict behavioral modification of landlords' search patterns.²⁰

4.7.3 Effect of information positioning on the website

In this subsection we will ask whether there is any effect of distribution of information on the website. We have had four different positions for information boxes where the two variables of our interest were located; namely it were boxes with information on *education* and *bad habits* informing about the applicant being a non-smoker. We have discussed the importance of these signals in the previous chapter. Our *a priori* assumption was that the most visited will be the upper middle box while the least visited will be the bottom right box.²¹ These assumptions have proven to be true. Relative frequencies of visits state the lowest number of first non-transitory visits of the box in the bottom right, four, while the highest number for the upper middle position, 52, out of 128 in total. The remaining positions are 24 for the top right, 26 for the bottom left and 18 for the bottom middle.²² The frequencies are stable for each information positioning on the website.

Table 4.17 shows the shares of positive responses to our applicants given the particular distributions of information on the respective websites. Comparison of the shares does not provide any clear pattern in terms of higher probability of positive response for any of the four realized distributions. Due to very small numbers of observations²³ the results are highly unstable and the differences are insignificant. By adding observations, results could be very easily manip-

²⁰The minimal value obtained by pairwise two sided t-test returns $p=0.162$ if testing for equality of means of the first two columns in the fourth row. All other pairwise tests return larger values implying equality of means. See the data on appended CD for exact values.

²¹See the sample screenshot of our website in figure 3.1.

²²For the 32 observations adding up to the total of 160 visits on our websites the data are missing due to technicalities discussed earlier in the previous chapter.

²³See table 4.18.

Table 4.17: Response rates and information positioning on the applicant's website

	General ¹	Position 1	Position 2	Position 3	Position 4	Obs.
Czech	87,50% ²	100,00%	100,00%	85,71%	57,14%	32
Vietnamese	66,67%	62,50%	57,14%	83,33%	55,56%	36
Roma	62,75%	75,00%	76,47%	46,15%	53,85%	51
Ukrainian	75,61%	70,00%	87,50%	60,00%	84,62%	41
Total	71,88%	77,78%	80,00%	66,67%	64,29%	160
Observations	160	36	40	42	42	

¹Pooled shares of positive responses for all observations irrespective of information positioning.

²The numbers show the percentage of positive results for the respective groups for given distribution of information irrespective of all other website manipulations.

Note: The numbers in the last row and last column show the numbers of observations in our dataset. The 160 observations leave us with 10 observations per category (position / group) which does not allow for stable results. Modification of our results by adding one observation can dramatically change the results, hence our findings are not robust.

ulated. This leaves us with an unanswered question whether there is an effect of positioning of information on response rates.

To conclude, we have not found any systemic changes in landlords behavior in either of our three sub-hypotheses. Our results are in some cases hardly testable and stable due to very small numbers of observations as only one third of landlords, who were given an opportunity, was willing to obtain additional information by clicking on the link that would navigate them to applicants' website. The manipulations of the website were minor on purpose as we wanted to control for as many unobservable effects as possible, yet still we wanted to evoke some nudging and framing effects. However, the non-results obtained can be understood as a positive fact that the landlords do not yield to non-informative effects if deciding about further contact with possible applicants. It also allow us for possible comparison of future experiments without worries about the exact replication of our design.

Table 4.18: Effect of information positioning on applicant's website on response rates

Dependent variable: response	(1)	(2)	(3)	(4)		(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Full	Pooled	P1	P2	P3	P4	P4	Pooled	P1	P2	P3	P4
Vietnam. applicant = 1	-0.273** [0.135]	-0.278** [0.135]	-0.991*** [0.0132]	-1.000*** [3.05e-06]	0.0160 [0.272]	-0.109 [0.284]	-0.109 [0.284]	-0.259* [0.133]	-0.993*** [0.00953]	-0.996*** [0.00421]	-0.0359 [0.266]	-0.0149 [0.238]
Roma applicant = 1	-0.323*** [0.122]	-0.316*** [0.122]	-0.983*** [0.0116]	-0.991*** [0.0126]	-0.456* [0.253]	-0.0624 [0.239]	-0.0624 [0.239]	-0.290** [0.119]	-0.985*** [0.0101]	-0.897*** [0.0650]	-0.426* [0.238]	-0.0309 [0.222]
Ukrainian applicant = 1	-0.149 [0.131]	-0.154 [0.131]	-0.978*** [0.0256]	-1.000*** [2.55e-05]	-0.283 [0.276]	0.288 [0.195]	0.288 [0.195]	-0.160 [0.129]	-0.977*** [0.0247]	-0.980*** [0.00952]	-0.305 [0.269]	0.280 [0.186]
Female landlord = 1	0.0159 [0.0780]											
Landlord's name Cz. = 1	-0.170* [0.0986]											
log(Apt. Price per m ²)	0.138 [0.187]	0.137 [0.148]	0.0363 [0.0505]	0.0136 [0.0139]	0.458 [0.371]	0.107 [0.343]	0.107 [0.343]					
Apt. equipped = 1	0.0682 [0.0957]	0.0633 [0.0934]	0.00895 [0.0165]	0.00839 [0.00767]	0.167 [0.158]	-0.190 [0.342]	-0.190 [0.342]					
Security deposit = 1	-0.0128 [0.143]	0.0144 [0.0828]	0.0176 [0.0207]	-0.0206 [0.0171]	-1.07e-05 [0.175]	0.0114 [0.173]	0.0114 [0.173]					
log(Security deposit)	0.00430 [0.0182]											
Apt. in Prague = 1	-0.0982 [0.104]	-0.0858 [0.0971]	-0.0278 [0.0331]	-0.0134 [0.0192]	-0.271 [0.223]	-0.112 [0.186]	-0.112 [0.186]					
Apt. 1+kitchenette = 1	0.00155 [0.123]											
Apt. 1+1 = 1	0.0342 [0.114]											
Apt. 2+kitchenette = 1	0.0117 [0.107]											
Observations	153	154	36	37	41	40	40	160	36	40	42	42

Probit estimates (marginal effects) of the probability of receiving a positive response

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Chapter 5

Discussion and Conclusions

In our experiment we found strong evidence of discrimination in the Czech rental housing market. *Ceteris paribus* the positive response rates for the Czech applicant were 23.5 percentage points higher than compared to any other minority applicant. As expected, the worst affected by discrimination in the Czech rental housing market is the Roma applicant who received the lowest share of positive responses. Compared to the responses to our control, Czech applicant, the Roma applicant was receiving 26.96 percentage points less responses. The Vietnamese applicant is, however, hardly better off with resulting difference in positive responses of 26.95 percentage points compared to our control applicant. The results in table 4.10 show the negligible and insignificant difference. The Ukrainian applicant has a better position in the market with 15.92 percentage points difference in response rates between him and our control applicant.

The results, however, may be affected by possible misinterpretation of our intentions by the landlords who may have interchanged respective nationalities or ethnic groups with different, third groups. During our pilot testing, some of the subjects matched the name Gejza Horváth with Slovak nationality instead of Roma ethnic origin which would make it significantly more favourable for this applicant in this market. The results are thus, according to our beliefs, understated and we would expect greater difference between the Roma and the Czech applicant in terms of positive response rates. Despite the attempts to select the name as representative for respective groups, we may have not been entirely successful. The name of Phan Quyet Nguyen was almost flawlessly matched with Vietnamese origin, hence we believe that our results coincide with true behavior of landlords with respect to this particular group.

The name of Oleksander Zincenko was mostly matched with assumed Ukrai-

nian origin, but in some cases it was matched with Russian origin. The Ukrainians are often being viewed as cheap laborers by the Czechs (See e.g. Drbohlav 2004), we believed that there would possibly be separation in rental prices where the Ukrainian origin of the name would be more probably matched with the lower costs of rental while the Russian origin would be matched more likely with higher rental prices as Russian immigrants often have significantly higher incomes from business activities. If we run our model represented by equation 4.10, column (5) for the observations below the 25th percentile and above 75th percentile, we end up with interesting results. For the former group the difference in response rates between Ukrainian and Czech applicants is just 6.62 percentage points while for the latter it is 17.88. If our hypothesis was true, it would imply significant distaste towards Russians compared to Ukrainians. However, this would be pure speculation as we cannot tell the exact understanding of the name by the landlords. Moreover, our data show in general that the rates of discrimination increase with price per square meter for the apartment offered. For the observations below the 25th percentile the difference between positive response rates for Czech and other groups pooled is 14.03 percentage points while for the observations above the 75th percentile it is 20,79 percentage points. The difference for the observations inbetween is highest, ranging 28.14 percentage points. These results are in contrast to findings of Drydakis (2007) who found evidence of positive linear correlation between attractiveness of the area (as measured by average rental cost) and difference in invitations to showing for the minority and majority applicants.

Finding 1 *Minority applicants face discrimination in Czech rental housing market. Probability of getting a positive response is on average 23.5 percentage points lower compared to the Czech applicant.*

It was striking to us that information about the applicants played very small role in landlords' propensity to respond positively. The only statistically significant was the effect of the Info treatment versus NoInfo treatment. The difference in positive responses is 6.55 percentage points favoring the applicants who stated additional information directly in the body of their application emails. Even this minor improvement may be, however, economically significant as costs of conveying information about ourselves if applying for rental housing is not costly and some positive effect is evidently achievable. The results were mainly driven by the positive effect of information for the Roma applicant,

who could improve his position by more than 11 percentage points if he stated additional information directly in the body of his application email. For both other minority applicants the effect of additional information was insignificant. Compared to the results of Ahmed & Hammarstedt (2008), who estimate that applicants of Arabic origin adding information about their education, occupation, marriage status and bad habits (non-smokers) obtain equal level of positive responses as Swedish applicants who do not add any information, our results are discouraging.

Our findings imply that in the Czech rental housing market taste based discrimination substantially prevails over statistical discrimination as landlords are not willing to update their prior beliefs and additional information does not help in reducing the difference in rate of positive responses to minority groups compared to the majority, Czech group.

We discover a puzzling result that the response rates to the Czech applicant are higher (even if not significantly) if he states no information about himself.¹ This is puzzling to us as it would imply that the *a priori* expectations of landlords about the applicants were on average higher than the ones stated in our Info and WebInfo treatments. Even if it was true, the information should not only serve as updating of *expected value* of the applicant, but it should also reduce *noise* which should be desirable to any risk averse individual.

However, if we go further in our discussion, we separate the results for WebInfo and Info and we find that the negative coefficient for the Czech applicant is driven by the results for WebInfo. We have shown that there is a selection process, hence we disregard the fact that the share of positive responses drops by 18.84 percentage points if the landlord does not visit the website and is positive but insignificant if the landlord visits the website at last. The average drop of 13.03 percentage points compared to NoInfo treatment is still puzzling to us.

Finding 2a *Despite adding positive information about the minority applicant, rate of positive responses is significantly lower compared to the Czech applicant irrespective of amount of information given by him. Preference based discrimination prevails over statistical discrimination in the Czech rental housing market.*

¹See tables 4.7 and 4.8.

Finding 2b *The Roma applicant may improve his position in terms of receiving more positive responses if he states additional information directly in the body of the application email. If the transaction costs of obtaining information rise, the effect is no longer significant.*

Finding 2c *Czech applicant receives more positive responses if he states no information about himself than if he adds a link to his personal website.*

As we have stated earlier, the Roma minority has the worse position in the Czech rental housing market. Yet, the effect of being Vietnamese matches with the effect of being Roma almost exactly. We have argued that the true effect of being Roma may be underestimated due to limitations in our experimental design. After this adjustment, this would be exactly what would be predictable from the sociological studies mentioned in chapter 2. Thus we present our third finding without any further comments:

Finding 3 *We have confirmed our hypothesis that the Roma applicant faces most severe discriminative behavior from landlords in the Czech rental housing market. The Vietnamese follow with almost no difference in the level of discrimination.*

In our design we were questioning the returns to education in the Czech rental housing market in terms of more equal conditions for more educated individuals. The theories suggesting positive returns to education in various fields seem to be partially confirmed in our experiment. We provide strong support for positive returns to education in our experimental design and find evidence of this effect for two out of four groups, namely for the Vietnamese and Ukrainian applicants. *Ceteris paribus*, these groups have respectively 17.49 and 16.3 percentage points higher probability of receiving a positive response than their high school graduate counterparts, on average.

The strong effects of education were, however, not observed for the group of Roma. Our Roma applicant did not receive significantly more positive responses if he finished his university degree compared to the applicant with high school education. These results are in common accord with findings of O'Higgins (2009) in his survey research conducted in South Eastern Europe on returns to education in labor market of Roma compared to Non-Roma. He concludes that "the employment returns to education are lower for Roma than for non-Roma. [...] Absolute returns to education accruing to Roma is that their

lower educational participation is, at least partially, due to *rational economic calculus*.” (Italics added by us.)

These results suggest that the possibilities of improvement for the group members are minimal even if they were willing to leave the impoverished environment in which many Roma live. Our results confirm give a part of the answer to the question of why are Roma not willing to improve their position by acquisition of more education. The answer is simple: it is not worth the effort. Policy advice that stems from our finding is that low education participation of Roma and mitigation of discrimination must be handled contemporaneously.²

Finding 4 *Vietnamese and Ukrainian applicants strongly benefit from more education in terms of positive correlation between the level of education and number of positive responses.*

Policy suggestion 1 *The Roma applicant does not seem to benefit from higher education in the Czech rental housing market in the afore mentioned manner. Policies aiming for improvement of poor situation of Roma should treat low education participation and mitigation of discrimination simultaneously.*

We have also partially confirmed our hypothesis that there is a positive correlation between the accessibility of information and positive response rates. There were three levels of information about the applicant. The treatments NoInfo, WebInfo and Info were separated by accessibility of information where in the first, information was not available at all, in the second information was to be obtained for a small opportunity cost while in the last information was accessible at no cost directly in the body of the email. We found that the level of discrimination is reduced significantly only under WebInfo treatment. This is, however, mainly due to the fact that under the WebInfo treatment the Czech applicant receives significantly less positive responses than under NoInfo treatment as we have described above. We do not want to make any conclusions from this finding as we do not fully understand the reason for the drop in positive response rates for the Czech applicant under WebInfo treatment.

For Info treatment the level of discrimination does not change compared to NoInfo treatment. This would imply that the landlords do not positively discriminate minorities in their updating, even if the updating is minimal as we have learned earlier. Given the striking difference in response rates for

²This policy advice correspondse with the conclusions of O’Higgins (2009).

minorities compared to the majority, Czech applicant, the position of minorities in the Czech rental housing market will always be inferior to that of the Czech applicant.

Finding 5b *The level of discrimination of minorities does not change if they state additional information – assumingly positive – in the body of the application email. There is no positive discrimination in terms of updating priors.*

Finding 5b *The rate of positive responses to any minority applicant who gives additional information about himself and is a university graduate is on average inferior to the rate of positive responses to a Czech applicant who shows interest in renting the landlord’s flat without adding any more information.*

We have also tested for systemic changes in landlords’ decision making processes as well as in their search patterns using our newly developed system based on the more commonly known tool called MouseLab by modifications on the websites of our applicants’. The changes aimed to be completely non-informative, only cognition-based. All of our *a priori* hypotheses based on behavioral predictions were not confirmed. Unfortunately, some of the effects could not be tested due to small number of observations which resulted in instable results or to break-downs of some of our model specifications. Hence we conclude with a weaker prediction:

Finding 6 *The cognitive manipulations of our website do not seem to affect landlords’ decision making or search patterns systemically. Thus our results are robust to small and non-informative experimental design manipulations.*

The small number of observations collected on our websites was the main limitation in studying of possible systemic effects of cognitive manipulations on landlords’ behavior. Hence, there is a motivation for the collection of larger sample of observations that would allow for more precise estimation. Also, we have opened many questions in this thesis that would require more thorough scrutiny.

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Appendix A

Emails Sent to Landlords

In the following sections we present the emails sent to the landlords. As noted in chapter 3, there were actually three basic types of emails being sent – NoInfo, Info and WebInfo. The emails differed in the names – and respective email addresses and website addresses – and in type of education of the fictitious applicants only. The examples below show the Roma applicant Gejza Horváth with a college degree. His email address is horvath-gejza@seznam.cz and website address is horvath-gejza.sweb.cz. The subject of each email was generated according to a given rule. It consisted of interest in apartment rental and the location of the flat.¹

The other names were Jiří Hájek for the Czech applicant, Oleksander Zincenko for the Ukrainian applicant and Phan Quyet Nguyen for the Vietnamese applicant. Their respective email and website addresses are j-hajek@seznam.cz and j-hajek.sweb.cz, oleksander.zincenko@seznam.cz and oleksander.zincenko.sweb.cz and phan.quyet.nguyen@seznam.cz and phan.quyet.nguyen.sweb.cz.

Seznam.cz is a largest Internet portal in the Czech Republic, offering various services. It hosts one of the largest number of email accounts as well as many websites are hosted on swab.cz, a webhosting division owned fully by seznam.cz. We do not expect any landlord to be suspicious about the email addresses or website addresses we selected.

In the WebInfo email the reader can see that there is a uniform website address in each email for a given group. However, in the HTML encoding there is a hidden link to the webpage that, if the landlord actually hits the link in the email, assigns the unique ID to each landlord so that we can track the landlord's behavior by our tracking technology. The landlord could possibly

¹For example: *"Apartment rental: Vodickova street, Prague - Reply to the offer."*

see the suspicious link in her Internet browser in the lower left corner, however, most of the landlord's did not pay any attention to the address hidden in the HTML code. Those landlords who copied the visible link to their Internet browsers without hitting the link could not be tracked and were assigned ID 0. Such problem occurred in 18 cases out of which some of the visits were possibly not even related to our experiment.

A.1 Original Emails

A.1.1 NoInfo Email

Dobry den,

mel bych vazny zajem o Vami nabizeny byt. Mohli bychom se domluvit na prohlidce bytu?

S pozdravem,

Gejza Horvath

A.1.2 Info Email

Dobry den,

mel bych vazny zajem o Vami nabizeny byt. Mohli bychom se domluvit na prohlidce bytu? Jsem tricetiletý muž, nekurak, vysokoskolsky vzdelany. Pracuji v oblasti mezinarodniho obchodu a mam zajisten stabilni prijem.

S pozdravem,

Gejza Horvath

A.1.3 WebInfo Email

Dobry den,

mel bych vazny zajem o Vami nabizeny byt. Mohli bychom se domluvit na prohlidce bytu?

S pozdravem,

Gejza Horvath
horvath-gejza.sweb.cz

A.2 Translated Emails

A.2.1 NoInfo Email

Hello,

I am very interested in your offer regarding the flat. Would it be possible to arrange a visit of the flat?

Best regards,

Gejza Horvath

A.2.2 Info Email

Hello,

I am very interested in your offer regarding the flat. Would it be possible to arrange a visit of the flat? I am a man in his thirties, non-smoker, with university degree. I work in the field of international trade and have a stable income.

Best regards,

Gejza Horvath

A.2.3 WebInfo Email

Hello,

I am very interested in your offer regarding the flat. Would it be possible to arrange a visit of the flat?

Best regards,

Gejza Horvath
horvath-gejza.sweb.cz

A.3 Teaser Email

A.3.1 Original version

Dobry den

zaujala mne nabitka Vaseho bytu a mel bych o jeho pronajem velky zajem. Jsem lekar s cerstve uzavrenou dlouhodobou smlouvou v blizke nemocnici, bezdetny, nekurak, nemam zadne domaci zvire. Je Vase nabitka stale aktualni? Bylo by mozne se domluvit na prohlidce bytu?

Predem dekuji,

MUDr. Vaclav Smolik

A.3.2 Translated version

Hello,

I was impressed byt the offer of your apartment and I am very interested in renting it. I am a doctor with a fresh

contract with a hospital nearby, no children, non-smoker,
I do not have any pets. Is your offer still valid? Would it be
possible to arrange the apartment showing?

Thank you in advance,

MUDr. Vaclav Smolik

Appendix B

Content of Enclosed CD

There is a CD enclosed to this thesis which contains empirical data and Stata source codes.

- Folder "codes": Source codes
- Folder "data": Empirical data