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BACHELOR THESIS

The asymmetric dominance effect: Three-attribute phantom alternative at play

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Declaration of Authorship

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Abstract

In this thesis I investigate asymmetric dominance effect in hypothetical consumer choice. The main goal of this study is to determine if asymmetrically dominated unavailable alternative (phantom decoy) can cause preference shifts toward the target option which dominates it in scenario employing choice items defined on three numerical attributes. To date, previous research of consumer choice only studied asymmetric dominance effect induced by phantom decoy in scenarios utilizing two-attribute choice items. Secondary aim of this study is to determine if the same but available three-attribute decoy causes similar asymmetric dominance effect as the phantom decoy. I also examine differences in choice shares of choice items between two scenarios, both employing two choice items defined on two and three attributes, respectively, where the third distinguishing attribute serves to evoke perception of numerically expressed customer feedback on the choice items. For these purposes, I designed an experiment in a form of online questionnaire on free survey websites, which was filled by participants via the internet. I found significant asymmetric dominance effect caused by a presence of the phantom decoy. In case of the available decoy, no preference shifts were observed. Statistical analysis revealed no significant differences between the two-attribute and three-attribute scenario.

JEL Classification	C99, D03
Keywords	asymmetric dominance effect, preferences, attraction effect, phantom decoy, unavailable alternative, consumer choice

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Abstrakt

V této práci zkoumám efekt asymetrické dominance u hypotetického spotřebitelského výběru. Hlavním cílem této práce je zjistit zda asymetricky dominovaná nedostupná alternativa (fantom návnada) může způsobit změnu preferencí ve prospěch zvolené cílové možnosti, která nad ní dominuje v případě, kdy předměty volby jsou definované třemi číselnými atributy. Doposud se výzkum spotřebitelského výběru zabýval jen efektem asymetrické dominance způsobeným fantom návnadou v případech využívající dvojatributní předměty výběru. Vedlejší cíl této studie je zjistit zda stejná, ale dostupná trojatributní návnada vyvolá podobný efekt asymetrické dominance jako nedostupná návnada. Také zkoumám rozdíly v podílech vybraných předmětů výběru mezi dvěma případy, oba využívající dva předměty výběru definované v jednom případě dvěma a ve druhém třemi atributy, kde třetí odlišovací atribut slouží k navození představy číselně vyjádřené spotřebitelské zpětné vazby na předměty výběru. Pro tyto účely jsem na bezplatných internetových stránkách sloužících pro tvorbu průzkumů navrhl experiment ve formě online dotazníku, který byl vyplněn účastníky prostřednictvím internetu. Zjistil jsem významný efekt asymetrické dominance vyvolaný přítomností fantom návnady. Žádné změny preferencí nebyly pozorovány v případě dostupné návnady. Statistická analýza neodhalila významné rozdíly mezi dvojatributním a trojatributním případem.

Klasifikace JEL	C99, D03
Klíčová slova	efekt asymetrické dominance, preference, efekt přitažlivosti, fantom návnada, nedostupná alternativa, spotřebitelský výběr

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Proposed topic	The asymmetric dominance effect: Three-attribute phantom alternative at play

Topic characteristics Consumer's choice among alternatives is highly dependent on context, in which the decision making takes place. Particularly, contrary to rational choice theories which build on concept of value maximization, preferences of a decision maker between two given options A and B can be distorted radically in favour of A by adding the third option A' (decoy) which is dominated by A in some feature (but not by B), even if A is not preferred option in the setting exclusive of A'. When first studied, Huber *et al.* (1982) showed this asymmetric dominance effect (ADE) to violate generally accepted notions about preference relations as regularity, or similarity hypothesis formulated by Tversky (1972), on a consistent basis. Ariely and Wallsten (1995) demonstrated that the effect persists even in a framework where participants were asked to decide which option was chosen the most by other participants. An evidence was found to claim that ADE can affect decision making even in non-market setting such as preferences for political candidates (Pan *et al.*, 1995), job candidates (Highhouse, 1996), policy choices (Herne, 1997), partner selection (Sedikides *et al.*, 1999) or choices concerning environmental issues (Bateman *et al.*, 2008). Various theoretical explanations for ADE were offered during the years. Simonson (1989) pointed out that "justifiability" play the role in the decision making. Theoretical model by Tversky and Simonson (1993; Simonson & Tversky, 1992) takes into account loss aversion and explains ADE by means of contrast effect. ADE is essentially part of a larger phenomenon of so-called decoy effects. The name refers to the notion that when a decoy is added to a set of two choices, the decision makers are likely to shift their choice

in anticipated direction. Particularly, phantom decoys which refer to an option added to a choice set which has similar features as normal decoy option, but is for some reason not available to be chosen (Farquhar & Pratkanis, 1993). In the real in-store experiment, Doyle *et al.* (1999) found both asymmetrically dominated decoy and its phantom version to predictably distort the consumer behaviour similarily to laboratory experiments of for example Huber *et al.* (1982) or Sedikides *et al.* (1999). In this thesis I will propose an experiment in order to test if ADE is observable in the setting where one of the features of given options, in this instance pictures, is number of "likes" at the social media (Facebook) and the participants are asked to choose the one they find the most appealing. The thesis will improve understanding of the phenomenon of context-dependent valuation of given options and also help to understand the importance of social feedback represented by the number of "likes" from social media. Finally, these pieces of knowledge may be implicable for online marketing purposes.

Hypotheses

1. Do people perceive information about number of people which "like" particular picture on the social media (Facebook) valuable enough to be prone to preference reversal when decoy option is added?

2. Is introduction of the third alternative, which is for some reason unavailable (phantom decoy) likely to cause similar effects as the ordinary decoy?

3. Does information about number of "likes" cause significant change in preference structures over treatments with decoy as well as phantom decoy with respect to the situations in which this information is not considered?

Methodology An experiment for asymmetric dominance effect will be designed. Following mainly examples of Huber *et al.* (1982) and Pan *et al.* (1995), the proposed experiment will consist of two major sections, each divided into three parts. In the first section, participants will be asked to choose one of the available options having two attributes. In the second, the task will be the same, but the number of "likes" of given choices will be added to the set of attributes. At first, the choice set in both sections will consist of two options. Then, the third option (decoy), which is strictly dominated by one of

the original two options, but not the other, will be added to the choice sets in both sections. Finally, the decoy option will be replaced with (information about) phantom decoy. That is, this decoy option will be made unavailable to be chosen.

Outline

1. Introduction
2. Asymmetric dominance effect in literature
3. Design of the experiment
4. Discussion of possible results
5. Conclusion

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Chapter 1

Introduction

Conventional economic theories assume great deal of consumer's rationality in decision making. In this view, rational economic agents have nearly complete preferences over the choice alternatives, as well as the needed information from the environment at hand. Moreover, they are able to readily compute the optimal solution which lies on the highest level of utility feasible for them to attain (Simon, 1955, p. 99). In reality, people often behave in contradiction with these assumptions. Economic agents are subjects to their cognitive limitations and to external context of the decision making processes. The aim of research in behavioural economics field is to identify the boundaries of economic rationality for better understanding of instances in which people behave in irrational ways when making decisions, mainly utilizing on knowledge from research in psychology and marketing.

Concerning human cognitive limitations, Kahneman (2003) identifies two distinct types of cognitive processes: intuition and reasoning. The former is "fast, automatic, effortless, associative, and often emotionally charged" and the second is "slower, serial, effortful, and deliberately controlled" (Kahneman, 2003, p. 1451). The amount of mental effort used by decision maker is the most important distinctive feature between the two processes. He argues that agents often arrive at the decision by means of intuition, rather than by employing proper reasoning and making computations. Furthermore, the context in which agents see the alternatives may be more relevant for the final decision than their ability to compute the optimal solution. Kahneman (2003) remarks that decision makers often use heuristic strategies to decide among options. That is, their mind finds ways to simplify the complex task such that lower level of the cognitive effort is needed.

Bounded rationality implies that preferences over alternatives are often not complete or permanent. As reported by Tversky and Simonson (1993), "people often do not have a global preference order and, as a result, they use the context to identify the most 'attractive' option"(p. 1187). Therefore, economic agents are likely to be influenced by the context of a decision. There are various types of the context that can be present in decision of choice. Tversky and Simonson (1993) distinguishes between background and local context of a decision. The former is defined by options encountered by a decision maker in the past, whereas the latter is defined by a choice set which is known to a decision maker at a time the choice is made.

Three main biases from a rational behaviour patterns emerge in consumer choice due to the local context: compromise effect, similarity effect and asymmetric dominance effect that is commonly called attraction effect or decoy effect[1] (Rooderkerk *et al.*, 2011). These effects occur in instances where introduction of third option into two-item choice set predictably alter choice shares of one item from the original set. In case of similarity effect, choice shares of original options decrease proportionally to degree of similarity between particular option from the original set and the third alternative whereas the more are these two similar, the larger is drop of shares of the original option. Compromise effect refers to the notion that if the introduced third option makes one of the original options to be perceived as a compromise between the other two, it causes the compromise option to be chosen relatively more. Asymmetric dominance effect refers to the observation that if the third alternative (decoy) is dominated[2] by one option from the original set (target), but simultaneously is not clearly dominated by the other (competitor), its presence in the set increases choice share of the dominating option (target).

Firstly studied by Huber *et al.* (1982), the asymmetric dominance effect appears to be of somewhat controversial nature. It was observed in consumer decision making (e.g. Huber *et al.*, 1982; Ratneshwar *et al.*, 1987; Doyle *et al.*, 1999; Müller *et al.*, 2014), as well as in other types of decision making (e.g. Pan *et al.*, 1995; Highhouse, 1996; Herne, 1997; Sedikides *et al.*, 1999; Bateman *et al.*, 2008). The effect was also found when unavailable alternative (phantom decoy) with the same features as ordinary decoy (that is available for choice)

[1]Note that sometimes, these terms are used not to mean the same thing. For example, Herne (1997) refers to decoy effect as a broader set of phenomena in which decoy alternative alters the choice share of a target option (the asymmetric dominance effect and compromise effect is mentioned).

[2]i.e. it is perceived inferior to it

was used (Doyle *et al.*, 1999). Remarkably, Shafir *et al.* (2002) observed the asymmetric dominance effect induced by ordinary decoy alternatives even in choices made by animal subjects, particularly honeybees and gray jays. Other researchers found evidence to doubt the practical usefulness and robustness of the effect and based on their research concluded that its importance for real life situations is highly questionable due to the fact that majority of previous studies utilized on options with arbitrarily chosen numerical values (Frederick *et al.*, 2014; Yang & Lynn, 2014).

On contrary, I suggest that this effect could be increasingly relevant in modern era. Firstly, there is a growing necessity to numerically estimate multitude of things, for example price of intangible assets or economic impacts of certain policies and measures and therefore many choices made by people are done between choices having only numerically specified attributes. Secondly, I aim to reflect a current importance of electronic word of mouth (eWOM) for online commerce (Amblee & Bui, 2011) in the choice items' attributes I used in the experiment. I designed two of the choice items' attributes, ride quality rating and 'likes', to evoke the simple numerically expressed eWOM. The eWOM is a general term that encompasses broad variety of practices through which people signal their personal opinion toward a particular product or brand via the internet. Hennig-Thurau *et al.* (2004) define eWOM as "any positive or negative statement made by potential, actual, or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet" (p. 39). It includes various customer ratings, opinions on social media through posts or likes, written reviews, expert evaluations, and alike. In my study, the attribute ride quality rating is used as a representation of an expert evaluation and the attribute 'likes' a representation of customer stance shared on social media (Facebook).

The objective of this thesis is to review differing views on the asymmetric dominance effect in scientific literature and to bring more evidence that the asymmetric dominance effect can be replicated while respecting certain conditions.

The central aim of this study is to test if the illusory presence[3] of a phantom decoy in the choice set comprised of three-attribute choice items result in preference shifts toward the target option asymmetrically dominating the phantom decoy, as in scenarios used in previous studies where only two-attribute choice

[3]By 'illusory' I mean that the presence of a phantom decoy in the choice set is not 'actual' presence, because the phantom decoy alternative cannot be chosen.

items were used instead. I am unaware of any research that studied how phantom decoy alters the choice share of the target option in scenario where all the choice items are defined on three attributes, rather than on two attributes.

Based on prior research, I derive that the preference shifts toward the target option due to asymmetric dominance effect should be observable in choice task employing three-attribute choice items. This should hold for choice task where ordinary decoy is used, as well as for the similar choice task in which the phantom decoy is used. Another question of interest is if there are differences in the decision makers' preferences toward the choice items defined on two attributes and choice items defined on three attributes, of which the two attributes remain the same as in the former case and the third added in the latter case is the 'likes' attribute. Final question is if the ordinary decoy task and phantom decoy task yield asymmetric dominance effect of the same size, or not.

To test this, I run an experiment in which participants were to choose among available options using an online survey. Between-subject experimental design was employed. In four experimental treatments I varied the choice task and included either two or three items, the third being the decoy alternative, while both ordinary and phantom decoys were utilized separately. All the defining attributes of decoy alternatives remained the same for both the phantom and the ordinary decoy, aside from its availability for actual choice.

I found that the phantom decoy alternative induced the asymmetric dominance effect resulting in a 19.05% shift toward choosing the target option. Thereby the hypothesis that three-attribute phantom decoy alternatives can induce the asymmetric dominance effect similarly to the two-attribute phantom decoys was supported. However, in the task where ordinary decoy alternative was used, the asymmetric dominance effect was not observed. The comparison of two-attribute and three-attribute control groups did not show any statistical differences due to the presence of the third attribute.

The thesis is structured as follows. Chapter 2 reviews relevant literature on asymmetric dominance effect. Chapter 3 introduces hypotheses for the experiment. Chapter 4 covers overall methodology of the experiment. Chapter 5 describes data and results of the experiment. Chapter 6 discusses the results of the experiment. Chapter 7 concludes with summary of my findings. Appendices contain results of all performed analyses along with depiction of all stimulus used in the experiment.

Chapter 2

Asymmetric dominance effect in literature

2.1 Early findings in the consumer behaviour

First evidence for asymmetric dominance effect in consumer behavior was found by Huber *et al.* (1982). Their study demonstrated that important assumptions which number of prior choice models carried, regularity and similarity hypothesis, can be consistently violated under certain conditions. Regularity, "a minimum condition of most existing probabilistic choice models" (Huber *et al.*, 1982, p. 91) states that it is impossible to increase probability of the option being chosen from a choice set by adding another option into the set. Similarity hypothesis asserts that a newly introduced option into a choice set will decrease probability of similar options being chosen by amount proportional to the degree of similarity between new alternative and given option (Tversky, 1972, p. 292).

In experiment conducted by Huber *et al.* (1982), participants were asked to choose among choice items defined on two attributes. Six categories of such options with various attributes were used. Particularly, beer category was defined on dimensions price per sixpack and quality, cars on ride quality and gas mileage, restaurants on driving time and food quality, lotteries on chance on winning and amount of win, film on developing time and colour fidelity, and TV sets on percent distortion and reliability (average time to breakdown). One group of participants was presented with two choice items (control group), comprised of a target option and competitor option. The second group was presented with three choice items (target group), the two of which (target and

competitor) were the same as in the control group and the third choice item was a decoy[1] alternative. This decoy was asymmetrically dominated in its attributes by only one of the two original options, the target. They found that the introduction of the decoy option substantially increases choice share of the dominant target being chosen, which in turn violates both regularity and similarity hypothesis.

Study conducted by Ratneshwar *et al.* (1987) suggested that 'meaningfulness' of used choice items' attributes play the role in magnitude of the asymmetric dominance effect.

Simonson (1989) hypothesized that magnitude of the asymmetric dominance effect will be even higher if decision makers are informed that they can be asked to justify their decision to other participants after their choice is made. His findings suggest that anticipating to be held accountable for their choices can indeed make asymmetric dominance effect stronger. He argued that this is because "the asymmetric dominance relationship provides the only reason for choice that does not depend on knowledge of the evaluators' preferences"(Simonson, 1989, p. 170).

Simonson and Tversky (1992) presented participants in control group with the option to exchange the 6$ (which they were told will be given in cash to some randomly selected participants) for the elegant Cross pen. In the other experimental group, participants were told that they can also exchange the 6$ cash for another, less appealing pen. They found that this extra option resulted in 10% increase in choice share of the Cross pen.

Ariely and Wallsten (1995) found that asymmetric dominance effect can be observable in a setting in which decision maker's task is to guess the relative frequency of choosing the options in the sample of respondents, rather than making a choice themselves.

2.2 Possible explanations of the phenomenon

Wedell (1991) identifies three models with the potential to explain asymmetric dominance effect: dimensional weight model, value shift model and dominance-valuing model. Dimensional weight model asserts that introduction of a decoy option make decision makers to change weights of how important the given dimensions seem to them and in turn the dominating alternative is chosen more

[1]Note that the terms 'target', 'competitor' and 'decoy' are used only for working purposes. These were not displayed to participants during the experiment.

frequently. Value shift model counts with the notion that the act of enlarging the set by dominated decoy subjectively either increases the range of values along one of the dimensions and thus affects perception of decision makers such that the particular dimension is perceived more important (range decoy) or increases the frequency of choices which are poorer on one of the dimensions than a dominating target thus making it seem more valuable choice along that dimension (frequency decoy) or increases both range and frequency (range-frequency decoy). Dominance-valuing model explains asymmetric dominance effect by means of simplification of the decision process. For example, that includes inclination to avoid poor decisions or to reduce cognitive difficulty of the task by employing qualitative comparison of choices, rather than quantitative one (Wedell, 1991, p. 770).

There are other models that were used to explain asymmetric dominance effect. For example, Highhouse (1996) suggests applicability of the reference-dependent model by Tversky and Kahneman (1991) in which loss aversion is assumed. By decision makers, decoy option might be viewed as the reference point to which the other alternatives are then compared and viewed as either gains or losses, while perceived utility of the decision maker is more drastically affected in case of losses, than gains. Note that the incorporating of the loss aversion concept into choice model which accounts for the asymmetric dominance effect was introduced previously by Farquhar and Pratkanis (1993), but they counted with advantages and disadvantages measured between the two original options instead.

Findings of Ariely and Wallsten (1995) support the notion that the construction of preferences takes place during the choice task (p. 231).

2.3 Research beyond consumer behaviour

A number of studies were conducted to find if the asymmetric dominance effect can also occur in choices outside of consumer behaviour.

Pan *et al.* (1995) examined choices between political candidates at two elections in United States, primary in 1994 and presidential in 1992. In their two-experiment study, they used information about actual candidates. Following previous studies from consumer behaviour, attributes of candidates in 1994 primary elections were chosen such that one of the candidates appeared to be dominated by one of the others. It was demonstrated that asymmetric dominance effect was present. Furthermore, the other experiment studying the

presidential election in 1992 showed that asymmetric dominance effect persists even in framework where asymmetric dominance relation between candidates was not pre-set by the researchers, but rather directly constructed by respondents themselves using questionnaire as the introductory component of the experimental procedure.

In her study, Herne (1997) asked respondents to decide among alternative hypothetical strategies for particular policy issue, for example economic policies with unemployment and inflation rates in percentage points. Evidence was found that asymmetric dominance effect was present with shift of ten percentage points in preferences between the two initial options.

Sedikides *et al.* (1999) studied if hypothetical partner selection process can be affected by adding asymmetrically dominated alternative. They randomly assigned each hypothetical partner choice three out of five most important characteristics (psychical attractiveness, honesty, sense of humour, dependability, intelligence) described by subset of university students participating in the preceding pilot experiment. Students were told that the hypothetical partner is of same race or ethnicity, about same age and attends the same university. Numerical values of each particular attribute were defined as percentage of other students attending the same university, being the same gender or ethnicity and being equally old as the respondent, who are in that respect equal or worse. For example, person A having 60 on physical attractiveness means that 60 percent of the same-age, same-gender, same-university students are less physically attractive than person A. The addition of dominated decoy alternative to the choice set consisting of two original options was found to elicit the asymmetric dominance effect.

Bateman *et al.* (2008) studied choices among strategic options in environmental management. Concerning particular British lake environment, respondents were asked to decide which managerial strategy they would adopt from the set of options defined on two numerical attributes, increase in number of birds, and increase in the plant cover in the area. In the treatment group, set of options was enlarged by asymmetrically dominated decoy. The results show that the asymmetric dominance effect was statistically significant and accounted approximately for 19 percent preference shift toward the target option.

Highhouse (1996) studied occurrence of asymmetric dominance effect in decision making concerning selection of job candidates. University students were asked to make a decision among hypothetical job candidates, each of them defined on two numerically represented attributes related to their job

performance. In one condition of the experiment, respondents were to rate importance of given attributes of the candidates before the actual choice. His findings suggest that not only available dominated decoy alternatives affect choices of candidates, but even unavailable alternatives (phantom decoys) had similar effect on preference shifts, regardless of manipulation with feature ratings described earlier.

2.4 Phantom alternatives

In addition to what I call ordinary decoy alternative, which are those decoys available for actual choice, research shows that similar asymmetric dominance effect can be induced by alternative which is unavailable for choice, called phantom alternative. As Farquhar and Pratkanis (1993) define it, "a 'phantom alternative' is an option that looks real but for some reason is unavailable at the time a decision is made" (p. 1214). They further distinguish between phantom alternative which is known and unrecognized by the decision maker, whereas "a *known phantom* occurs when the decision maker correctly assumes from the beginning that a particular option is not available." and "the *unrecognized phantom* ... occurs when the decision maker incorrectly assumes that a decision alternative is available for certain" (Farquhar & Pratkanis, 1993, p. 1215). However, some researchers refer to phantoms as to alternatives which *dominate* the target option (e.g Pettibone & Wedell, 2000; 2007; Pratkanis & Farquhar, 1992; Farquhar & Pratkanis, 1993; Scarpi & Pizzi, 2013), as opposed to being *dominated* by the target. Also phantom alternatives used by Highhouse (1996) were phantom alternatives dominating the target option.

In my thesis I focus only on phantom decoy alternatives asymmetrically *dominated* by the target option, on which the research is limited. From now onwards, the terms 'phantom alternative', 'phantom decoy alternative', or 'phantom decoy' are used to refer only to that phantom decoy alternative which is asymmetrically dominated by the target option.

In their work, Doyle *et al.* (1999) conducted four experiments testing for asymmetric dominance effect. In the first experiment, they adopted classical experimental designs for testing asymmetric dominance effect utilizing data obtained in surveys. University students were to decide among options in choice set, which consisted of two options in the control group and three in the target group, where decoy option was added. Familiar choice items were used: tapes, batteries and orange juice. Each option was defined on two attributes, price and

quality. Two separate frameworks were used with this experiment, 'you choose' and 'most choose'. In the former, respondents were asked to choose, which of the available options they would buy. In the latter, respondents were to make a prediction of how many percent of people would choose each option, replicating the framework of Ariely and Wallsten (1995). In both scenarios, asymmetric dominance effect was found. The second experiment was the modification of the first one. Only 'you choose' framework was used and ordinary decoy options were replaced by phantom decoy alternatives with the same attributes as their ordinary counterparts.

In the third and fourth experiment, Doyle *et al.* (1999) tried to replicate the similar conditions for occurrence of asymmetric dominance effect in actual in-store experiment with cans of baked beans. Using direct data from sales of those products, similar results to previous studies building on survey type of data (e.g. Huber *et al.*, 1982; Huber & Puto, 1983; Simonson & Tversky, 1992) were attained. Furthermore, it was found that the asymmetrically dominated phantom alternative can also cause asymmetric dominance effect, if it can be meaningfully incorporated into decision-making process. This was demonstrated to hold for both laboratory and real in-store experiments. Doyle *et al.* (1999) concluded that "the effect is robust, has a wide scope, is quite sizeable, and is of practical significance"(p. 225).

In their experiments, Colman *et al.* (2007) studied presence of asymmetric dominance effect in strategic games. Using asymmetrically dominated alternative strategies, both phantom and ordinary, which were added into two-strategy strategic game. Though effect was slightly smaller in magnitude in case of the phantom decoy than with the ordinary decoy, the asymmetric dominance effect was found to be present.

As I found no previous studies which utilized phantom decoy alternatives defined on three numerical attributes, the focus of my thesis is on filling this research gap.

2.5 Boundaries of the effect

There is an ongoing debate about the extent of decisions to which the asymmetric dominance effect can be generalized to. Doubts have been cast upon notions claiming robustness and practical usefulness of the effect, recently. In their large-in-scope work, Frederick *et al.* (2014) pointed out that the vast majority of experimental designs used by researchers in the past utilized rather

abstract options with artificially constructed attributes having numerical values. For that reason, their research focused largely on stimulus with attributes specified non-numerically. In addition, they also attempted to replicate some of the experiments conducted by other researchers with no significant result, for example the experiment of Simonson and Tversky (1992) with 6$ and the Cross pen. Out of the total 38 experiments, they reported a failure to find the significant effect in majority of instances where at least some of the attributes of the presented choice items were not represented solely by numerical values, but were at least partly experienced either perceptually (e.g. pictures of hotel departments or fruit), or even directly (e.g. by touching or tasting the choice items). Overall, based on their data they concluded that the importance and validity of the asymmetric dominance effect should be revisited. Moreover, they remarked that when attributes of the options are experienced perceptually or directly, very different results could occur in contrast with instances where options are presented with numerically defined features. For example, in the experiment they marked "3a", the effect was even reversed due to perceptual stimuli, meaning that the target option was chosen *less* frequently when the decoy option was present in the choice set (Frederick *et al.*, 2014, p. 225).

Likewise, Yang & Lynn (2014) expressed scepticism about generalizability of the past findings into real world settings such as marketing practices. Based on results of their research they concluded that in cases with options having non-numerically defined attributes, the asymmetric dominance is much less likely to occur. Out of total 91 scenarios, 11 manifested the asymmetric dominance effect. Particularly, only 9 of 37 (approximately 23.7%) scenarios which utilized choice items' attributes solely defined numerically manifested asymmetric dominance effect. Moreover, in 54 scenarios where visual or verbal description of the choice items' attributes was used, only 2 exhibited asymmetric dominance effect (approximately 3.7% of these scenarios). Nevertheless, they acknowledged the fact that past research showed asymmetric dominance effect even in the scenarios with non-numerically defined features.

For example, Fasolo *et al.* (2006) demonstrated that perceptual stimuli as a component part of information about choice items in the choice set have a potential for strengthening the asymmetric dominance effect. Employing ordinary decoy options in the experiment with choice items being laptops defined on two numerical attributes and depicted either by static or animated picture of a laptop, he found that the asymmetric dominance effect was corroborated the most when the target option was depicted as animated picture and the

competitor option was depicted as static picture, irrespective of whether the decoy option was depicted static or animated.[2]

Follow-up commentaries examining the scepticism about asymmetric dominance effect emerged. Simonson (2014) supported the remark that there indeed exist many boundaries to the effect. However, he argued that the results of Frederick *et al.* (2014) do not disprove the earlier findings despite the fact their attempts to replicate past experiments yielded different results, since the way the replications were designed was in many ways not completely perfect.

Huber *et al.* (2014) maintained that the asymmetric dominance effect remains replicable in cases where the preferences among options are constructed during the decision making process. They identified five main factors that can weaken or even eliminate the asymmetric dominance effect: "strong prior trade-offs, the inability [of the decision maker] to identify the dominance relationship quickly and easily, cross-respondent value heterogeneity, and either a strong dislike of the decoy or a strong liking for the decoy" (Huber *et al.*, 2014, p. 522).

Other conditions were found to influence the occurrence of the asymmetric dominance effect, for example formulation of choice task and how people construe the decisions. Formulating the choice task such that decision makers are to reject the options which they don't prefer, rather than to choose the preferred option was found to mitigate the effect (Chang *et al.*, 2015). Construal level is characterized by Chang *et al.* (2015) as follows:

> People construe an event with a high construal level when that event is perceived to be psychologically distant, i.e., the event happens in a remote place (spatial distance), occurs further in the future (temporal distance), has low probability of occurrence, or occurs to persons who have a distant relationship with the self (social distance). (pp. 170-171)

High level of construal was previously demonstrated to strengthen the asymmetric dominance effect by Khan *et al.* (2011). On the other hand, they found no significant differences between the low construal level condition and the control condition where they made no attempts to manipulate how are the task or the options construed. According to Khan *et al.* (2011), this indicates that customers might be inclined to construe at low level by default (p. 66).

[2]The picture of laptop did not differ for target, competitor, and decoy alternatives. In other words, only two pictures were used in the whole experiment: one static and the other animated (which was the animated version of the static one).

Chapter 3

Hypotheses

On the basis of previous research I hypothesize that the asymmetric dominance effect will be observable in the designed experiment, meaning that the choice share of a target option (Brand A car) will be higher in scenarios where the decoy alternative (Brand C car) asymmetrically dominated by the target will be present in the choice set, regardless of whether it is available to be chosen in ordinary version, and unavailable to be chosen in phantom version.

In other words, individual participants should be more likely to choose target option in set-ups in which the information about asymmetrically dominated alternative (decoy) is readily accessible to them as opposed to set-ups in which no such information is at hand and the choice set consists only of target (Brand A car) and competitor (Brand B car) options. Moreover, I hypothesize that the ordinary and phantom decoy will cause the effect similar in size meaning that the magnitude and signs will be similar.

Separately, these hypotheses are stated as follows:

H1: The presence of the ordinary asymmetrically dominated decoy alternative (Brand C car) in the choice set increases the share of participants who choose the target option (Brand A car).

H2: The presence of the phantom asymmetrically dominated decoy alternative (Brand C car) in the choice set, which is unavailable for actual choice, increases the share of participants who choose the target option (Brand A car).

H3: The effects presented in hypotheses H1 and H2 are approximately of the same size.

H4: The addition of the third attribute 'likes' to the set of choice items' attributes affects the share of participants who choose the target option (Brand A car).

Table 3.1: **Hypotheses H1 to H4**

		H0			**HA**	
	C2		OD	C2	***H1***	OD
share of target option (Brand A car)	acar	=	acar	acar	<	acar
	C2		PD	C2	***H2***	PD
share of target option (Brand A car)	acar	=	acar	acar	<	acar
	OD		PD	OD	***H3***	PD
share of target option (Brand A car)	acar	=	acar	acar	≠	acar
	C1		C2	C1	***H4***	C2
share of target option (Brand A car)	acar	=	acar	acar	≠	acar

C1 = control group with two-attribute alternatives
C2 = control group with three-attribute alternatives
OD = treatment group with three-attribute alternatives involving ordinary decoy
PD = treatment group with three-attribute alternatives involving phantom decoy

Chapter 4

Methodology

I design the experiment to test presence of the asymmetric dominance effect in hypothetical consumer choice scenario. The main purpose of this experiment was to explore whether asymmetric dominance effect can be induced by the presence of an unavailable decoy alternative (phantom) in a scenario with three-attribute choice items similarly as in the previous research where only two-attribute choice items were used instead (e.g. Doyle *et al.*, 1999). The secondary aim of this experiment was to compare the scenario with two-attribute choice items and scenario with three-attribute choice items to explore if there are observable differences between the two scenarios, both involving no decoys.

Based on hypotheses and previous research I designed four separate tasks in the experiment:

1. first control treatment task: a choice from two choice items defined on two attributes
2. second control treatment task: a choice from two choice items defined on three attributes
3. decoy treatment task involving ordinary decoy: a choice from three choice items defined on three attributes
4. decoy treatment task involving phantom decoy: a choice from two choice items with the information about the third item at hand, all defined on three attributes

Each task in the form of an online questionnaire was fulfilled by one of the four groups of participants in the experiment. To avoid the carryover effect where

subjects could again make the same choices they once did regardless of presence of the decoy (Huber *et al.*, 1982), I used between-subjects experimental design.

4.1 Subject pool

In total, 153 participants took part in the experiment. Individuals who participated in the study were approached either through e-mail, messages on social media or posts on social media on student Facebook groups with a request to fill the questionnaire form which will take about one minute, followed by the direct URL link to the questionnaire. Also, they were kindly asked to share the questionnaire link with their friends, family, or others.

A small portion of participants were recruited through Facebook groups of what I call 'participant-for-participant' type. These groups on Facebook were created for the purpose of sharing the questionnaires from students all over the world, allowing them to find there participants for their own studies in exchange for their participation in the studies of others in the group. In other words, member of these groups can collect some participants for their studies by taking part in the studies of others. This can be considered an incentive for the particular student from the group to participate in the research.[1]

Nevertheless, it can be very well expected that the vast majority (all apart from those collected through 'participant-for-participant' Facebook groups) of participants who took part in my experiment were either part of my own social group, or part of my friends' social groups. Therefore, I suppose that most of the subjects were university students.

To obtain precise information about the participants' age or other demographics would require additional questions in the questionnaire. As was found by Cranor *et al.* (2000), not every participant is comfortable with providing such information. This could in turn increase respondents' drop-out rate; because of that, I decided to include no questions of this type. It should be mentioned that because the questionnaire was issued only in English, it would not made any sense to send the questionnaire URL link to non-English speakers. Therefore, the population of the experiment can be anticipated to have at least high-school knowledge of English.

[1] I filled 15 students' questionnaires for this purpose in total; note however, that some of the member of the groups may have filled my questionnaire form purely because it seemed interesting to them, without even asking for returning the favour by filling their own questionnaires.

No incentives were offered to subjects for taking part in the study due to no financial support. It is known that the absence of financial incentives can result in higher drop-out rates (Frick *et al.*, 1999). Naturally, participants were free to withdraw from the experiment at any time without any penalty by closing the questionnaire page.

4.2 Choice sets and items attributes

As choice items for the experiment, I used cars as they were widely used in number of other studies (e.g. Huber *et al.*, 1982; Simonson, 1989; Wedell, 1991). Attributes mostly used for cars in previous studies were gas mileage in miles per gallon and ride quality rating (Frederick *et al.*, 2014, pp. 495-497). I used attributes gasoline consumption in litres per hundred kilometres, which substituted gas mileage, because the latter was likely to be unfamiliar to majority of the subjects, who were expected to be citizens of Czech republic; and ride quality rating with values on 100 points scale, where 100 represents flawless quality ride and 0 the poorest, respectively. Very similar scale for ride quality rating (1 to 100) was used in previous research (Wedell & Pettibone, 1996; Pettibone & Wedell, 2000).

In three-attribute condition, third attribute named *likes* was used in addition to gasoline consumption and quality ride rating. To make the attribute *likes* sizeable, I define it as the proportion of number of likes under the product advertisement announcement divided by the number of likes which automobile manufacturer of the product has on the Facebook page, all multiplied by 100. As the original proportion is always positive number, the attribute *likes* could take only positive values. In addition, subjects received short information on meaning of attributes except the gasoline consumption, which was assumed to be clear. In case of the ride quality rating, participants were told that its range is from 0 to 100, and in case of *likes* attribute, clear definition along with the example was presented to subjects.

The ride quality rating attribute and the *likes* attribute were designed to simulate an expert evaluation of the choice items and a consumer stance on choice items expressed on social media (Facebook), respectively. In real consumer scenario, the sharing of opinions of this kind is called electronic word of mouth (eWOM) if the sharing takes place on the internet (Hennig-Thurau *et al.*, 2004).

4.2.1 Choice sets by experimental task

Original choice sets for control treatment tasks consisted of two cars, Brand A car (target) with 5.7 on gasoline consumption, 74 on ride quality rating and 61 on *likes* and Brand B car (competitor) with 4.2 on gasoline consumption, 70 on ride quality rating and 48 on *likes*. In first control treatment task, only gasoline consumption and ride quality rating dimensions were used, whereas in the second control treatment task the list of attributes included also the *likes* attribute. The extended choice set for the decoy treatment task involving ordinary decoy included third option (decoy), Brand C car with 6.2 on gasoline consumption, 72 on ride quality rating and 57 on *likes*. The exact same choice items were used for the decoy treatment task involving phantom decoy, while the only difference was that this decoy was unavailable for choice. In practice, that was marked by a short statement "**Assume the brand C car is unavailable.**" (Doyle *et al.*, 1999, p. 11), which was written in bold below the information about the choice items, but prior to description of items' attributes. Note that this means the *known* phantom alternative was used, because the information about unavailability of the decoy was known prior to the choice.

The attribute values of choice items were set by selecting the attribute values of the Brand A car arbitrarily and then applying the same ratios between target and the two other options employed by Pan *et al.* (1995) to derive attribute values of the Brand B car and the Brand C cars.

Numerical values of all choice items and description of their attributes used in the experiment are presented in Figure 4.1. Following Fasolo *et al.* (2006), the choice items were always displayed in the same, alphabetical order.

Figure 4.1: **Choice items and their attributes**

	Brand A car	Brand B car	Brand C car
gasoline consumption	5.7	4.2	6.2
ride quality rating	74	70	72
likes	61	48	57

Descriptions of attributes:

- ***Gasoline consumption*** is in litres per hundred kilometres units.
- ***Ride quality rating*** is a number on 100 points scale provided by an expert from the automobile industry, where 100 represents flawless ride quality and 0 the poorest one.
- Attribute ***likes*** is defined as follows:

$$likes_X = \frac{\text{number of likes under the product X advertisement announcement}}{\text{number of likes which automobile manufacturer of the product X has on the Facebook page}} \times 100$$

  - Example: Let's say that manufacturer Mercedes has one million Facebook subscribers (i.e. they like the Mercedes official Facebook page). Mercedes decides to promote the product Z through its Facebook page by posting the advertisement message on its wall. Let's say that 200 000 people like this post. Then attribute *likes* of the product Z will be equal to:

$$likes_Z = \frac{200\,000}{1\,000\,000} \times 100 = 20$$

4.3 Task procedure

The task procedure varied for individual participants, while the choice task as the central element of this procedure remained the same for all participants. There were two distinct versions of the online questionnaire, one created in the Survey Face[2] environment and the other in the Google Forms environment. Regardless of the version, the first page of particular online questionnaire ap-

[2]The surveyface.com is a survey website where anybody can design their own surveys for free. In all the online survey environments that I scrutinized in order to find the most suitable one for creating the online questionnaire, only Survey Face had sufficiently sophisticated features.

peared before participants after they clicked on the corresponding direct URL link they received.

To minimize the possibility that particular subject of the experiment would participate multiple times, I set a constraint that it could be sent only one response from: particular IP address in the case of Survey Face version, and particular Google account in the case of Google Forms version. Note that it would be possible to avoid this precautions by accesing the direct URL link from another computer or another account, respectively. However, I argue this was unlikely to happen because one can reasonably assume that vast majority of people have no motivation for doing so. These precautions, therefore served mainly to eliminate the accidental sending of multiple responses by one participant. For example, technical issues with an electronic device used by a particular participant, or poor quality of internet connection at the time the participant was filling the questionnaire might have caused the participant's perception that the response to questionnaire was not sent. If it was already sent, the survey website prohibited the participant from sending more responses.

The Survey Face version consisted of three pages in this order: Randomization page, Choice task page, and Final page.[3] After participants completed what was asked of them on the particular page, they clicked on the 'Save & Continue ≫' button on the bottom of the page, by which they proceeded to the next page.

The Google Forms version consisted only of the Choice task page of decoy treatment involving ordinary decoy task and the 'Submit' button on the page's bottom.

The complete instructions on Randomization page and Choice task page are depicted in Appendix B.

4.3.1 Randomization page

On this page, the purpose of which is explained in subsequent section Randomization procedure, participants read the instruction 'To begin with the questionnaire, please choose one of following options to begin:' on the top of the page followed by four bullet points with the same heading 'Begin!'.

[3]Note that these page titles were chosen just for the working purposes and were not disclosed on the actual pages of the questionnaire.

4.3.2 Choice task page

On this page participants read the instruction to choose among alternatives the one they would prefer to buy with a question 'Given that YOU had to buy one brand based on this information alone, which one would it be?', which was used by Doyle *et al.* (1999, p. 231) in this exact form, including capital letters. Below the question, a table with characteristics of the choice set was placed, followed by description of attributes relevant to choice items presented in the table. After participants decided on the one option they preferred, they selected the corresponding bullet point marked 'Brand A car', 'Brand B car', or 'Brand C car' (if it was available for choice) and proceeded further. After proceeding further, their choice was already recorded in the survey tool system.

4.3.3 Final page

This page of the questionnaire comprised only of the 'Done' button and was yet of no practical significance. However, its inclusion was needed for the questionnaire to work properly.

4.4 Randomization procedure

This section applies solely to the Survey Face version of online questionnaire. By employing the procedure described here, participants were to be randomly assigned to one of four groups, each one corresponding to respective choice task: control group with two-attribute alternatives (C1), control group with three-attribute alternatives (C2), treatment group with three-attribute alternatives involving ordinary decoy (OD), or treatment group with three-attribute alternatives involving phantom decoy (PD).

It should be stressed that the random assigning of participants to respective groups was important in order to diminish possibility of the subjects' individual characteristics being correlated with their classification into the particular group. For example, it could be that all of the subjects in group C2 would be students of Czech University of Life Sciences in Prague and all of the subjects in group OD would be students of Institute of Economic Studies at Charles University in Prague. If so, there would be a correlation present between the characteristics of a particular student and the group which the student belongs to, and consequently the choice that is being made in the choice task.

Such selection of individual participants in which a proper randomization is not achieved is called sample selection bias (Berk, 1983).

Avoiding the sample selection bias was not easy task to carry out in practice. Particularly, I did not find any possibility for redirecting the subject on the randomly selected version of the task merely by clicking on the direct URL link. To deal with this problem, I included a Randomization page on the beginning of the online questionnaire, the purpose of which was to randomly assign the subjects into one of the four experimental groups. After one of the bullet points denominated 'Begin!' were selected and subjects proceeded further, they were immediately redirected to the page containing one of the four experimental tasks.

Additionally, the order in which the 'Begin' bullet points were to be lined up was likely to be relevant factor for the participants' choice of particular button. Serial position effects manifest in the subjects' tendency to better remember an item in the list, to like it more or believe it is desirable, and to choose it more frequently if the item is placed either in the first position (primacy effect) or on the last position in the list presented to them (recency effect) (Murphy *et al.*, 2006, pp. 524-525). Because of these phenomena, the position of 'Begin!' bullet points were neither to be chosen arbitrarily, nor randomly beforehand. Instead, I decided to order the buttons randomly on each reload of the page by checking the corresponding option in the survey design settings. The probability for any given button appearing on a specific position in the list was therefore the same after every reload of the page and equal to $\frac{1}{4}$.

The whole purpose for creating the first page in this fashion was to come as closely as possible to natural randomization of participants into the respective groups that could be done in laboratory conditions.

Chapter 5

Data and results

5.1 Data collection

Out of total 153 participants who took part in the experiment during a time period of two months, 132 were contacted in the first round of the experiment to fill the SurveyFace version of the online questionnaire and additional 21 were asked to fill the Google Forms version of the online questionnaire in the second round. Here I describe the development of data collection processes in detail.

5.1.1 First round

Out of total 132 participants, there remained 34 participants in the control group with two-attribute alternatives (C1), 39 in the control group with three-attribute alternatives (C2), 17 in the treatment group with three-attribute alternatives involving ordinary decoy (OD) and 42 in the treatment group with three-attribute alternatives involving phantom decoy (PD) at the end of data collection. The inequality of the group sizes stems directly from the nature of randomization procedure described earlier. Its outcome is described in detail in subsequent section.

Due to these large differences among the four groups and the lack of time to wait until all the groups have the sufficient number of participants, a need emerged to complement the treatment group with three-attribute alternatives involving ordinary decoy with more participants. Moreover, even if there was enough time to collect more participants, there was no guaranteed direct correlation between the number of extra participants collected and the number which was to be taken by randomization procedure to the group which needed more subjects. This combined resulted in the second round of data collection.

5.1.2 Second round

In the second round, additional 21 subjects were asked by messages on social media or posts to student groups on Facebook[1] to fill the version of decoy treatment involving ordinary decoy task directly. The reason of choosing the Google Forms instead of Survey Face was that the randomization procedure was not involved and therefore no special features of the survey-making tool were needed. The task was identical to the task presented to the first round of participants on the second page of Survey Face version questionnaire and also the appearance of the page did not differ in any important way to the former.

The end goal of this data collection was 21 extra participants. This number was chosen such that with these extra subjects, the treatment group with three-attribute alternatives involving ordinary decoy contained the same number of participants as was the average of the other three groups[2], 38. It is important to reiterate that these participants were not subject to the randomization procedure described earlier altogether.

Note that this time, none of the participants were approached through the Facebook groups of the type 'participant-for-participant' (described in Subject pool section).

5.2 Outcomes of randomization procedure in the first round

Out of 202 respondents who accessed the questionnaire URL link in the first round, 70 dropped out before finishing the whole questionnaire. That is, approximately 35% of those who proceeded to the second page (Choice task page), where the main choice task of the experiment was presented, withdrew from the survey. With respect to experimental groups it was 17 withdrawals out of 51 entries within the control group with two-attribute alternatives (33% drop-out rate), 20 withdrawals out of 59 entries within the control group with three-attribute alternatives (34% drop-out rate), 17 withdrawals out of 34 entries within the treatment group with three-attribute alternatives involving ordinary decoy (50% drop-out rate) and 16 withdrawals out of 58 entries within

[1] Student groups of Institute of Economic studies of Charles University in Prague were utilized for this purpose.

[2] rounded down to integers; the precise calculation: $\frac{34+39+42}{3} \approx 38.33$

the treatment group with three-attribute alternatives involving phantom decoy (28% drop-out rate).[3]

The probability of any particular participant proceeding to a particular experimental choice task version on the second page was $\frac{1}{4}$, as follows from the fact that all the 'Begin' bullet points on the first page were put in random order on every reload of the page and thus eliminating the possibility of any particular bullet point having a prominent position with higher probability to be chosen than others. However, in reality some of the tasks were accessed more often. To be specific, 51 of the total 202 total initial respondents received first control treatment task (25%), 59 received second control treatment task (29%), 34 received decoy treatment involving ordinary decoy task (17%), and 58 received decoy treatment involving phantom decoy task (29%).[3]

This unfolds the reasons why the treatment group with three-attribute alternatives involving ordinary decoy exhibited the lowest number of participants. One is that approximately only 17% of initial respondents were taken to the decoy treatment task involving ordinary decoy and the second that 50% of the participants which were to perform the task dropped out. On one hand, it can be argued that much higher drop-out rate in this group compared to other groups might be attributed to expected unwillingness of participants to perform tasks of higher complexity or difficulty (Sax *et al.*, 2003). The information presented on the page might have evoked a perception of the choice task being too complicated, which resulted in the participants' decision to withdraw from the experiment. On the other hand, the complexity or difficulty of the decoy treatment task involving phantom decoy (which shows much lower 28% drop-out rate) perceived by participants should be very similar to that of the decoy treatment task involving ordinary decoy, considering that the only difference in the task was the one sentence which informed the subject that one of the options was not available for choice.

5.3 Data analysis

Data was directly downloaded from the respective survey websites in a form of ordered responses to all the steps involved in the task procedure. The data were transformed to vectors of dependent variable and group variable such

[3] The percentages are approximate figures.

that it could be readily used for comparison between the experimental groups of interest.

The dependent variable was *acar*, which was a dummy coded 1 if the target option (Brand A car) was chosen by the participant and 0 if the competitor option (Brand B car) was chosen instead. From that follows that mean of the *acar* variable was equivalent to share of participants who chose the target option.

There were 2 observations in which participants chose the decoy option (Brand C car) in the pooled ordinary decoy treatment. In line with the previous research practice (Herne, 1997) I excluded these observations from the sample due to the need to obtain the vector of dependent dummy *acar* variable for later use in statistical analysis. These 2 participants account only for 5.3%[4] of subjects in this group, which indicates that the decoy was generally recognized by the majority of participants. Regardless, the mere fact that the decoy option was chosen by some participants is of some interest. As have been argued by Herne (1997, p. 587), "dominated decoys should not be chosen (or should be chosen only by mistake)". He further noted that complexity of the decision making problem can attribute to participants' perception that the decoy is not actually asymmetrically dominated. However, it could happen that those participants did not actually care enough to process the instructions entirely (Sax *et al.*, 2003).

As Doyle *et al.* (1999), I treated phantom alternatives in every regard as their ordinary counterparts, meaning that their presence among the alternatives was expected to yield similar asymmetric dominance effect even though they were not actual options.

5.3.1 Two-sample t-test analyses between the experimental groups

To test hypotheses H1 to H4, four separate independent t-tests were run in STATA Statistical Software (StataCorp, 2011). It was done by comparing the sample means of dependent variable *acar* (which represents the relative proportion of participants who chose the target option, Brand A car) between the two particular experimental groups, yielding four pairs of groups:

[4] precise calculation: $\frac{2}{38} \approx 0.053$

- control group with two-attribute alternatives & control group with three-attribute alternatives
- control group with three-attribute alternatives & treatment group with three-attribute alternatives involving ordinary decoy
- control group with three-attribute alternatives & treatment group with three-attribute alternatives involving phantom decoy
- treatment group with three-attribute alternatives involving ordinary decoy & treatment group with three-attribute alternatives involving phantom decoy

The assumption of equal variances in each pair of respective groups was tested using the variance ratio test.

5.3.2 Results

The results of all t-tests are summarized in Table 5.1. Variance ratio tests did not bring evidence for rejecting the null hypothesis of equal variances between the respective experimental groups in any pair of groups. Detailed results of t-tests and variance ratio tests are enclosed in Appendix A.

Control group with three-attribute alternatives & treatment group with three-attribute alternatives involving ordinary decoy

According to hypothesis H1, the comparison of these two groups was expected to yield the asymmetric dominance effect. However, the one-tailed t-test brought insufficient evidence for rejecting the null hypothesis of no sample mean difference (p=0.5). Additionally, the means of these two groups were found both equal to approximately 0.3333. The hypothesis H1 was therefore not supported.

Control group with three-attribute alternatives & treatment group with three-attribute alternatives involving phantom decoy

Under hypothesis H2, also the presence of phantom decoy was expected to trigger asymmetric dominance effect. The one-tailed t-test against the null hypothesis of no sample mean difference brought fairly strong evidence for rejecting the null ($p = 0.0429$). The size of the mean difference due to the

effect was 19.05%. In other words, the presence of phantom decoy increased share of participants choosing Brand A car by 19.05%.

Treatment group with three-attribute alternatives involving ordinary decoy & treatment group with three-attribute alternatives involving phantom decoy

Because the hypothesis H1 was not supported, i.e. ordinary decoy was not found to produce asymmetric dominance effect, the H3 hypothesis could not be validly tested. This is because the H3 hypothesis naturally assumed that the asymmetric dominance effects caused by both ordinary and phantom decoy alternative were observed.

Control group with two-attribute alternatives & control group with three-attribute alternatives

Statistical comparison of these two sample means was done to examine how extra 'likes' dimension affected the *acar* mean, the null hypothesis being that the sample means were equal. The two-tailed t-test failed to bring sufficient evidence for rejecting the null hypothesis (p=0.5303), meaning that there was no observable effect of extra 'likes' attribute on the participants' choices.

Table 5.1: **Summary of two-sample t-test analyses results**

	Sample means			p-value	t-statistic
	C2		OD		
share of target option (Brand A car)	0.3333333	=	0.3333333	0.5	0.0000
	C2		PD		
share of target option (Brand A car)	0.3333333	<	0.5238095	0.0429	-1.7401
	C1		C2		
share of target option (Brand A car)	0.2647059	=	0.3333333	0.5305	-0.6304

C1 = control group with two-attribute alternatives
C2 = control group with three-attribute alternatives
OD = treatment group with three-attribute alternatives involving ordinary decoy
PD = treatment group with three-attribute alternatives involving phantom decoy

Chapter 6

Discussion

The results showed that phantom decoy alternatives can induce the asymmetric dominance effect when used with three-attribute choice items similarly to two-attribute choice items, on which there exists a prior research. The magnitude of the effect was within expectation. It indicates that in aggregate, the participants did not blindly choose the particular option at random.

However, the results did not bring sufficient evidence for preference shifts due to presence of ordinary decoy alternatives. This is surprising because only very small portion of participants chose the decoy option in the treatment group of participants with three-attribute alternatives involving ordinary decoy, suggesting that the decoy was indeed recognized by majority of the participants. Overall, I believe that these results were caused by the necessary corrective actions regarding the treatment group of participants with three-attribute alternatives involving ordinary decoy that might have resulted in biased experimental data, namely launching the second round of data collection which was needed to replenish the experimental group with the lowest number of participants. The bias could have been caused by several factors.

Firstly, it might happen that the majority of participants in the second round differed from those in the first round in terms of background characteristics (e.g. age, education, residence), resulting in sample selection bias. This is possible, because in the second round no classification into experimental groups took place. To be more specific, it is highly possible that most of the subjects participating in the second round were potential, present, or former students of economics, as the student Facebook groups of Institute of Economic Studies in Prague were used to share the online questionnaire URL link. If that is so, it might happen that some of these students were familiar with the asym-

metric dominance effect phenomenon and they therefore might have avoided choosing the target option to demonstrate that they were not manipulated by the presence of the decoy alternative. Even if these participants had no notion of asymmetric dominance effect, it is plausible to suggest that their practical experience with comparing the choice items and arrive at the best feasible solution might be broader than of those who have no interest or education in economics.

Secondly, the reason for these results could be that the participants in the second round might have chosen the particular option due to differing weighting of choice items' attributes. In other words, they might have decided on the basis of partial information, to which they paid attention. Maybe it was because it seemed to them unusual to choose a car solely on a basis of information about three numerically defined attributes, from which some could seem to them unnecessary to count with. For example, it could happen that some of the participants cared only about the gasoline consumption attribute and therefore chose the car with the lowest value on this dimension (which was the competitor option), regardless of the information about other attributes. This example illustrates the observation that even when considering buying a car, people in general might view the consumption to be among the most important attributes of the car.

The comparison of the control groups did not bring evidence for statistical differences between the two in terms of shares of participants choosing the target option. This could be caused partially by participants' differing weighting of items' attributes, as described earlier in the case of a comparison of the control group with three-attribute alternatives and the treatment group with three-attribute alternatives involving ordinary decoy.

Because the asymmetric dominance effect caused by ordinary decoy alternative was not observed, it was unfeasible to statistically compare the asymmetric dominance effects induced by ordinary decoy alternative and phantom decoy alternative.

Chapter 7

Conclusion

I studied asymmetric dominance effect which manifests in consumer preference shifts from a competitor option towards a target option, which are induced by the addition of a decoy alternative into the original two-item choice set (formed by target and competitor option), while the decoy alternative is asymmetrically dominated by the target option. Although the asymmetric dominance effect was studied in variety of experimental settings by other researchers, there is no prior research studying the asymmetric dominance effect induced by unavailable decoy alternative (a phantom) when employing choice items having three numerically represented attributes.

To study this phenomenon, I designed an experiment using online survey platforms. The task in the experiment was to choose among the alternatives based on the information available. As choice items, I used cars as widely used in previous research, defined on either two or three numerically represented attributes. One of the attributes was gasoline consumption and other two were constructed such that they evoke electronic word of mouth (eWOM) whereby people express their attitude to a particular product on the internet. The ride quality rating attribute should evoke the expert perspective on the product whereas the 'likes' attribute should evoke the layman consumer opinion on the product.

The volunteer experimental subjects were assigned to four different experimental groups for subsequent between-subject comparison. I designed two control groups such that in the first participants chose between two choice items defined on two attributes (the 'likes' attribute was absent), while in the second participants chose between two choice items defined on three attributes (including the 'likes' attribute). In other two experimental groups participants

chose between three choice items defined on three attributes, the third choice item being a decoy alternative. The decoy alternative was available for choice (ordinary) in one of these groups and unavailable for choice (phantom) in the second. Such design enabled me to compare the choices made by participants in each treatment group separately and the choices made by participants in the control group and infer if the asymmetric dominance effect was observed. Secondly, control groups were compared to ascertain differences in preference structures between the two groups.

I found that the asymmetric dominance effect caused by a presence of unavailable decoy alternative (phantom) in the choice set resulted in 19.05% increase in the choice share of the target option. This showed that similarly to studies employing choice items defined on two attributes with numerical representation, the asymmetric dominance effect induced by phantom alternative can be observed even when utilizing choice items defined on three numerically represented attributes. Also the design of the two choice items' attributes such that they evoke electronic word of mouth on a particular product suggests that consumers indeed pay attention to such information.

On the other hand, I was unable to observe the asymmetric dominance effect when the decoy alternative was available for choice, i.e. when employing the ordinary decoy. This could happen due to technical and time constraints regarding the data collection in the respective experimental group. The sizes of asymmetric dominance effects induced by ordinary and phantom decoy alternatives therefore could not be validly compared.

The comparison of the control group with two-attribute alternatives and control group with three-attribute alternatives revealed no statistical differences in terms of share of participants choosing the target option.

There are limitations to which extent can these results be generalized to. As remarked by Smith and Leigh (1997), "there is no guarantee that the data collected using Internet subjects are valid or generalizable to the general population" (p. 499). These results do not and cannot reflect how the participants would choose among the options if faced with the same choice problem if buying a real car. This is because the model problem of choosing between car brands solely on basis of the three numerical attributes is too simplified from the practical viewpoint.

The future research is needed to examine if the same experiment yields similar results if done in laboratory conditions. Also, it is certainly of interest how choice items' attributes constructed such that they numerically represent

consumer opinion or expert stances on products are perceived in terms of importance for the final decision in a model choice scenario similar to one that I employed. In other words, the question is how these attributes are weighted with respect to other attributes.

I support the notion of Huber *et al.* (2014) that while the asymmetric dominance effect in the form observed in laboratory conditions seldom occurs in today's marketplace, the expansion of digital marketing may change this current state. With the rapid development of social media and online shopping sites enabling customers to express their opinion on products people often choose between options described by, at least partially, numerically expressed attributes, it may happen that addition the decoy alternative as a new product can in the future be a viable marketing strategy. However, the marketer attempting to utilize this strategy should be well aware of many conditions which can result in diminishing of the asymmetric dominance effect.

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Appendix A

Results of statistical analyses

Results of two sample t-tests

Figure A.1: **Result of two-sample t-test comparing sample means of C2 and OD groups**

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
C2	39	.3333333	.0764719	.4775669	.178524	.4881426
OD	36	.3333333	.0796819	.4780914	.1715705	.4950962
combined	75	.3333333	.0547997	.474579	.2241426	.442524
diff		0	.1104358		-.2200983	.2200983

diff = mean(C2) - mean(OD) t = 0.0000
Ho: diff = 0 degrees of freedom = 73

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.5000 Pr(|T| > |t|) = 1.0000 Pr(T > t) = 0.5000

C2 = control group with three-attribute alternatives
OD = treatment group with three-attribute alternatives involving ordinary decoy

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Statistical software used:
StataCorp (2011): "Stata statistical software: Release 12." College Station, TX: StataCorp LP

Figure A.2: **Result of two-sample t-test comparing sample means of C2 and PD groups**

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
C2	39	.3333333	.0764719	.4775669	.178524	.4881426
PD	42	.5238095	.0779983	.5054867	.3662888	.6813303
combined	81	.4320988	.0553838	.4984544	.3218814	.5423161
diff		-.1904762	.109465		-.4083609	.0274085

diff = mean(C2) - mean(PD) t = -1.7401
Ho: diff = 0 degrees of freedom = 79

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.0429 Pr(|T| > |t|) = 0.0857 Pr(T > t) = 0.9571

C2 = control group with three-attribute alternatives
PD = treatment group with three-attribute alternatives involving phantom decoy

Statistical software used:
StataCorp (2011): "Stata statistical software: Release 12." College Station, TX: StataCorp LP

Figure A.3: **Result of two-sample t-test comparing sample means of C1 and C2 groups**

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
C1	34	.2647059	.076799	.4478111	.1084572	.4209546
C2	39	.3333333	.0764719	.4775669	.178524	.4881426
combined	73	.3013699	.0540763	.4620285	.1935706	.4091691
diff		-.0686275	.1088638		-.2856957	.1484408

diff = mean(C1) - mean(C2) t = -0.6304
Ho: diff = 0 degrees of freedom = 71

Ha: diff < 0 Ha: diff != 0 Ha: diff > 0
Pr(T < t) = 0.2652 Pr(|T| > |t|) = 0.5305 Pr(T > t) = 0.7348

C1 = control group with two-attribute alternatives
C2 = control group with three-attribute alternatives

Statistical software used:
StataCorp (2011): "Stata statistical software: Release 12." College Station, TX: StataCorp LP

Results of variance ratio tests

Figure A.4: **Result of variance ratio test regarding C2 and OD groups**

Variance ratio test

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
C2	39	.3333333	.0764719	.4775669	.178524	.4881426
OD	36	.3333333	.0796819	.4780914	.1715705	.4950962
combined	75	.3333333	.0547997	.474579	.2241426	.442524

ratio = sd(C2) / sd(OD) f = 0.9978
Ho: ratio = 1 degrees of freedom = 38, 35

Ha: ratio < 1 Ha: ratio != 1 Ha: ratio > 1
Pr(F < f) = 0.4956 2*Pr(F < f) = 0.9911 Pr(F > f) = 0.5044

C2 = control group with three-attribute alternatives
OD = treatment group with three-attribute alternatives involving ordinary decoy

Statistical software used:
StataCorp (2011): "Stata statistical software: Release 12." College Station, TX: StataCorp LP

Figure A.5: **Result of variance ratio test regarding C2 and PD groups**

Variance ratio test

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
C2	39	.3333333	.0764719	.4775669	.178524	.4881426
PD	42	.5238095	.0779983	.5054867	.3662888	.6813303
combined	81	.4320988	.0553838	.4984544	.3218814	.5423161

ratio = sd(C2) / sd(PD) f = 0.8926
Ho: ratio = 1 degrees of freedom = 38, 41

Ha: ratio < 1 Ha: ratio != 1 Ha: ratio > 1
Pr(F < f) = 0.3631 2*Pr(F < f) = 0.7262 Pr(F > f) = 0.6369

C2 = control group with three-attribute alternatives
PD = treatment group with three-attribute alternatives involving phantom decoy

Statistical software used:
StataCorp (2011): "Stata statistical software: Release 12." College Station, TX: StataCorp LP

Figure A.6: **Result of variance ratio test regarding C1 and C2 groups**

Variance ratio test

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
C1	34	.2647059	.076799	.4478111	.1084572	.4209546
C2	39	.3333333	.0764719	.4775669	.178524	.4881426
combined	73	.3013699	.0540763	.4620285	.1935706	.4091691

ratio = sd(C1) / sd(C2) f = 0.8793
Ho: ratio = 1 degrees of freedom = 33, 38

Ha: ratio < 1 Ha: ratio != 1 Ha: ratio > 1
Pr(F < f) = 0.3553 2*Pr(F < f) = 0.7106 Pr(F > f) = 0.6447

C1 = control group with two-attribute alternatives
C2 = control group with three-attribute alternatives

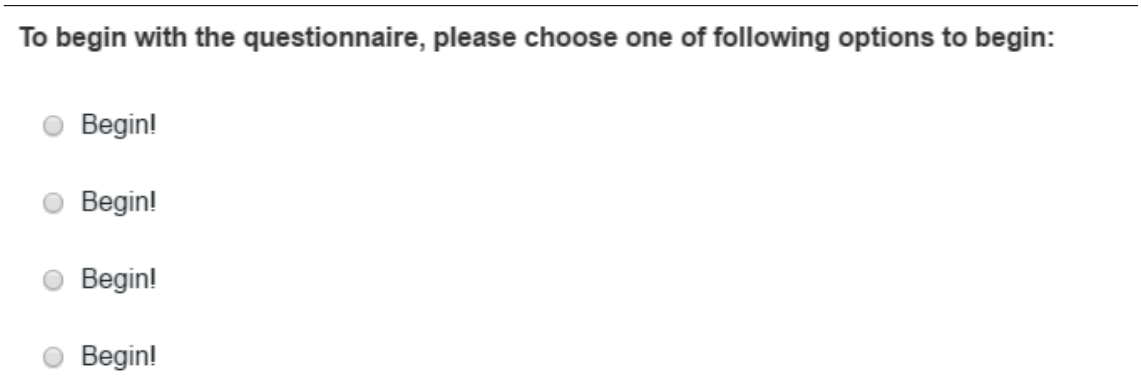
Statistical software used:
StataCorp (2011): "Stata statistical software: Release 12." College Station, TX: StataCorp LP

Appendix B

Experimental stimulus and instructions

Randomization page

Figure B.1: **Instruction on Randomization page**



This is a representation of the page content. In reality, the page had different colour (similar to grey) set by the survey website. The button for proceeding to next page is not depicted here.

Choice task page

Figure B.2: **First control treatment task: a choice from two choice items defined on two attributes**

Given that YOU had to buy one brand based on this information alone, which one would it be?

	Brand A car	Brand B car
gasoline consumption	5.7	4.2
ride quality rating	74	70

Descriptions of attributes:

- ***Gasoline consumption*** is in litres per hundred kilometres units.
- ***Ride quality rating*** is a number on 100 points scale provided by an expert from the automobile industry, where 100 represents flawless ride quality and 0 the poorest one.

This is the task which was displayed (including the text formating and the table) to participants in the control group with two-attribute alternatives (C1). The bullet points denoted with corresponding choice items titles (Brand A car, Brand B car) and the button for proceeding further which were located below in that order are not depicted here.

Figure B.3: **Second control treatment task: a choice from two choice items defined on three attributes**

Given that YOU had to buy one brand based on this information alone, which one would it be?

	Brand A car	Brand B car
gasoline consumption	5.7	4.2
ride quality rating	74	70
likes	61	48

Descriptions of attributes:

- ***Gasoline consumption*** is in litres per hundred kilometres units.
- ***Ride quality rating*** is a number on 100 points scale provided by an expert from the automobile industry, where 100 represents flawless ride quality and 0 the poorest one.
- Attribute ***likes*** is defined as follows:

$$likes_X = \frac{\text{number of likes under the product X advertisement announcement}}{\text{number of likes which automobile manufacturer of the product X has on the Facebook page}} \times 100$$

  - Example: Let's say that manufacturer Mercedes has one million Facebook subscribers (i.e. they like the Mercedes official Facebook page). Mercedes decides to promote the product Z through its Facebook page by posting the advertisement message on its wall. Let's say that 200 000 people like this post. Then attribute *likes* of the product Z will be equal to:

$$likes_Z = \frac{200\,000}{1\,000\,000} \times 100 = 20$$

This is the task which was displayed (including the text formating and the table) to participants in the control group with three-attribute alternatives (C2). The bullet points denoted with corresponding choice items titles (Brand A car, Brand B car) and the button for proceeding further which were located below in that order are not depicted here.

Figure B.4: **Decoy treatment task involving ordinary decoy: a choice from three choice items defined on three attributes**

Given that YOU had to buy one brand based on this information alone, which one would it be?

	Brand A car	Brand B car	Brand C car
gasoline consumption	5.7	4.2	6.2
ride quality rating	74	70	72
likes	61	48	57

Descriptions of attributes:

- ***Gasoline consumption*** is in litres per hundred kilometres units.
- ***Ride quality rating*** is a number on 100 points scale provided by an expert from the automobile industry, where 100 represents flawless ride quality and 0 the poorest one.
- Attribute ***likes*** is defined as follows:

$$likes_X = \frac{\text{number of likes under the product X advertisement announcement}}{\text{number of likes which automobile manufacturer of the product X has on the Facebook page}} \times 100$$

  - Example: Let's say that manufacturer Mercedes has one million Facebook subscribers (i.e. they like the Mercedes official Facebook page). Mercedes decides to promote the product Z through its Facebook page by posting the advertisement message on its wall. Let's say that 200 000 people like this post. Then attribute *likes* of the product Z will be equal to:

$$likes_Z = \frac{200\,000}{1\,000\,000} \times 100 = 20$$

This is the task which was displayed (including the text formating and the table) to participants in the treatment group with three-attribute alternatives involving ordinary decoy (OD). The bullet points denoted with corresponding choice items titles (Brand A car, Brand B car, Brand C car) and the button for proceeding further which were located below in that order are not depicted here.

Figure B.5: **Decoy treatment task involving phantom decoy: a choice from two choice items with the information about the third item at hand, all defined on three attributes**

Given that YOU had to buy one brand based on this information alone, which one would it be?

	Brand A car	Brand B car	Brand C car
gasoline consumption	5.7	4.2	6.2
ride quality rating	74	70	72
likes	61	48	57

Assume the brand C car is unavailable.

Descriptions of attributes:

- ***Gasoline consumption*** is in litres per hundred kilometres units.
- ***Ride quality rating*** is a number on 100 points scale provided by an expert from the automobile industry, where 100 represents flawless ride quality and 0 the poorest one.
- Attribute ***likes*** is defined as follows:

$$likes_X = \frac{\text{number of likes under the product X advertisement announcement}}{\text{number of likes which automobile manufacturer of the product X has on the Facebook page}} \times 100$$

  - Example: Let's say that manufacturer Mercedes has one million Facebook subscribers (i.e. they like the Mercedes official Facebook page). Mercedes decides to promote the product Z through its Facebook page by posting the advertisement message on its wall. Let's say that 200 000 people like this post. Then attribute *likes* of the product Z will be equal to:

$$likes_Z = \frac{200\,000}{1\,000\,000} \times 100 = 20$$

This is the task which was displayed (including the text formating and the table) to participants in the treatment group with three-attribute alternatives involving phantom decoy (PD). The bullet points denoted with corresponding choice items titles (Brand A car, Brand B car) and the button for proceeding further which were located below in that order are not depicted here.