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# The Effect of Pension Plan Design on Experiences of Choice Overload

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# The Effect of Pension Plan Design on Experiences of Choice Overload

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# *Abstract*


Contrary to the view that choice is always for the good of a person, recent research introduces the concept of choice overload, likely inhibiting peoples' ability to take effective decisions. This study is to test the extent to which individuals suffer from choice overload in the context of pension plan settings, a sector recently turning it's attention towards autonomous choice. In specific, considering the asset allocation decision, by manipulating assortment size as well as assortment type, this research aims to improve pension plan design. Results show that presenting an alignable assortment and keeping the number of offered options reasonably small provides the most effective solution. Ultimately, the purpose of these results is to improve people's financial position for retirement, by assisting pension funds in their plan design and in turn reducing the impact of choice overload.

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# *1.Introduction*

The first part of this paper starts with a general outline of the problem. In the following the study's practical as well as theoretical relevance are examined. Moreover, the section ends with a concrete problem statement and a roadmap on how this paper proceeds.

## *1.1 Problem definition*

According to the "rational economic theory" (Botti & Iyengar, 2006, p.26) choice is always for the good of people. This is because autonomously taking choices enables individuals to find a perfect match to their preferences (Botti & Iyengar, 2006). In line with this reasoning, a global movement for granting individuals more choice evolved (Mitchell & Utkus, 2003). Consequently, various national pension systems are debating about the possibility of granting their participants increased choice.

But what does increased choice mean in this case? Concerning pension, a lot of choices have to be made, the main ones dealing with accumulation (*How much money do I save for my pension every months?*), investment (*Where should I invest the capital I save?*) and decumulation (*How do I want to receive my money when I am retired? Should I take a lump sum or an annuity?*)(Mitchell & Utkus, 2003). Accordingly the discussion about national pension reforms is based on the assumption that each individual is a "well-informed economic agent" (Mitchell & Utkus, 2003, p.1), being able to process all information and take efficient decisions.

However, the Employee Benefit Research Institute (2003) provides quite different evidence. According to the results of the study, which has taken place in America, just

20% of workers feel rather confident about their retirement savings, while 40% did not really take care of their retirement savings and 30% did not save a single dollar for retirement yet.

One potential reason for this enormous lack of interest in retirement savings may be the phenomenon of "choice overload" (Mitchell & Utkus, 2003, p. 10), meaning that participants may be overwhelmed by the complexity of a choice context and get discouraged to finally take a decision. This occurrence is being further investigated in the following research along with examining possibilities for restricting its impact.

## *1.2 Practical phenomenon*

The aforementioned pension plan reform towards promoting more individual choice is currently at a debate in the Netherlands. According to a newly conducted poll, 67% of the respondents voted in favour of an adjusted pension system, offering more choice and personal pension to its' participants (Telegraaf.nl, 2016). Due to this potential shift, the Dutch pension system should be in a proactive state in order to be prepared the best way possible in case such a reform is really implemented.

Why be prepared? Like already touched upon in the section on problem definition, research poses doubts about the assumption of people being able to process all information concerning pension plan settings and take efficient decisions. Confirming evidence for this proposition can be found in the paper of Agnew & Szykman (2004). Controlling for financial literacy in their research, the authors find that individuals being categorized as below average financially literate suffer from experiences of choice overload and as a result take suboptimal decisions for their retirement. These decisions in turn badly affect accumulated retirement wealth (Agnew & Szykman, 2004).

However, the authors also find that changes in pension plan design can effectively reduce feelings of choice overload and assist people in making improved decisions for retirement.

Hence this paper examines ways for improving pension plan design. In particular, the number of options and the assortment type will be manipulated.

So if a reform gets realized, outcomes of this paper should be utilized in the way that they assist pension plans on how to best design their plan settings. This ultimately aims at reducing participants' feelings of choice overload, increasing decision efficiency and improving outcomes for retirement.

## *1.3 Theoretical contribution*

Botti & Iyengar (2006) already pointed out that prior research has suggested that choice is always for the good of people. However, by time this proposition has been challenged by studies coming up with the phenomenon of choice overload (Iyengar, Huberman, & Jiang, 2004; Iyengar & Lepper, 2000; Diehl & Poynor, 2007). Since then the view on choice is more of an ambiguous kind due to the mixed results provided by research. Thus, the paper at hand follows the call for further research testing the robustness of these results (Scheibehenne et al, 2010).

Besides that Agnew & Szykman (2004) note that participant choice is already a fixed component in the US as well as in Latin America, while European countries like the Netherlands in this case are still debating on that (Telegraaf.nl, 2016). Hence, in contrast to the overwhelming majority of papers focusing on the US (Chernev, 2003; Iyengar & Lepper, 2000; Gourville & Soman, 2005), this research is to investigate the phenomenon of choice overload in the European context. Given the actuality of the topic in the Dutch

setting, the main objective is to provide the theoretical basis for an effective pension plan design to ensure a smooth transition in case of a reform.

## *1.4 Research problem and roadmap*

The overall purpose of this research is to help prepare the Dutch pension system for a potential reform towards autonomous decision-making. In specific, this paper is to manipulate the assortment size as well as the assortment type (discussed in more detail in the literature review) offered to participants to explore ways for improving plan design. Ultimately, an improved pension plan design should serve to lower the impact of choice overload and enhance decision-making. Breaking down the purpose in a concrete problem statement leads to the following:

*In which ways can effective pension plan design influence participants' experiences of choice overload?*

For addressing this particular issue, it is split in the following sub questions, all of which will contribute to finally finding an answer to the problem statement:

Sub questions

*1. Are people effective decision makers?*

*2. To what extent does the assortment size influence the occurrence of choice overload?*

*3. To what extent does the assortment type influence the occurrence of choice overload?*

*4. Does the degree to which people already formed preferences prior to a decision have an impact on their preferred choice set size?*

The remainder of my paper is organized like this:

The following section is to build the theoretical basis for this research by reviewing relevant literature, developing a conceptual model and formulating concrete hypotheses. Section three specifies the methodology. In essence, it is to outline the sample population, sampling methods, the experimental setup and an operationalization of the variables. Next, section four figures out validity and reliability of the constructs and presents results of the hypotheses tests. Interpretation of these results and concrete managerial implications are shown in the next section. Lastly section 6 concludes by providing answers addressing the sub questions and the problem statement posed in section 1.

# *2. Literature Review*

This part of the paper focuses on the state of research concerning choice overload and its relevance for the retirement context.

## *2.1 People's attitude towards choice*

People generally like choice. At least that is what is the baseline of the "rational economic theory," stating "choice can never reduce well-being, because it enables consumers to engage in preference matching without necessarily burdening their cognitive system." (Botti & Iyengar, 2006, p. 26). In other words, choice offers people the opportunity to pick an option that best matches their preferences.

Looking at it from the psychological point of view Botti & Iyengar (2006) hint at the importance of the concept of being in control. Naturally, people have the desire to control their fate. Consequently, giving people a choice makes them feel they can have a positive influence on their future by picking the option, which they think will provide the best possible future outcomes. This theory can be confirmed by the authors' evidence (Botti & Iyengar, 2006), who observe that intrinsic motivation is higher for people who are offered to choose, as compared to non-choosers. Moreover, their evidence suggests that the effect is even stronger in societies encouraging values like individuality and autonomy.

In addition to their observation that the aspect of being in control plays a crucial role for decision making, in another paper Botti & Iyengar (2004) report a further essential factor, namely potential for outcome satisfaction. According to their results, people themselves forecast that they will be happier when taking a decision for themselves as compared to having somebody else take the decision for them. Confirming evidence for this proposition can be found in Botti & Iyengar (2006), noting that people deciding

autonomously feel increased life satisfaction, whereas people who are not given the opportunity to choose feel helpless and hopeless.

Accordingly, "modern society" assumes that "the human ability to manage, and the desire for, choice is infinite" (Iyengar & lepper, 2000, p. 995).

In order to relate this line of reasoning back to the main topic of this research, namely the increased choice that may potentially be given to Dutch pension plan participants in the future, one would assume that this is always for the good of these people. But are people really effective decision makers?

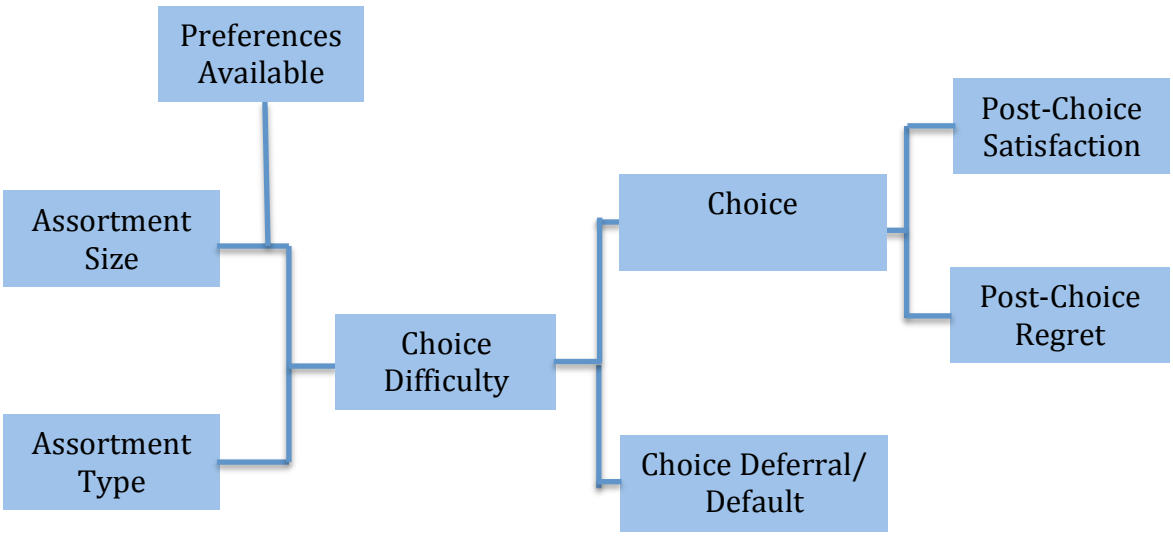
## *2.2 Choice overload*

When investigating recent research in more detail, the above findings have to be limited to a certain extent. As already implied by the name of their paper, *The dark side of choice,* Botti & Iyengar (2006, p. 24) note "that the benefits associated with the provision of choice may be limited to issues in which decision complexity is manageable; as decision complexity rises, the very provision of choice, which is seemingly desirable and beneficial, can become paralyzing and debilitating, resulting in suboptimal decision making." This statement hints at a phenomenon researchers call "choice overload" (Reed, Reed, Chok & Brozyna, 2011, p. 547).

Following the line of reasoning of Mogilner et al (2008), increased decision complexity induces people to increase cognitive effort, which is rather limited in a way. Consequently, when decisions get too complex, people tend to reduce rather then increase their cognitive effort. Therefore they are likely to defer/ delay choice or rely on short-cut heuristics (Agnew & Szykman, 2004), all of which may be suboptimal for decision outcomes.

In order to get a grasp of how this might be counteracted, the following of this paper will deal with concepts having an influence on peoples' experiences of choice overload and therewith also finally on decision outcomes. The issues that will be discussed are illustrated in the model below, so that readers can easily follow.

***Model 1***




## *2.3 Choice overload due to size*

Identifying factors, which affect the extent to which people experience choice overload, this section starts with investigating the choice set size in more detail. Many studies considered the number of options to have significant impact on individual's perceived choice overload (Iyengar & Kamenica, 2007; Chok & Brozyna, 2011; Gallery & Gallery, 2005).

To start with a popular paper of Iyengar & Lepper (2000), they conduct an experiment manipulating the assortment size of jams. Participants can choose from an assortment of

24 flavours of jam or else just 6 flavours. Inspecting their results, they observed that the assortment containing 24 flavours of jam attracted more participants.

However, what they also found is that when it finally comes to choosing/ purchasing, people presented with only 6 jams were way more probable to also buy a jam relative to the ones presented with 24 jams. So to summarize the results of Iyengar & Lepper (2000), on the one hand a large assortment of options tend to attract people but on the other hand also complicate decision-making, whereas relatively smaller assortments do not tend to have such an attraction effect but facilitate decision-making. This general phenomenon is what Schwartz (2004, p. 1) calls "the paradox of choice." But how can this phenomenon be explained?

Approaching this question, research papers' turned their attention to people's limited cognitive capacity. Starting from scratch, by nature people like to have a lot of options available to them (Dan Ariely, 2010), which is why large assortments attract them. But when it comes to making decisions, following the line of reasoning of Agnew & Szykman (2004, p. 4), people seem to get "overwhelmed when making their decision and as a result they look for an easy way out". Consequently, in case decisions get too complex, rather than increasing effort and evaluating the options relative to the other ones to arrive at an optimal decision, people actually tend to go the contrary way, which is minimizing cognitive effort. In essence this means that the probability for making use of heuristics (for instance staying with the default option) or deferring choice at all increases (Scheibehenne et al, 2010).

From the above findings, the following predictions evolve:

*H1: The difficulty of choice is higher for large assortments as compared to small assortments.*

*H2: Participants facing a large assortment increasingly defer making a choice, as compared to participants facing a small assortment.*
*H3: Participants facing a large assortment increasingly stay with the default option, as compared to participants facing a small assortment.*

However, an increasing probability for choosing the default option or deferring choice does not mean that every individual being overwhelmed by the choice set does so. Hence, there are participants who still choose an option. So in addition to what Chernev, Böckenholt and Goodman (2015) call outcome-based indicators of choice overload (for instance choice deferral), they also deal with process-based indicators. In specific, the authors use constructs measuring post-choice satisfaction and post-choice regret as means of assessing the impact of choice overload. The reasoning behind this is that participants finally choosing one option naturally have to give up on the other options (Botti & Iyengar, 2006). Further it is argued that after making a decision, a person still engages in comparisons with all the other options left behind, maybe finding "that the option they selected was not ex post optimal." (Iyengar & Kamenica, 2007, p. 5). As a consequence, participants are probable to be dissatisfied with the option they chose and in turn regret not having taken one of the other options.

This gives rise to additional predictions:
*H4: Participants facing a large number of options feel less satisfied with their choice, as compared to participants facing a small number of options.*
*H5: Participants facing a large number of options feel more regret, as compared to participants facing a small number of options.*

Consequently, due to the aforementioned scenarios, it is of crucial importance to control for the number of options provided to a person, trying to decrease experiences of choice overload and therewith increase the efficiency of decision making.

## *2.4 Choice overload due to similarity*

An additional factor recent research investigated in connection to the phenomenon of choice overload is the similarity of options. On basis of what is stated in the article of Gourville & Soman (2005), this section introduces the concept of assortment type. According to the authors' theory an assortment can be alignable or non-alignable. To define, an alignable assortment is "a set of brand variants that differ along a single, compensatory dimension such that choosing from that assortment only requires within-attribute trade-offs" (Gourville & Soman, 2005, p. 382). An example for such an alignable assortment would be notebooks just varying on the size of their display. So people just have to consider their size preferences when deciding, which notebook to buy. For instance if you were a student and would carry the notebook all day, you would decide to take one with a small display due to improved portability.

On the contrary, a non-alignable assortment is "a set of brand variants that simultaneously vary along multiple, noncompensatory dimensions, demanding between-attribute trade-offs" (Gourville & Soman, 2005, p. 382). To illustrate this with the example of notebooks, a person would have to decide on a set of notebooks varying on different attributes. The various notebooks might for example differ on display size, price, processor power, battery life and so forth. Consequently a person needs to engage in between-attribute trade-offs, so give up certain features in order to attain other ones.

For instance, choosing for a strong processor power, one may have to give up on a long battery life.

Following the line of reasoning of Gourville & Soman (2005), between-attribute trade-offs (non-alignable assortment) are way more abstract and therewith also more effortful as compared to within-attribute trade-offs (alignable assortment). Consequently, participants faced with a non-alignable assortment are more probable to experience choice overload as compared to the ones faced with an alignable assortment. This naturally results in an increased probability for choosing the default option or deferring choice at all. (Agnew & Szykman, 2004)

Again the above predictions can be turned into concrete hypotheses:

*H6: The difficulty of choice is higher for non-alignable assortments as compared to alignable assortments.*

*H7: Participants facing a non-alignable assortment increasingly stay with the default, as compared to participants facing an alignable assortment.*

*H8: Participants facing a non-alignable assortment increasingly defer making a choice, as compared to participants facing an alignable assortment.*

But just like in the above section, there will be individuals taking a choice despite their cognitive overload. As a consequence post-choice satisfaction and post-choice regret are used again as means of assessing the impact of choice overload.

To illustrate the logic behind the concepts, an example named by the authors is the choice whether to spend one's bonus payment "on a new refrigerator or a vacation" (Gourville & Soman, 2005, p. 384). Assessing the utility of one option compared to the other one is much more abstract, as one has to compare them on a non-compensatory

dimension. For instance when deciding for the refrigerator, a person may regret not having taken the vacation while watching it rain through the window. The other way around, a person may regret not having taken the refrigerator when his/her vacation is over. These "attractive but mutually exclusive alternatives lead to more conflict" in people's minds (Scheibehenne, 2010, p. 410), increasing the feelings of regret. By nature this also means that people are less satisfied with what they finally chose (Scheibehenne, 2010).

To sum up in formal predictions:

*H9: Participants facing a non-alignable assortment feel less satisfied with their chosen option, as compared to participants facing an alignable assortment.*

*H10: Participants facing a non-alignable assortment feel more regret, as compared to participants facing an alignable assortment.*

Accordingly, pension plans are to take care about the type of assortment offered to participants in order to decrease the potential for choice overload.

## *2.5 Preference Availability*

Furthermore, in his paper, Chernev (2003) proposes a covariate having an impact on the way people experience choice overload, namely ideal point availability. This covariate deals with the extent to which participants have already formed preferences prior to making a decision.

Chernev (2003) points out that research simply assumes people have created their preferences prior to a decision. However, he further expresses that in most cases people do not have available preferences prior to a decision. This is especially true for the case

that you have to take a decision in areas one lacks sufficient knowledge (Chernev, 2003). As is already pointed out throughout the whole paper, most people lack expertise in the field of planning for pension, which is to hint at the importance of considering participants' prior preferences in this context.

According to Chernev's theory (2003), people should be treated differently depending on if they have an ideal point available or not. The argumentation behind this is that, on the one hand a person having an ideal point available may be better off choosing from a relatively larger choice set, as the likelihood for finding a perfect match to these preferences increases with the number of options offered. This is to say that people having formed preferences before making a decision may probably profit from a larger assortment instead of experiencing choice overload.

On the other hand, participants having no ideal point available face a "rather complex two-stage decision," meaning that these participants have to "first construct their attribute preferences" and then evaluate available options relative to this reference point (Chernev, 2003, p. 171). This two-stage process requires increased cognitive effort, increasing the probability for choice overload.

However, in order to minimize the influence ideal point availability can have on feelings of choice overload researchers provide certain hints. For instance Chernev (2003) proposes to decrease the number of options offered to people without an ideal point available. This is to facilitate preference generation and decrease cognitive effort.

Adding to the issue of preference formation, Novemsky (2007) observes that factors unrelated to the actual set of options can lead to problems in preference formation like for instance difficult to read font or an information display that complicates comparisons among options. To counteract this, Novemsky (2007, p. 354) recommends to "proactively create conditions that are conductive to preference

fluency," like for instance presenting information in an easy-to-read format and using "information displays that help consumers compare options along relevant attributes."

Although conditions in the following research experiment are in line with Novemsky's (2007) recommendation for facilitating preference fluency, still the variable "ideal point availability" has to be controlled for, as it might have an effect on the original relationship between assortment size and people's feelings of choice overload. Therefore it will be included as a covariate in the analysis.

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# *3. Methodology*

The following part of the research paper deals with the research approach. It starts with examining the target population of the research as well as how the sample is addressed. Further, the research design is explained in detail. Finally, variables at hand are operationalized.

## *3.1 Sample Population*

Concerning sampling, the target population of this research is rather broad. Why is this?

First of all, every human gets confronted with the topic of retirement. This is to say that everyone needs to define his/her pension settings one day and may possibly also adjust these at several points in time. So generally speaking, everybody should care about it.

However, in order to receive reasonable responses, targeted participants are in working age. As too young individuals may not be familiar with the topic and retired individuals will not care about pension plan settings anymore, the target age is set between 18 and 65 years. Nevertheless working age does not mean that participants have to be employed. This is because studying or also unemployed individuals still have to care about their pension. Therefore they can also be included in the sample population.

## *3.2 Sampling method*

The sample gets approached in two ways, namely via the Internet as well as personal contact. Concerning the Internet, Facebook is used as a tool for distribution. The survey is sent to all personal contacts as well as posted in general public groups. Making use of

"snowball sampling" (Malhotra, ,2009, p. 381), all contacted persons are encouraged to pass the survey to other people they know.

Regarding personal contact, this research uses what Malhotra (2009, p. 377) calls "Convenience Sampling". This is to say that people get asked to participate in the survey on public places like for instance stations as well as shopping malls.

Using these two approaches 194 answers have been gathered. Due to missing answers as well as inconsistencies when answering reverse coded questions, the data had to be cleared so that the sample finally consists of 169 responses. Breaking down the number of replies per experimental group makes 45 answers for treatment group 1, 43 for treatment group 2, 39 for treatment group 3 and 42 for treatment group 4. According to the central limit theorem a nearly normal distribution can be assumed, as there are more than 30 respondents per treatment group (Wetzels, 2015).
However, as other sampling methods are out of the scope of this paper and research is based solely on non-probabilistic sampling methods, this sample population cannot be treated as being representative. Nevertheless, for the sample to be as representative as possible, participants are approached in numerous cities as well as in diverse locations. Also subjects are assigned to the treatment groups in a random manner.
In order to evaluate in which way results may still be generalized, demographic statistics are examined in more detail in the following.

## *3.3 Research design*

The whole experiment is computer-based in the way that consumer data is gathered by use of the online survey software qualtrics.com.

Participants start with reading a short introduction giving general information like for instance the time the survey will take on average and that data will be treated confidentially. Also they have to read the following instruction:

*Assume that you just started your working career and are currently busy with specifying your pension plan settings. You have already decided on the amount of money you want to contribute to your pension plan at the end of each month. Next, you have to decide on the way you want to invest the capital you are going to save. Therefore several investment options will be presented to you in the following. Your task is to choose your preferred option. A default investment option is already selected. However, in order to get the best for your personal pension, please choose the most suitable option for your situation.*

Clicking on "further", participants finally get to see the available investment options. The range of investment options they will be offered depends on which group they have been randomly assigned to prior to the experiment.
To specify, the experiment is set up in a 2 (number of options: 5 vs. 10) x 2 (assortment type: alignable vs. non-alignable) design, so that there are four treatment groups. Concerning the assortment type, participants in the alignable group face options that just differ on one dimension. Following the advice from the paper of van Binsbergen et al (2014, p. 212), the decision gets restricted the way that "households can choose from a set of diversified balanced index funds, with different weights in stocks and bonds." So in other words, the funds offered should only be just varying according to their risk (equity) exposure. The reasoning behind this is on the one hand that the offered funds are already well diversified, as households are shown to have problems diversifying their portfolio (van Binsbergen et al, 2014). On the other hand index funds have been

shown to perform at least as well as actively managed funds, and are also way cheaper due to their passive management (Broeders et al, 2012). So the choice offered to participants is limited to the risk factor. Participants facing an alignable assortment can choose solely according to their personal risk preferences, which risk/return characteristics they prefer.

In contrast to that, options in the non-alignable assortment may differ on all dimensions. Besides varying asset allocations, the options can also differ in:

-*Geographic information: Where is the money invested?*

-*Industry sector: Which industry is the money invested in?*

-*Management: How frequently are assets in the portfolio traded?*

-*Management fee: How much does the investment cost?*

-*Minimum initial investment: How much money has to at least be invested?*

In addition to the five, respectively ten options, participants are offered the opportunity to click on "I prefer to choose later", which means they defer choice.

Besides that, a default option is indicated in advance. The efficiency of the chosen default option is justified by prior research. Therefore the default option is selected in accordance with the following criteria. Assuming that individuals evaluate the performance of their portfolio each year, which is realistic due to the fact that one receives an informational mail at the end of each year, Benartzi & Thaler's (1995) findings show that the optimal equity exposure of a portfolio in this scenario lies between 30 and 55 %. Furthermore, supposing that default funds are generally chosen rather conservatively (Agnew & Szykman, 2004), the default fund orients at the lower bound of the 30-55 % range. Lastly, as pension funds are to provide efficient defaults,

French (2008) advises to have the investment managed passively in order to drive down management fees. Also by evidence active management does not outperform passive management (French, 2008).

After having checked one of the options, all participants get to see the same questionnaire. The operationalization of the questionnaire is discussed in the next section.

When all questions have been answered, participants are thanked for their effort and engagement in the study.

## *3.4 Operationalization*

Getting in detail on the questionnaire items, the effectiveness of the manipulations of plan design is assessed on the resulting experiences of choice overload. However, due to the fact that choice overload is just a "mental construct describing the subjective state of the decision maker" (Chernev, Böckenholt & Goodman, 2015, p. 335) one cannot simply observe it. Instead, for the operationalization and measurement of experiences of choice overload, recent literature has come up with several objective indicators hinting at choice overload. In their paper, Chernev et al (2015) summarize some of these objective choice overload indicators, which are in use most frequently and categorize them in two groups; process-based indicators and outcome-based indicators. On the one hand process-based indicators are concerned with internal feelings of a person like for instance the feeling of regret or satisfaction with what has been chosen. On the other hand outcome-based indicators deal with observing a person's behaviour like participants deferring to take a choice.

Although Chernev et al (2015) prove that indicators of choice overload they investigate can be used interchangeably, this study makes use of several of them, namely post-choice satisfaction, post-choice regret, choice deferral and default choice. Consequently, all of them will serve as dependent variables measuring the effect of the treatment on experiences of choice overload. The results of the different measures can be compared in the end.

In order to measure to what extent participants feel satisfaction or regret, they will be asked a construct of questions on this (Appendix). These constructs are derived from Scheibehenne, Todd & Greifeneder (2009) and measured on a 7-point Lickert Scale (1-7). Validity as well as reliability of the constructs are examined by performing a factor analysis. Results of this test are discussed in the following.

Going into detail on the second group, outcome-based indicators, it can be argued that a person reaching his/her cognitive limits and experiencing choice overload is likely to do nothing and simply defer choice. Thus it is expected that a person experiencing choice overload will be more probable to stay with the default option or defer making a choice (Scheibehenne et al, 2009). Choices can be deferred by checking an added option stating, "I prefer to choose later".

Consequently, by simply observing the outcome of the decision, this research utilizes the choice of the default option and choice deferral as dependent variables for assessing choice overload.

## *3.5 Control Variable*

As already pointed out in earlier sections of this paper, research identified ideal point availability as potential covariate, having an impact on the extent to which people experience choice overload (Chernev, 2003).

Due to these findings it is essential for this research to control for participant's preferences, as it could explain potential variation in the results. Consequently, the extent to which people have prior preferences is measured with the help of a construct of Scheibehenne et al (2009). Again, all of the questions to assess ideal point availability make use of a 7-point Lickert scale. The construct can be found in the appendix. Validity and reliability are also assessed by the factor analysis.

# *4. Results*

This section starts by exploring the demographic data of the sample. Thereafter, validity and reliability of the constructs are assessed. Based on the results, an adjusted model is presented. Lastly, this section deals with the results of the hypotheses tests.

## *4.1 Sample demographics*

This section is to investigate the demographics of the final sample containing 169 respondents. Starting over with gender and the level of education, one can see that frequencies are distributed fairly equal along the different categories. However, as also indicated in the frequency table below, the sample population represents more of the younger population, 55,6% being between 15 and 34 years. Regarding the current work status, nearly 60% of the respondents are employed, while 28,4% are students and a minority of 11,9% is unemployed. The net monthly household income is distributed in a rather linear way, logically showing decreasing frequencies for an increasing level of income. Lastly, referring to the participants' level of financial literary, 84,6% had two or more correct answers (out of three questions). This is to say that the sample population can be considered fairly financially literate.

As the section on *sample population* already noted, due to the non-probability sampling methods, the sample cannot be considered representative. As a consequence, results cannot be generalized for the whole population. However, an investigation of the demographic data may prove valuable when interpreting results of the hypotheses tests and trying to formulate concrete recommendations.

***Table 1. Sample demographics***

| Demographics | Categories | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 96 | 56,8 |
| | Female | 73 | 43,2 |
| Age | 15-24 | 35 | 20,7 |
| | 25-34 | 59 | 34,9 |
| | 35-44 | 35 | 20,7 |
| | 45-54 | 27 | 16,0 |
| | 55-64 | 13 | 7,7 |
| | >=65 | 0 | 0,0 |
| Highest level of education | High school or less | 50 | 29,6 |
| | Bachelor's degree | 60 | 35,5 |
| | Graduate degree or more | 59 | 34,9 |
| Current work status | Employed full time | 73 | 43,2 |
| | Employed part time | 28 | 16,6 |
| | Unemployed looking for work | 15 | 8,9 |
| | Unemployed not looking for work | 5 | 3,0 |
| | Student | 48 | 28,4 |
| Net monthly household income | €0-1.000 | 49 | 29,0 |
| | €1.001-2.000 | 40 | 23,7 |
| | €2.001-3.000 | 33 | 19,5 |
| | €3.001-4.000 | 18 | 10,7 |
| | €4.001-5.000 | 20 | 11,8 |
| | €5.001-6.000 | 6 | 3,6 |
| | more than €6.000 | 3 | 1,8 |
| Financial literacy | 0 correct answers | 6 | 3,6 |
| | 1 correct answer | 20 | 11,8 |
| | 2 correct answers | 43 | 25,4 |
| | 3 correct answers | 100 | 59,2 |

## *4.2 Validity and reliability*

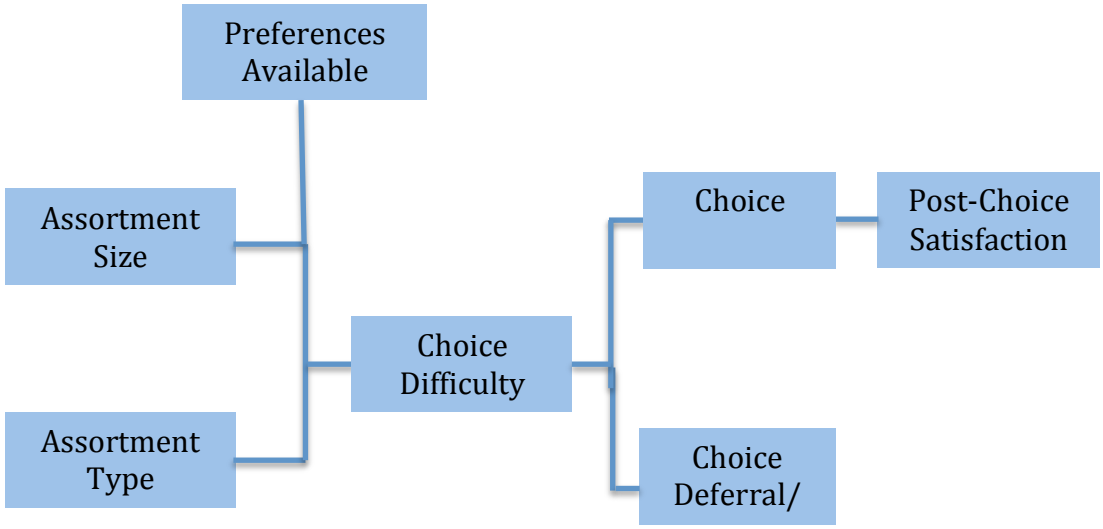
In order to assess the validity of the constructs (post-choice satisfaction, post-choice regret, choice difficulty and prior preferences) a factor analysis with promax rotation is performed. In order to test the suitability for factor analysis, I start checking the assumptions. First of all, the sample contains more than five observations per item. Also Bartlett's test of spericity ($p<0,001$) and the Kaiser-Meyer Olkin measure of sampling adequacy (0,865) confirm the suitability for factor analysis.

An investigation of eigenvalues provided by the factor analysis indicates a 3-factor solution explaining 67,713 % of the variance. However, an inspection of factor loadings displays several loadings below the cut-off value of 0,7. As a consequence, question four of the construct concerning post-choice satisfaction (*Did you enjoy making your decision?*) as well as the whole post-choice regret construct have to be eliminated. However, the elimination of post-choice regret as a measure of choice overload does not pose a big problem as the results of Chernev et al (2015) state that post-choice satisfaction and post-choice regret can be used interchangeably. Thus, concerning process-based indicators of choice overload, this research continues to rely solely on post-choice satisfaction.

After removing the aforementioned items, the factor analysis is repeated. Again Bartlett's test of spericity ($p<0,001$) is significant and the KMO measure is bigger than 0,7 (0,81), indicating suitability for factor analysis. Examining the eigenvalues, the test still suggests a 3-factor solution. Due to the removed constructs the explained variance increased to 79,425%. Going into detail on the factors, all three items of the post-choice satisfaction construct load on the first factor, the loadings being >0,7. The same can be stated for choice difficulty, loading on the second factor, and prior preferences making up the third factor. Due to these high loadings convergent validity can be assumed. Also discriminant validity can be checked as items have no cross-loadings >0,4. For investigating the factor loadings, check appendices 4 and 5.

Concerning reliability of the constructs, Cronbach's alpha values have been calculated for the three constructs. Using 0,7 as a cut off value, all constructs can be considered a reliable measure ($\alpha_{\text{satisfaction}}= 0,825$ $\alpha_{\text{choice difficulty}}=0,879$ $\alpha_{\text{prior preferences}}=0,838$). However, due to the removal of the post-choice regret construct, the model is adjusted (see below).

***Model 2***




## *4.3 Hypotheses tests*

The following section is to present results of the hypotheses tests. In order to test the effects treatments have on the dependent variables various tests have been performed.

Firstly, treatment groups are integrated to be able to perform several independent-samples t-tests. This means that treatment group 1 and 2 are put together to form the assortment size "small" and treatment group 3 and 4 are combined and labelled "large". For assortment type this is to say that treatment groups 1 and 3 form the alignable assortment, while treatment groups 2 and 4 form the non-alignable one.

Additionally, several one-way between subjects ANOVA are performed in order to test for significant differences in the dependent variables between each of the four treatment groups. The purpose of these additional tests is to keep one treatment constant, while testing for the effect of the other. For instance, evaluating outcomes for

treatment groups one and two means that assortment size is kept constant (both face a small choice set), while the effect of assortment type is examined.

Moreover, as the dependent variables choice deferral and default choice are categorical in nature, chi-square tests of independence are performed to test for significant differences.

Lastly, I conduct a General Linear Model to control for possible effects of the covariate *prior preferences* (ideal point availability) on the original relationship between assortment size and the dependent variables.

Just to be clear on this issue, due to the removal of the construct of post-choice regret, H5 and H10 also have to be abandoned.

### *4.3.1 Treatment group and choice difficulty*

In order to examine the choice complexity for each of the treatment groups, means of choice difficulty are compared by performing a one-way between subjects ANOVA. Indeed, there is a significant effect for choice difficulty among the four groups [$F(3, 165) = 6{,}156$, $p < 0{,}001$]. Making use of the Tukey HSD test and further examining the post hoc comparisons indicates a significant difference between treatment group 1 ($M=2{,}6444$, $SD=1{,}2173$) and the treatment groups 2, 3 and 4 ($M_2=3{,}6434$, $SD_2=1{,}5488$; $M_3=3{,}7607$, $SD_3=1{,}3657$; $M_4=3{,}7222$, $SD_4= 1{,}5529$). Despite this result, there is no additional significant effect. Inspecting the means shows that treatment groups 2, 3 and 4 are rather close to each other.

So all in all these results suggest increased choice difficulty for participants in treatment groups 2, 3 and 4 as compared to treatment group 1. Due to significant differences between treatment groups 1 and 2 as well as 1 and 3, results provide support for H1 and H6.

### *4.3.2 Treatment group and choice deferral*

Making use of choice deferral as a dependent variable, a chi-square test of independence is performed to test for significant differences in the four treatments. The first thing to note is that the expected cell frequency condition cannot be assumed as 50% of the cells have expected counts less than 5. Therefore an interpretation of the results would be meaningless. Moreover, the test revealed an insignificant result ($x^2$=(3)= 1,545, p=0,336). This is to say that results cannot provide evidence to support H2 and H8. Thus we cannot state that changes in assortment size and/or assortment type lead to changes in frequencies of choice deferral.

### *4.3.3 Treatment group and default choice*

However, using choice of the default option and running a chi-square test of independence on respective frequencies for the four treatment groups reveals a significant result ($x^2$(3)= 19,417, p<0,001). Also the expected cell frequency condition can be assumed, proving that the data at hand are suitable for a chi-square test of independence. Investigating the probabilities for default choice per treatment group shows that treatment group 1 (22,2%) 2 (34,9%) and 4 (42,9%) are in line with the prediction that participants facing large and non-alignable assortments are way more likely to choose the default option as compared to participants facing small alignable as well as small non-alignable assortments. However, treatment group 3 (2,6%), facing the large & alignable assortment is least likely to take the default. Due to these results, additional chi-square tests of independence are done on the effect of assortment size as well as assortment type separately.

### *4.3.4 Assortment size and default choice*

Testing for differences in counts of default choice along assortment sizes, the expected cell frequency condition can be assumed (0% of cells having expected counts less than 5). But the test does not yield a significant effect ($x^2(1)= 0,537$, $p=0,232$). Therefore H3 cannot be supported by results of the chi-square test of independence.

### *4.3.5 Assortment type and default choice*

To start with the expected cell frequency condition, due to 0 cells with less than 5 expected counts it can be assumed. The test for differences in choice deferral frequencies among alignable and non-alignable assortments yields a significant result ($x^2(1)= 14,523$, $p<0,01$). Therefore the results support H7, stating that frequencies of keeping the default option for participants facing a non-alignable assortment is higher as compared to participants facing an alignable assortment.

### *4.3.6 Assortment size and post-choice satisfaction*

Shifting from outcome-based indicators of choice overload to the process-based ones, this section is to examine differences in post-choice satisfaction by assortment size. Firstly, Levene's test is insignificant, indicating that equal variances can be assumed. Results of the independent samples t-test reveal a significant difference in the means for a small ($M=2,9858$, $SD=0,9666$) and large assortment size ($M=3,5309$, $SD=1,0378$): $t(167)=-3,535$, $p<0,001$. In other words this means that an increasing number of options offered to participants leads to decreased satisfaction with the choice outcome. Thus these results support H4.

### *4.3.7 Assortment type and post-choice satisfaction*

Also the independent samples t-test examining difference of post-choice satisfaction regarding assortment types is significant (t(157,262)=-1,948, p=0,0265). However, due to a significant Levene's test, equal variances cannot be assumed so that results have to be interpreted with care. Nonetheless, looking at the means reveals that the value for the alignable treatment group (M=3,0923, SD=0,8822) is lower than the mean of the non-alignable assortments (M=3,4, SD=1,1516). Therefore individuals facing alignable assortments are more satisfied with the chosen option as compared to the ones facing non-alignable assortments. This finding provides evidence for H9.

### *4.3.8 Treatment group and post-choice satisfaction*

Additionally, I performed a one-way between subjects ANOVA for examining potential differences in the means of post-choice satisfaction for participants facing a small & alignable, small & non-alignable, large & alignable or large & non-alignable assortment. To start with, a significant Welch test states that equal variances can be assumed. Investigating results of the ANOVA show that there is a significant effect for post-choice satisfaction among the four groups [$F(3, 165) = 6,28$, $p < 0,001$]. Making use of the Tukey HSD test and further examining the post hoc comparisons indicates a significant difference between treatment group 1 (M=2,7333, SD=0,91608) and the treatment groups 3 and 4 ($M_3$=3,5064, $SD_3$=0,6321; $M_4$=3,5536, $SD_4$= 1,3154). There is no significant difference for treatment group 2 (M=3,25, SD=0,9574). The significant difference between treatment group 1 and 3 indicates that increased post-choice

satisfaction for group 1 can be attributed to assortment size as assortment type is held constant. This offers additional support for H4.

Investigating the means these results suggest increased post-choice satisfaction for participants in treatment group 1 as compared to treatment groups 2, 3 and 4.

### *4.3.9 General Linear Model*

In order to test if the covariate prior preferences has an impact on choice difficulty, I did a one-way ANCOVA. After controlling for the level of preferences people established prior to their decision, there is still a significant effect of assortment size on choice difficulty: F (1,167)=6,506, p=0,012. Consequently, disregarding preferences people have formed in advance, people should still be increasingly probable to suffer from choice overload as the assortment size increases.

This proposition is to be verified by conducting a one-way ANCOVA to test for the effect of the covariate prior preferences on the original relationship between assortment size and post-choice satisfaction. After controlling for the level of preferences people established prior to their decision, there is still a significant effect of assortment size on post-choice satisfaction: F (1,167)=11,592, p<0,01. Therefore results are robust to varying levels of preferences.

# *5. Discussion*

The discussion section presents an interpretation of the results and infers managerial implications. To round this section up, limitations to the study are stated along with suggestions for further research.

## *5.1 Assortment size*

In line with the findings of Scheibehenne et al (2010), results of this study support the notion that an increasing assortment size causes increased choice difficulty. This effect also holds when controlling for prior preferences. But does an increased assortment size also lead to choice overload?

Proceeding to the frequencies of choice deferral for assessing choice overload, an effect due to different choice set sizes cannot be found. Therefore, increasing the choice set size does not have an influence on how many people defer choice in this research. However, due to the hypothetical status of this experiment, participants face no real consequences when deferring choice, which is why these findings should be interpreted with great care. To be sure there is no effect, it is recommended to repeat this kind of study, but make it a real world case so that participants face consequences for their decisions.

For the aforementioned reasons this study makes additional use of the frequencies of choosing the default choice for assessing choice overload. But still the test does not provide a significant difference, which may be attributed to the point that the sample size is rather small.

Investigating participants' feelings, Iyengar and Kamenica (2007) propose that increasing choice set sizes lead to less satisfaction with the finally chosen option. This study confirms the research of Iyengar and Kamenica (2007), by participants facing the

small choice sets indicating significantly higher satisfaction with their chosen option as compared to participants facing large choice sets. This also holds when controlling for the level of participant's prior preferences.

To conclude this section, using post-choice satisfaction as an indicator of choice overload, this study confirms the existence of the phenomenon and its increasing effect along an increasing assortment size.

## *5.2 Assortment type*

Again in line with what has been proposed by the authors (Gourville & Soman, 2005), this study hints at an increased choice difficulty for non-alignable assortments as compared to alignable ones. In order to test if this increased choice difficulty also fosters choice overload, the dependent variables are examined more closely.

Concerning choice deferral rates, this study also does not find a significant difference among alignable and non-alignable assortments. This could again be attributed to the fact that choice deferral counts are low all in all, maybe because of the hypothetical nature of this study.

Therefore another one, namely the choice of the default option, replaces choice deferral as dependent variable. Utilizing the default choice as indication of choice overload, a significant difference among the groups can be found. Participants facing the non-alignable assortment are way more likely to take the default option as compared to participants facing the alignable assortment. This may be due to the abstract comparisons required by the non-alignable assortment (Gourville & Soman, 2005), making participants look for an easy way out and simply keep the default option.

Investigating people's feelings of post-choice satisfaction yields a significant difference among the groups. Participants in the alignable assortment are way more satisfied with the option they chose as compared to the non-alignable treatment groups. This may be due to the fact that it just requires a trade off in one dimension and not across several dimensions (Gourville & Soman, 2005).

So overall, using the measures of choosing the default and post-choice satisfaction, this study confirms the existence of choice overload and its increasing effect for non-alignable as compared to alignable assortment types.

## *5.3 Theoretical contribution*

Is choice always for the best of people? That is the question a lot of research addressed in the past, providing mixed results (Scheibehenne et al, 2010). Due to this ambiguous view on the topic, some studies find choice overload (Botti & Iyengar, 2007), some do not (Mussa & Rosen, 1978), this paper is to follow the call of Scheibehenne et al (2010), testing the robustness of the phenomenon called choice overload.

Making use of several indicators proposed by literature (Chernev et al, 2015) to assess choice overload, results of this research suggest the existence of choice overload. In particular, in contrast to the majority of studies taking place in the U.S, this study provides supporting evidence for the European context.

Assessing the degree to which each of the four treatment groups suffer from experiences of choice overload, this study is to build a theoretical basis for effective pension plan design in Europe. This ultimately aims at enabling people to choose autonomously without posing a threat to their retirement position.

## *5.4 Managerial implications*

Results of this research provide several suggestions for European pension plans.

Due to the call for increased autonomy, pension plans reforms towards granting each individual more choice are considered. However, results of this research show that the phenomenon of choice overload indeed exists and may cause people to take ineffective decisions, having a suboptimal impact on their retirement position.

In order to ensure a stable life for every individual during retirement, findings of this research are to help European pension plans anticipate problems with choice overload and minimize its impact by means of effective pension plan design.

Investigating the size of the choice set, in this case results show that an increased number of options are not for the good of people, which is why the choice set size should be restricted to a certain extent. In context of this study, which particularly tested the asset allocation decision, people facing an assortment of 5 options suffered significantly less from choice overload than people facing an assortment of 10 options. As a consequence, choice offered to participants should be kept to just a few options.

Also, results still hold when controlling for prior preferences. This is to say that, no matter what level of preferences people have prior to the decision, still the decision should be restricted in order to avoid feelings of choice overload and suboptimal outcomes.

Concerning the assortment type, this research proposes to keep options simple. Instead of variations along different attributes, requiring abstract and difficult trade-offs, options should be just varying on one attribute. This is to facilitate comparisons among the options and therewith simplify choice overall.

Specifically addressing the decision concerning how to allocate assets, it is proposed to offer participants a choice set of five options, just varying on one dimension, namely

risk. This is to say that, following the advice of van Binsbergen et al (2014), all options should be passively managed index funds, due to diversification and a low fee structure. Lastly, this research supports the notion that the choice of the default option is critical to an effective pension plan design. In order to be effective, but still not take too much risk, research proposes an equity exposure of about 30%. Still it is important to promote autonomous choice, as the default option is not optimized for each individual.

## *5.5 Limitations and further research*

Just like other papers do, also this research faces some limitations.

Firstly, due to the limited scope of this paper, it has to exclusively rely on non-probability sampling techniques. As a consequence, the sample population cannot be assumed representative for the whole population and one has to be careful when generalizing the results. In order to still be able to interpret results and formulate recommendations, the demographic data of the sample have been investigated in more detail, showing that the sample is biased towards younger age groups.

Further research could address this issue by reproducing this research, making use of probability sampling techniques to ensure having a representative sample at hand and valid generalizations.

Secondly, consisting of 169 units and thereby fulfilling conditions for being able to assume a normally distributed sample size, the sample is still relatively small. For testing the robustness of the results, replications of the study should not just consider probability-sampling techniques but also increase the sample size.

An additional limitation to the study is that the choices people take are just hypothetical in nature. This means that participants choosing their asset allocation strategy do not

face real consequences for their decision. Consequently the study lacks providing people an incentive to choose the way they would being in this situation in reality. In other words, people may choose an option without being convinced that this is the optimal one. This might also be the reason why I observe such a low frequency of choice deferral and no statistical effect could be found. Therefore it is advised to provide certain incentives for the people taking a choice to ensure they take the experiment seriously and the way they would being in this situation.

Lastly, this research is focussed on the asset allocation decision as well as on the factors of assortment size and assortment type. However, on the one hand there are many more decisions to take when specifying settings for retirement and on the other hand research provides additional factors, which may potentially have an impact on the occurrence of choice overload. So future research should check the impact of other factors on choice overload and also consider testing them on different decision contexts.

# *6. Conclusion*

For concluding the paper, this section is to provide an answer to the problem statement of this research, stated in section one. In order to do so, I start by relating the results to the sub questions; the main problem statement has been splitted in.

Regarding sub question one, it can be stated that research has found mixed results (Scheibehenne et al, 2010), some stating that people are able to choose the option that provides highest utility to them, while others observe the contrary. According to the results of this paper, people in the European context are proven to suffer from choice overload, as choices get increasingly complex. So given complex decision contexts, individuals cannot be considered effective decision makers.

Proceeding to sub question two, this research finds that an increasingly large choice set induces increased task complexity and a higher probability for suffering from choice overload. While the frequencies of the default choice as well as choice deferral for assessing choice overload do not provide significant evidence (maybe due to the lack of real world consequences as stated in limitations), a decreased satisfaction with the finally chosen option hint at the occurrence of the phenomenon for participants facing the large choice set as compared to the small one. Thus, as the number of offered options increases, feelings of choice overload likely increase. Therefore people are not able to carefully evaluate and pick the option that provides most utility to them from a rational point of view.

Sub question 3 dealing with the affect of assortment type on participants' choice can be answered in a similar way. Again choice deferral does not hint at choice overload, which may be due to the hypothetical characteristic of the study. However, assessing frequencies of the default choice as well as examining the level of satisfaction with the

chosen option support the theory of non-alignable assortments increasing the probability for choice overload as compared to alignable assortments.

Fourth, including the degree to which people have already formed preferences prior to a decision does not change the original relationship between assortment size and post-choice satisfaction. In other words, regardless of people's existing level of preferences, an increasing assortment size increases the probability for cognitive overload and thereby choice overload.

Having addressed the four sub questions, a combination of the answers can lend a response to the overall problem statement, which is: *In which ways can effective pension plan design influence participants' experiences of choice overload?* Results of this study show that, disregarding the level or preferences people already have established prior to a decision, pension plans are to take care concerning assortment size as well as assortment type offered to their participants. The number of options should be reasonably small, so that people's choice is restricted to a number of preselected and efficient options. Moreover, the options should be alignable, so just differing on one dimension for keeping decision complexity low due to the limited cognitive capacity of people. In the case of asset allocation, it is proposed to offer several passively managed index funds just varying on the risk dimension. So people only have to select an option according to their risk preference, keeping the choice process simple and increasing probability for efficient decisions.

# *Appendix 1: Treatment Groups*

***Treatment Group: Small Number/ Alignable***

| | ***Option 1*** |
|---|---|
| Asset mix: | 20% Equity, 70% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| | ***Option 2*** |
|---|---|
| Asset mix: | 35% Equity, 55% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| | ***Option 3*** |
|---|---|
| Asset mix: | 50% Equity, 40% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| | ***Option 4*** |
|---|---|
| Asset mix: | 65% Equity, 25% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| | ***Option 5*** |
|---|---|
| Asset mix: | 80% Equity, 10% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

***Treatment Group: Small Number/ Non-Alignable***

| | ***Option 1*** |
|---|---|
| Asset mix: | 20% Equity, 70% Bonds, 10% Other |
| Geographic information: | Invested in Europe |
| Industry sector: | Diversified |
| Management: | Active |
| Management fee (yearly): | 1,2% |
| Minimum Initial Investment: | € 410 |

| | ***Option 2*** |
|---|---|
| Asset mix: | 35% Equity, 55% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,2% |
| Minimum Initial Investment: | € 590 |

| | ***Option 3*** |
|---|---|
| Asset mix: | 50% Equity, 40% Bonds, 10% Other |
| Geographic information: | Invested in the U.S. |
| Industry sector: | Diversified |
| Management: | Active |
| Management fee (yearly): | 0,9% |
| Minimum Initial Investment: | € 440 |

| ***Option 4*** | |
|---|---|
| Asset mix: | 65% Equity, 25% Bonds, 10% Other |
| Geographic information: | Invested in Europe |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,5% |
| Minimum Initial Investment: | € 560 |

| ***Option 5*** | |
|---|---|
| Asset mix: | 80% Equity, 10% Bonds, 10% Other |
| Geographic information: | Invested in the U.S. |
| Industry sector: | Diversified |
| Management: | Moderate |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

***Treatment Group: Large Number/ Alignable***

| ***Option 1*** | |
|---|---|
| Asset mix: | 20% Equity, 70% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 2*** | |
|---|---|
| Asset mix: | 27% Equity, 63% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 3*** | |
|---|---|
| Asset mix: | 33% Equity, 57% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 4*** | |
|---|---|
| Asset mix: | 40% Equity, 50% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 5*** | |
|---|---|
| Asset mix: | 47 % Equity, 43% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 6*** | |
|---|---|
| Asset mix: | 53% Equity, 37% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 7*** | |
|---|---|
| Asset mix: | 60% Equity, 30% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 8*** | |
|---|---|
| Asset mix: | 67 % Equity, 23% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 9*** | |
|---|---|
| Asset mix: | 73% Equity, 17% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

| ***Option 10*** | |
|---|---|
| Asset mix: | 80% Equity, 10% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 500 |

***Treatment Group: Large Number/ Non-Alignable***

| | ***Option 1*** |
|---|---|
| Asset mix: | 20% Equity, 70% Bonds, 10% Other |
| Geographic information: | Invested in Europe |
| Industry sector: | Diversified |
| Management: | Active |
| Management fee (yearly): | 1,3% |
| Minimum Initial Investment: | € 320 |

| | ***Option 2*** |
|---|---|
| Asset mix: | 27% Equity, 63% Bonds, 10% Other |
| Geographic information: | Invested in the U.S. |
| Industry sector: | Diversified |
| Management: | Active |
| Management fee (yearly): | 1,0% |
| Minimum Initial Investment: | € 370 |

| | ***Option 3*** |
|---|---|
| Asset mix: | 33% Equity, 57% Bonds, 10% Other |
| Geographic information: | Invested in the U.S. |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,4% |
| Minimum Initial Investment: | € 630 |

| | ***Option 4*** |
|---|---|
| Asset mix: | 40% Equity, 50% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,1% |
| Minimum Initial Investment: | € 680 |

| ***Option 5*** | |
|---|---|
| Asset mix: | 47% Equity, 43% Bonds, 10% Other |
| Geographic information: | Invested in Europe |
| Industry sector: | Diversified |
| Management: | Moderate |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 570 |

| ***Option 6*** | |
|---|---|
| Asset mix: | 53% Equity, 37% Bonds, 10% Other |
| Geographic information: | Invested in Europe |
| Industry sector: | Diversified |
| Management: | Active |
| Management fee (yearly): | 1,1% |
| Minimum Initial Investment: | € 430 |

| ***Option 7*** | |
|---|---|
| Asset mix: | 60% Equity, 30% Bonds, 10% Other |
| Geographic information: | Diversified |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,3% |
| Minimum Initial Investment: | € 650 |

| ***Option 8*** | |
|---|---|
| Asset mix: | 67 % Equity, 23% Bonds, 10% Other |
| Geographic information: | Invested in the U.S. |
| Industry sector: | Diversified |
| Management: | Moderate |
| Management fee (yearly): | 0,7% |
| Minimum Initial Investment: | € 350 |

| ***Option 9*** | |
|---|---|
| Asset mix: | 73% Equity, 17% Bonds, 10% Other |
| Geographic information: | Invested in Europe |
| Industry sector: | Diversified |
| Management: | Passive |
| Management fee (yearly): | 0,4% |
| Minimum Initial Investment: | € 590 |

| ***Option 10*** | |
|---|---|
| Asset mix: | 80% Equity, 10% Bonds, 10% Other |
| Geographic information: | Invested in the U.S. |
| Industry sector: | Diversified |
| Management: | Active |
| Management fee (yearly): | 1,0% |
| Minimum Initial Investment: | € 410 |

# *Appendix 2: Investment explanation*

***This is the description before taking an investment choice.***

*If necessary, please have a look at the following explanations:*

***Asset mix:*** *There are different classes of investment opportunities. In general, equity investments (stocks) are considered to be riskier than bonds.*

***Management:*** *This indicates the trading frequency. How much of your portfolio is sold and reinvested in other stocks/bonds each year?(categories: active=more than 70%; moderate=15%-70%; passive=less than 15%)*

***Management fee:*** *The amount of money you have to pay for the management service (measured in percentage of money invested).*

***Please choose the most appropriate option now.***

# *Appendix 3: Questionnaire*

*Post-Choice Satisfaction (Scheibehenne, Todd & Greifeneder, 2009)*
*(Cronbach's alpha=0,825)*

-In comparison with other options you could have picked, how satisfied are you with the option you chose? (1:very satisfied; 7:not at all satisfied)
-In comparison with other investments you know, how satisfied are you with the option you chose? (1:very satisfied; 7:not at all satisfied)
-Do you like the option you chose? (1:like it very much; 7:do not like it at all)
-Did you enjoy making your decision? (1:enjoy it very much; 7:do not enjoy it at all)

*Post-Choice Regret (Scheibehenne et al, 2009) (Cronbach's alpha=0,789)*
-Do you regret your choice? (1:very much regret; 7:not regret at all)
-Do you think that a different option from that assortment would have been better than the one you chose? (1:rather not; 7:probably yes)
-If you could repeat the choice, would you choose the same option again? (1:rather not; 7:probably yes)

*Perceived Choice Difficulty (Scheibehenne et al, 2009) (Cronbach's alpha=0,879)*
-How hard/easy was it for you to make a choice? (1:very easy; 7:very hard)
-How exhausting was it for you to choose an option? (1:not at all exhausting; 7:very exhausting)
-Did you experience the choice process as frustrating? (1:not at all frustrating; 7:very frustrating)

*Prior Preferences and Expertise (Scheibehenne et al, 2009) (Cronbach's alpha=0,838)*
-In general, how much do you like to invest? (1:like it very much; 7:do not like it at all)
-In general, how often do you take investment decisions? (1:daily; 7:never)
-How knowledgeable are you about investing? (1:know a whole lot; 7:do not know anything)

*Risk Preference (Dohmen et al, 2011)*

How willing are you to take risks, in general? (1:take a lot of risk; 10:do not take any risk)

*Financial Literacy (Lusardi & Mitchell, 2006)*

Suppose you had €100 in a savings account and the interest rate was 2% per year. After 5 years, how much do you think you would have in the account if you left the money to grow: more than €102, exactly €102, less than €102?

Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, would you be able to buy more than, exactly the same as, or less than today with the money in this account?

Do you think that the following statement is true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund."

*General Information*

What is your gender? (1:male; 2:female)

What is your age? (1:under 15 years; 2:15-24 years; 3:25-34 years; 4:35-44 years; 5:45-54 years; 6:55-64 years; 7:65 years and over)

What is your marital status? (1:never married; 2:divorced; 3:widowed; 4:married)
Do you have children? (1:yes; 2:no)

What is your highest level of education? (1:High school or less; 2:Bachelor's degree; 3: Graduate degree or more)

What is your current work status? (1:employed full time; 2:employed part time; 3:unemployed looking for work; 4:unemployed not looking for work; 5: retired; 6:student)

How many hours do you work a week? (1:0-15; 2:16-30; 3:31-45; 4:more than 45)
What is your net monthly household income? (1:€0-1.000; 2:€1.001-2.000; 3:€2.001-3.000; 4:€3.001-4.000; 5:€4.001-5.000; 6:€5.001-6.000; 7:more than €6.000)

Do you already have a retirement product like for instance life insurance or Riester pension? (1:yes; 2:no)

If yes, could you yourself decide on how much risk should be taken? (1:yes; 2:no)

# *Appendix 4: Factor Loadings Including All Constructs*

| | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| Post-choice satisfaction 1 | 0,895 | | |
| Post-choice satisfaction 2 | 0,875 | | |
| Post-choice satisfaction 3 | 0,853 | | |
| Post-choice satisfaction 4 | 0,357 | | |
| Post-choice regret 1 | 0,614 | | |
| Post-choice regret 2 | 0,546 | | |
| Post-choice regret 3 | 0,494 | | |
| Choice difficulty 1 | | 0,979 | |
| Choice difficulty 2 | | 0,767 | |
| Choice difficulty 3 | | 0,740 | |
| Prior preferences 1 | | | 0,852 |
| Prior preferences 2 | | | 0,849 |
| Prior preferences 3 | | | 0,725 |

# *Appendix 5: Factor Loadings Adjusted*

| | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| Post-choice satisfaction 1 | 0,905 | | |
| Post-choice satisfaction 2 | 0,830 | | |
| Post-choice satisfaction 3 | 0,768 | | |
| Choice difficulty 1 | | 0,971 | |
| Choice difficulty 2 | | 0,765 | |
| Choice difficulty 3 | | 0,753 | |
| Prior preferences 1 | | | 0,834 |
| Prior preferences 2 | | | 0,833 |
| Prior preferences 3 | | | 0,737 |

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