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Saving for a Better Retirement: How Risk Attitudes Affect Choice of Retirement Scheme

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Abstract

Over 3 million people in Hong Kong and 21 million people in the UK are saving for retirement under the mandatory provident fund and individual savings account schemes, respectively. Yet, we know little about how individual preferences, such as risk attitudes (risk-seeking and risk-averse) that are known to impact highly consequential decisions in a variety of real-world contexts, impact retirement investment choices. In two experimental studies (Study 1—Hong Kong sample and Study 2—United Kingdom sample), we show that personal risk attitudes were a strong predictor of the profile of retirement investment portfolios. Specially, risk-averse people allocated more of their savings to low-risk funds than risk-seeking people. The pattern of findings is consistent in both Hong Kong mandatory and the UK

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voluntary retirement investment schemes. These findings are considered in light of policy decisions made in Hong Kong retirement and UK pension schemes.

Keywords

Retirement saving, risk attitude, experiments, investment choices, decision-making, Hong Kong, UK

Introduction **AQ1**

Imagine that you have taken a new job and have just moved to a new country. There you find that a mandatory retirement scheme is in place. You face the unenviable task of navigating your way through a long detailed brochure to decide which of the different funds you want your money invested in, each of which carries different levels of risk. You also think about the fact that you tend not to like taking many risks, and so remind yourself to carefully read about the options and avoid a risky investment fund.

In fact, it is quite likely that many people in Hong Kong will face a situation just as the one described when faced with the mandatory provident fund (MPF). The MPF scheme is designed to protect a growing aging population by making sure that the current workforce is better prepared for their retirement (Wong, 2014; Yu, 2008). Up to the first quarter of 2016, 2.78 million Hong Kong residents are protected by this scheme (Mandatory Provident Fund Schemes Authority, 2016). In judgment and decision-making literature, this would constitute a situation in which investment preferences will vary, and possibly as a result of risk attitudes.

If indeed it is the case that personal preferences drive what people choose, this raises two unexplored empirical issues: (1) Do people rely on personal preferences, such as risk attitude, to inform their retirement investment decisions? (2) Are the influences of risk attitudes on choice behavior similar across different retirement investment contexts? To explore these questions, we consider two contrasting schemes by examining choice behavior in a Hong Kong (HK) sample (Study 1) and a United Kingdom (UK) sample (Study 2). The MPF in HK is a mandatory scheme. A popular retirement saving scheme in the UK is the individual savings account (ISA). It is a voluntary scheme (H M Revenue & Customs, 2013b, 2016).

To achieve the empirical objective of this project, the research questions are addressed using conventional judgment and decision-making tools from psychology. By taking this approach, our second objective is to reveal practical findings that will also have significant implications for policy makers and financial service providers. If individual differences in risk attitudes influence choice behavior in this context, then this might suggest that a one-size-fits-all investment retirement savings scheme may not be the optimal approach for the HK and UK government to take (Johnson, Hassin, Baker, Bajger, & Treuer, 2013).

MPF or ISA choices and individual risk attitude

The decision-making environment in retirement investment involves more than one single dimension (e.g., whether to/or not invest in one financial product). People will have to decide on *whether* and *how much* they want to contribute to different MPF or ISA choices. In the context of retirement saving, the stakes are high, and people will need to live with the financial consequences, which will have an impact on the quality of their retirement life. As a result, it is likely that people will be sensitive to the risks associated with various investment options.

Different MPF or ISA choices involve different levels of risk (Wong, 2014). Take the MPF market as an example, in which the MPF conservative fund is a less risky choice than an equity fund. So, it is likely that people will have a particular preference for one investment choice over another (Barasinska, Schafer, & Stephan, 2012; Weber & Milliman, 1997). In this context by preferences, we mean that one is more attracted to a particular fund, compared with other funds available in the market. However, to date, the research field knows little about the relationship between risk preference and investment choice in retirement savings schemes. The present study investigates whether individual preference determines the decision for allocating savings to different retirement products that carry different levels of risk.

Within the expected utility framework, risk attitude is a label that describes the shape of an individual's utility function in a specific context (Kahneman & Tversky, 1979). Individuals are referred to as risk-averse, risk-seeking, or risk-neutral, depending on their preference for one of the two choices with the same expected value. Suppose that Matt, Susan, and Dave are facing two choices: Choice A generates a sure gain of \$10 and Choice B is a gamble; for Choice B, there is a 50% chance of winning nothing and a 50% chance of winning \$20. In terms of expected value, Choices A and B are identical. Say, Matt prefers Choice A to Choice B because he does not want the risk of receiving nothing. In this context, he is risk-averse. Susan wants to go for Choice B, reasoning that it might give her a higher payoff than the sure gain, and so is risk-seeking. Dave is indifferent between these two choices, and they look identical to him, and so he is said to be risk-neutral. In the present research, when determining a person's risk attitude in an investment context, we take cues from the classic expected utility framework. However, it is important to note that theoretically, risk attitude is a continuum through which one person could be more or less risk-averse (or risk-seeking) than another (MacCrimmon & Wehrung, 1990; Weber & Milliman, 1997).

In the context of financial decision-making, a large body of research has shown that people's risk attitude affects their financial portfolios and activeness in trading (Barasinska et al., 2012; Fellner & Maciejovsky, 2007; Weber & Milliman, 1997; Wong, 2014). For example, a survey in Germany showed that risk-averse private investors tend to hold risk-free assets in their investment portfolios (Barasinska et al., 2012). Outside of work of this kind, there is no

prior work that has taken risk attitude into account in retirement savings. Thus, our work will be the first of its kind to provide insights into the relationship between individuals' risk attitudes and retirement investment, by categorizing individuals into one of the three descriptive labels discussed above. We will explore how one's risk attitude determines investment portfolio in HK (Study 1) and the UK (Study 2).

More specifically, our research focuses on people's contributions to five funds that vary in risk levels in both HK and the UK settings. The major difference between the two settings is that the HK MPF is a mandatory retirement scheme while the UK ISA is a voluntary scheme. Our empirical findings will allow for an examination of the importance of risk attitude in both mandatory and voluntary schemes.

Study 1 explores the relationship between the risk attitude of individuals in Hong Kong and their propensity to invest in high-risk and low-risk MPF products. But, the probability associated with gains and losses of a MPF product is usually not given; therefore, it is very difficult for novice investors to compute the expected return of the funds. In light of this, we predict that people's risk attitude in investment is reflected in the pattern of how they allocate their savings to MPF funds with different risk exposure. Some might have a tendency to invest more in riskier funds while others might not. Our speculation is that people's decisions in retirement investment are driven by their risk attitude. Specifically, risky funds are more attractive to risk-seeking individuals. Risk-averse individuals, on the other hand, are likely to invest more of their savings in lower risk products. Since risk-neutral individuals neither love nor hate risk, we speculate that risk-neutral individuals tend to invest more (less) in riskier funds than risk-averse (risk-seeking) individuals do. Although the relationship between risk attitude and investment portfolio seems plausible and intuitive, this has not been empirically examined in retirement saving.

Hypothesis 1a: The MPF investment portfolio of risk-seeking individuals shows higher levels of risk exposure than that of risk-averse individuals.

Hypothesis 1b: The MPF investment portfolio of risk-seeking individuals shows higher levels of risk exposure than that of risk-neutral individuals.

Hypothesis 1c: The MPF investment portfolio of risk-neutral individuals shows higher levels of risk exposure than that of risk-averse individuals.

Study 1: MPF retirement investment

Study 1 was designed to test the hypothesis regarding how risk-averse and risk-seeking individuals differ in their MPF investment portfolios.

Method

Study 1 presented a realistic MPF investment opportunity that most Hong Kong residents would encounter. To increase external validity, the task mirrored the financial characteristics of MPF funds available in the market in terms of variety and risk levels (American International Assurance Company (Trustee) Limited, 2012; Fidelity Worldwide Investment, 2014). There were a total of five MPF funds in which participants decided whether and how much they would invest. These were: MPF conservative fund, global bond fund, balanced fund, European equity fund, and China equity fund. Given the mandatory nature of MPF, participants needed to select the desired MPF fund(s) and contributed a total of \$1500 Hong Kong dollars monthly (or 5% of their salaries). The inclusion of MPF conservative fund in our research complies with the current MPF regulation that a conservative fund must be available.

Some research contends that different people may possess different risk perceptions in the same scenario (Figner & Weber, 2011). The same MPF fund may be perceived more (or less) risky by different individuals. Thus, we controlled the perceived risk levels of MPF funds, using a standardized risk index. An index from 1 to 5 was adopted whereby 1 presented lowest risk MPF fund and 5 was the highest risk fund. This risk index, although arbitrary (similar to the information provided by the MPF providers), provided a relative risk level (American International Assurance Company (Trustee) Limited, 2012); this is to ensure that perceived risk of MPF funds is controlled such that the equity fund is considered riskier than the global bond.

Participants. We recruited 210 participants through Qualtrics and 20 participants from Hang Seng Management College, Hong Kong. The median time taken in this study was 9.98 minutes. Thirty-three participants, who spent less than one third of the median time in the study, were considered as “speeders” and excluded from our analyses. Participants who failed the attention tests in the experiment were also excluded. The remaining 194 cases were analyzed (45.9% female). We developed both Chinese and English versions; 36.7% of the participants took part in the Chinese version, and 73.3% had at least a Bachelor degree. The mean age was 34.7 years ($SD = 10.60$). Participants received a fixed payment from Qualtrics in exchange for their participation. All participants were making MPF contributions at the time of study and had contributed to MPF in the past three years.

Procedure. Participants were first asked to complete demographic questions and to indicate their experience in MPF investment. To ensure that participants understood risk indices of MPF funds, they were asked to complete a short quiz that tested their understanding of relative risk levels of funds. They were also given general information about MPF system, including the mandatory

nature of MPF, the amount to be invested each month, etc. Before taking part in the MPF investment task, participants completed a questionnaire that elicited information about their risk attitude in the investment context.

Risk attitude. Research on risk attitude has indicated people do not consistently possess the same risk preference across different contexts (Figner & Weber, 2011; Weber, Ann-Rene, & Betz, 2002). We thus measured participants' risk attitude in an investment context by revealed choices. Participants were presented the following scenario:

Imagine that you have a lump sum of savings in your bank account and you are prepared to invest ALL of your savings. Having looked around at what is on offer and what works for you, you come down to two different options: 1. Buying government bonds - this guarantees a fixed return of \$10,000 in one year. 2. Buying stock of Company ABC - there is no guarantee of a return. There is a 50% chance that it may do well in the financial market and will give you a \$20,000 return in one year. There is a 50% chance that the stock value stays the same and it generates \$0 return in one year. The way the options are set up, you can only pick one of the two, you can't pick both. So, which one of these two options will you go for? Note that there is no right or wrong answer.

Participants were asked to indicate their preference for investments with respect to three choices: Government bond (risk-averse), Stock of Company ABC (risk-seeking) or Indifference between the two investment options (risk-neutral). Indicated in the parentheses were the descriptive labels of risk attitudes.

Perceived risk manipulation. To ensure that participants understood what the risk indices represented, "Which of the following MPF fund(s) generates the highest potential profit?" Before they proceeded to the MPF investment task all participants had to correctly indicate the highest and lowest risk funds based on the given risk indices.

Dependent measures

MPF decision and risk exposure of MPF portfolio. Facing five different MPF funds, participants needed to allocate their savings (in percentage). Participants were allowed to invest in one or more of the five funds. Say, entering a 0% in European equity fund indicated that the participant made no investment in this choice. Conversely, contributing 100% to European equity fund suggested that the participant decided to invest only in this fund. The summed MPF contributions had to be equal to 100%.

To empirically test the relationship between risk attitude and MPF saving, we measured the risk exposure of overall MPF investment portfolio for each

participant using the standardized risk index. The participants who invested more of their savings in risky MPF products would receive a higher score. For instance, if one invested 40% in MPF conservative fund, 20% in balanced fund and 40% in European equity fund, the overall risk profile would be $0.4*1 + 0.2*3 + 0.4*4 = 2.6$. The highest possible score would be 4 whereas the lowest score would be 1.

Results and discussion

Risk attitude and MPF portfolio. Of the 194 participants in the study, 94 were risk-averse individuals, 69 risk-seeking and 31 risk-neutral individuals. We performed the ordinary least squares regressions (OLS) with risk exposure of MPF portfolio as the dependent variable, and risk attitude, gender (0 = female, 1 = male), education (0 = not a degree holder, 1 = degree holder) and age as independent variables. Two dummy variables were created for the risk attitude variable: risk-seeking (0 = not risk-seeking, 1 = risk-seeking) and risk-neutral (0 = not risk-neutral, 1 = risk-neutral). The base reference category was risk-averse participants. Table 1 displays the results of the OLS-regression. The regression model accounted for 13.6% of the variance in the risk exposure of MPF portfolio, $F(1,178) = 5.462$, $p < .0005$.

Hypothesis 1a predicted that risk-seeking participants should allocate more of their MPF contributions to relatively high-risk funds than risk-averse participants. A one-way ANOVA showed a significant effect of risk attitude on the risk exposure of MPF portfolios, $F(2,191) = 6.592$, $p < 0.01$. As indicated in Table 2,

Table 1. Ordinary least squares regression on MPF risk exposure.

Variable	Coefficient	SE	t-statistic	Probability
Constant	253.539	20.852	12.159	<0.0005
Gender	-15.697	9.953	-1.577	0.117
Age	0.022	0.480	0.045	0.964
Risk-seeking	32.628	11.258	2.898	0.004
Risk-neutral	23.342	13.729	1.700	0.091
Degree holder	43.223	11.934	3.622	<0.0005
R^2	0.136	Mean dependent variable		295.8660
Adjusted R^2	0.111	SD dependent variable		70.73421
Durbin-Watson statistic	2.087	SE dependent variable		5.07842
F-statistic	5.462	Probability (F-statistic)		<0.0005

Note. Dependent variable: MPF risk exposure. The base reference category for risk-seeking and risk-neutral dummy variables was risk-averse.

Table 2. Means and standard deviations of MPF or ISA risk exposure (Study 1 and Study 2).

Variable	Risk-averse	Risk-neutral	Risk-seeking
MPF risk exposure	278.532 _a (76.124)	299.194 _{ab} (71.695)	317.986 _b (55.595)
ISA risk exposure	184.429 _c (94.061)	216.496 _c (120.779)	285.430 _e (129.074)

Note. MPF: mandatory provident fund; ISA: individual savings account. Subscripting is based upon comparisons of means using pairwise contrasts; different subscripts indicate means differ at $p < .05$ or less (e.g., MPF risk exposure of risk-averse participants are given the subscript "a" and it is significantly different to that of risk-seeking participants given subscript "b").

a planned contrast revealed that risk-seeking participants' MPF portfolios had higher risk exposure than those of risk-averse participants, $t(191) = 3.619$, $p < 0.0005$, $d = 0.58$. The finding lends support to Hypothesis 1a. However, pairwise contrasts showed no differences in risk exposure between risk-seeking and risk-neutral participants, $t(191) = 1.264$, $p = 0.104$, and between risk-averse participants and risk-neutral participants, $t(191) = 1.451$, $p = 0.075$. Hypotheses 1b and 1c did not receive support.

The regression model showed very similar findings: controlling for other independent variables, risk-seeking participants' MPF portfolios showed significantly higher risk exposure than those of risk-averse participants, $\beta = 32.628$, $t(177) = 2.898$, $p < .005$, 95% CI [10.408, 54.848]. No effects of age and gender were found, $t(177) = 0.045$, $p = .964$; $t(177) = -1.577$, $p = .117$. When controlling for other independent variables, participants with a degree, compared to those without a degree, tended to show higher risk exposure in their MPF portfolio, $\beta = 43.223$, $t(177) = 3.622$, $p < .0005$, 95% CI [19.668, 66.777]. We suggest that individuals' risk attitude (risk-averse vs. risk-seeking) shapes their decisions in the choice of high-risk and low-risk MPF products. Risk-seeking (risk-averse) participants tended to allocate higher (lower) proportions of their savings to relatively high-risk MPF products, compared to risk-averse (risk-seeking) participants. Although the mean risk exposures among participants with different risk attitude were in the direction as we predicted, risk-neutral participants' risk exposure did not significantly differ from those of risk-averse and risk-seeking participants.

Study 2: ISA retirement investment

Study 2 was designed to consider the retirement saving scheme: Individual Saving Accounts (ISAs) in the UK. ISA is a voluntary retirement saving scheme while MPF works in a mandatory fashion. To generalize our findings from Study 1, it is worth examining risk attitude in a retirement scheme that works on a voluntary basis. We are uncertain as to whether similar patterns found in Study 1 will hold in a voluntary setting. Study 2 investigates the

relationship between individuals' risk attitudes and the risk exposure of their ISA investments. If the patterns of findings are different between Study 1 and Study 2, the differences might speak to the nature of the retirement scheme (voluntary vs. mandatory) or cultural differences. However, it is important to note that the latter factor was not the central focus of the present study.

Like MPF, the relative risk level of ISA funds is made available to the public in the UK. **IAQ2** In each financial year, people may invest up to £15,000, and they may invest in either or both cash ISA and stock ISA (REF). As in Study 1, we examine individual risk attitude.

Risk attitude is one of the determinants in the context of retirement saving. Again, we expect that an ISA product with low risk (e.g., cash ISA) appeals more to risk-averse than to risk-seeking people. Conversely, relatively higher risk ISA products such as FTSE tracker and equities are more to the risk-seekers' tastes.

Hypothesis 2a: Risk-seeking individuals' ISA portfolios tend to show higher risk exposure than those of risk-averse individuals.

Hypothesis 2b: Risk-seeking individuals' ISA portfolios tend to show higher risk exposure than those of risk-neutral individuals.

Hypothesis 2c: Risk-neutral individuals' ISA portfolios tend to show higher risk exposure than those of risk-averse individuals.

Method

Study 2 adopted a realistic ISA investment scheme to which UK residents contributed. It provided a number of ISA choices with different risk levels in the decision task. The five ISA choices were: Cash ISA, UK government bond, FTSE tracker, European equities and emerging markets equities. These ISA choices were chosen because they are commonly offered by the ISA service providers (Fidelity Worldwide Investment, 2014; Santander, 2014; Virgin Money, 2014). Participants may invest up to £15,000 in a financial year or as little as nothing. As in Study 1, we controlled the perceived risk levels of various ISA products, using a risk index. This is to ensure that perceived risk of ISA products is controlled such that FTSE tracker was considered to be riskier than the government bond. As in Study 1, an index from 1 to 5 was adopted whereby 1 presented lowest risk ISA product and 5 was the riskiest ISA product.

Participants. We recruited one hundred and fifty-five participants through Qualtrics. The median time taken in this study was 11.9 minutes. Four participants spent less than one third of the median time in the study, and were

considered as “speeders” and therefore excluded from our analyses. Participants who failed the attention tests in the experiment were also excluded. The remaining 151 cases were analyzed (45.0% female). 64.0% had at least a Bachelor degree. The mean age was 44.7 years ($SD = 10.50$). Participants received a fixed payment from Qualtrics in exchange for their participation. 93.4% of participants were making ISA contributions at the time of study and 94.7% had contributed to ISA in the past three years.

Procedure. As in Study 1, before proceeding to the ISA allocation task, participants were required to complete a short quiz that tested their understanding of risk indices. They were also given general information about ISA scheme such as the yearly ISA allowance and the difference between cash ISA and stock ISA. Preceding the allocation task, participants were asked to show preferences between two investment products that tested their risk attitudes.

Risk attitude. We adopted the same assessment of individuals’ risk attitudes as in Study 1, prior to the ISA allocation task. Based on participants’ preferences between risk-free and risky investment products, they were labeled as risk-averse, risk-seeking, or risk-neutral.

Dependent measures

ISA decision and risk exposure of ISA investment. Facing five different ISA choices, participants needed to allocate their savings to a number of funds. Participants were allowed to invest in one or more of the five funds and the maximum allowance was £15,000 (H M Revenue & Customs, 2013a). To better reflect participants’ investment in ISA, percentages of their savings allocated to different ISA products were computed. Using absolute amounts may distort the findings as participants may differ in how much they earned and in turn how much they allocated to an ISA fund.

We measured the risk exposure of overall ISA investment portfolio for each participant, using the standardized risk index. The participants who invested more in low-risk ISA products (e.g., cash ISA) would receive a lower score than those who invested less in low-risk ISA products. In an extreme case where a participant invested all their money in the riskier ISA product, he or she would receive a score of 5; the lowest score would be 1.

Results

Risk attitude and ISA portfolio. Among the 151 participants tested in Study 2, 145 participants made an investment in ISA. 86 were classified as risk-averse, 31 risk-seeking and 28 risk-neutral individuals. As in Study 1, an OLS regression model was used with age, education, risk- attitude and gender as independent variables.

Table 3. Ordinary least squares regression on ISA risk exposure.

Variable	Coefficient	SE	t-statistic	Probability
Constant	119.049	46.078	2.584	0.011
Gender	63.225	18.048	3.503	0.001
Age	0.208	0.865	0.240	0.810
Risk-seeking	86.082	22.349	3.852	<0.0005
Risk-neutral	26.629	22.643	1.176	0.242
Degree holder	35.583	19.800	1.797	0.075
R^2	0.210	Mean dependent variable		211.0102
Adjusted R^2	0.181	SD dependent variable		113.40445
Durbin-Watson statistic	2.330	SE dependent variable		9.29045
F-statistic	7.130	Probability (F-statistic)		<0.0005

Note. Dependent variable: ISA risk exposure. The base reference category for risk-seeking and risk-neutral dummy variables was risk-averse.

The dummy variables were coded as in Study 1. 21% of variance in the risk exposure of ISA portfolio was explained by the regression model, $F(1,139)=7.130$, $p < .0005$. Table 3 presents the results of OLS-regression with the risk exposure of ISA portfolio as the dependent variable.

We conducted a one-way ANOVA to examine the effect of risk attitude on ISA risk exposure. A significant effect was found, $F(2, 142)=9.851$, $p < .0005$. The results of the contrasts can be found in Table 2. A planned contrast showed that risk-seeking participants tended to choose a riskier ISA investment portfolio ($M=285$) than risk-averse participants ($M=185$), $t(142)=4.434$, $p < .0005$, $d=0.97$. Hypothesis 2a was supported. As predicted by Hypothesis 2b, the risk exposure of risk-seeking participants' portfolio ($M=285$) was significantly higher than that of risk-neutral participants' portfolio ($M=213$), $t(142)=2.456$, $p < .01$, $d=0.56$. Hypothesis 2b received support. The risk exposure of risk-neutral participants' portfolio was not significantly higher than that of the risk-averse participants' portfolio, $t(142)=1.326$, $p=0.094$. The findings did not support Hypothesis 2c.

Similar patterns regarding the effect of risk attitude were found when we controlled for other demographic variables. When regressing risk exposure of ISA portfolio on age, education, risk attitude and gender, we found that risk-seeking participants' ISA portfolios showed significantly higher risk exposure than those of risk-averse participants, $\beta=86.082$, $t(137)=3.852$, $p < .0005$, 95% CI [41.880, 130.284]. The results of OLS-regressions also revealed the relationship between demographic variables and ISA risk exposure. No effects of age and education were found, $t(137)=0.240$, $p=.810$; $t(137)=1.797$, $p=.075$. There was a significant gender effect on ISA risk exposure. Male participants

tended to allocate more of their savings to riskier ISA funds than female participants did, $\beta = 86.082$, $t(137) = 3.503$, $p < .001$, 95% CI [27.529, 98.922].


General discussion

Research on investment behavior has demonstrated that individual differences in risk attitude affect trading activities and the number of assets held (Barasinska et al., 2012; Fellner & Maciejovsky, 2007). The current research addresses the relationship between risk attitude and people's choices in retirement saving, which has not been empirically explored previously. We focussed on the Hong Kong and the UK retirement schemes. These two retirement protection schemes were the MPF in Hong Kong and the voluntary individual savings (ISA) account in the UK respectively.


As predicted, we found that risk-averse and risk-seeking individuals demonstrated very different investment patterns in our experiments. Relatively low-risk MPF and ISA products were more appealing to the risk-averse individuals, while risk-seeking individuals were attracted to relatively high-risk products. Here we would like to raise a methodological point. Although studies have shown that individuals' risk perceptions change across different contexts (Weber et al., 2002; Weber & Milliman, 1997), the risk attitude assessment used in our studies helps predict the risk exposure of people's retirement portfolios. We have demonstrated that revealed choices, elicited by the binary choice of bond and stock, help predict people's decisions and the findings are consistent in both the UK and Hong Kong samples.

The findings from both studies showed that risk-neutral individuals did not appear to take more risk than risk-averse individuals in their retirement investment did. Our studies provided mixed results regarding the difference in risk exposure between risk-seeking and risk-neutral individuals, although the sample means from both studies were in the same direction as our predictions. Past studies that examined the relationship between risk attitude and investment behavior measured the degree of individuals' risk-aversion (Barasinska et al., 2012; Fellner & Maciejovsky, 2007); and risk-neutral individuals were not considered. Our research thus provides a fuller understanding of the differences in investment decisions among risk-averse, risk-neutral and risk-seeking individuals. It is important to note that we had a relatively small number of risk-neutral participants in both studies, though whether a larger sample would impact this pattern of results is hard to speculate on, and would require further study.

Taken together, in both HK and UK experiments, our findings suggest that risk attitude consistently predicts the risk exposure of people's retirement investment portfolios. Despite the different nature of retirement schemes (i.e., mandatory vs. voluntary), as well as the potential range of cultural difference between HK and UK individuals, the results from the two studies are very similar: Risk-seeking individuals' portfolios had higher risk exposure than

those of risk-averse individuals in both mandatory HK (MPF) and voluntary UK (ISA) retirement schemes. Risk attitude is a prominent g factor that determines people's decisions in retirement savings. The robustness of our findings may be explained by some of the similar characteristics in our HK and UK samples (i.e., about 45% female participants and over 60% of participants had a first degree in both studies). Additional evidence is needed to clarify to what extent we can generalize our findings to different countries.

Although the relationship between risk attitude and risk exposure of retirement investment portfolio is clear, there is a *slight* difference in investment choices between UK and HK participants. UK participants tended to invest less in risky products (e.g., equity) than HK participants did. In particular, UK risk-averse participants showed lower risk exposure in the ISA scheme than HK risk-averse participants in the MPF scheme ($M_{UK \text{ risk-averse}} = 185.4$ vs. $M_{HK \text{ risk-averse}} = 274.2$). The same pattern was observed between HK risk-seeking and UK risk-seeking participants ($M_{UK \text{ risk-seeking}} = 285.4$ vs. $M_{HK \text{ risk-seeking}} = 319.7$).

Extant literature on cultural differences sheds light on this trend. Although HK and the UK share some similar gross national incomes (indexed by purchasing parity power) (Harris, Rettie, & Kwan, 2005), there are obvious cultural differences. Hofstede (1991) developed the measures  cultural dimensions, and one of the six indices was uncertainty avoidance (Hofstede, 1991). Hofstede defined uncertainty avoidance as the “*extent to which the members of a culture feel threatened by ambiguous or unknown situations*”. Both Hong Kong and the UK showed a relatively low score on uncertainty avoidance compared to other countries, which indicated lower levels of uncertainty avoidance. However, the UK individuals were relatively less happy with ambiguous situations than the Hong Kong individuals ($UK \text{ score} = 35$ and $HK \text{ score} = 29$) (Hofstede, 1991). While other funds involved uncertainty, the fixed-income funds (e.g., Cash ISA) were more attractive to the UK participants than to HK participants. This may explain why the risk exposure of UK portfolios was lower than that of HK participants. An alternative, plausible explanation is that the amount of contribution in the UK scheme is much larger than that in the HK scheme (£1900 HK scheme vs. £15,000 UK scheme). And, the effect of the retirement scheme nature (mandatory vs. voluntary) is also underexplored. More research is necessary to identify the cause(s) of the relatively low-risk exposure in the UK scheme.

Our data also allowed us to investigate the effects of demographic variables such as gender and education level on the risk exposure of retirement investment portfolio. Along with the past findings (Charness & Gneezy, 2012; Dwyer, Gilkeson, & List, 2002; Neelakantan, 2010; Watson & McNaughton, 2007), Study 2 demonstrated that male participants allocated more of their savings to riskier funds than female participants did. However, no gender differences were found in Study 1. The research that showed gender differences examined

investment behaviors in mutual funds and individual retirement accounts in the United States, which worked on a voluntary basis. Coupling this with the voluntary nature of retirement scheme examined in Study 2, a plausible explanation is that the gender effect is only limited to a voluntary investment environment. It is possible that male and female participants do not differ in mandatory retirement investment. The finding from Study 1 also suggests that degree holders tended to invest more in riskier MPF funds than non-degree holders. This is consistent with past finding suggesting that there is a positive association between education level and risk tolerance (Grable, 2000). Since the p -value for the education effect in Study 2 was 0.075, we suspect that the effect of education level might become significant with a larger sample.

On a practical note, the advice from the present results is that people making retirement investment need to be aware of their own risk preferences and that policy makers should consider its importance when making changes to retirement saving scheme. From 2012, employers in the UK have automatically enrolled all eligible employees into a workplace pension scheme (Department for Work & Pensions, 2008). **IAQ3** Unless employees make an explicit choice, their funds are automatically invested into an investment fund, known as Defined Contribution (DC) workplace pension plans. About 80% of UK employees had their savings invested in the default investment fund in the UK (Byrne, Blake, Cairns, & Dowd, 2007). Recently, the Hong Kong government has implemented a similar MPF default system, known as Default Investment Strategy. If people contributing to MPF do not indicate their investment choices to the MPF provider, the MPF providers will, by default, make investment decisions on their behalf. Under this new default system, there are two MPF funds: one carries high risk and the other low risk. The government contends that younger people, compared to older people, can afford larger risk in retirement investment. As a result, for those aged below 50, all of their contributions will be put in the high-risk fund. After reaching the age of 50, their contributions will be moved to the low-risk fund (Mandatory Provident Fund Schemes Authority, 2017). However, this one-size-fits-all approach, although with two different categories of age, may be inappropriate.

Recent studies have discussed the issues relating to default systems in public welfare and advocated the use of “smart defaults” (Johnson et al., 2013; Smith, Goldstein, & Johnson, 2013). Coupling Johnson’s and his colleagues’ suggestion with our findings, the default MPF scheme may work in an effective manner, and incorporating individual risk attitude would better reflect people’s true preferences. For example, if an individual is assessed to be risk-averse, more of his or her saving to low-risk MPF products will be allocated in the default scheme. In doing so, the service providers require data collected explicitly (e.g., people’s risk attitudes) to generate the computer-made default retirement investment plan. Governing bodies should provide the MPF providers with guidance about people’s risk attitudes can be accurately assessed.

Conclusions

The present research differs from past studies that considered people's behavior in private investment such as in the stock market, which involves examining judgments and decisions as a result of voluntary choices. The innovation of our research is to examine the impact of both mandatory and voluntary settings on retirement investment. The findings from the two experimental studies suggest that risk attitudes affect people's MPF and ISA risk exposure. The pattern of findings in both studies also replicate, and the findings are robust. To that end, the present findings have brought us feel-good and feel-bad news. The good news is that retirement investment decisions are largely determined by people's own risk preference. Risk preference is the prominent factor that determines people's risk exposure in MPF and ISA schemes. The bad news is that people's risk attitudes are not currently considered in some UK pension schemes and Hong Kong MPF default systems. Policy makers should guide how the service providers obtain such information in order to match people's risk profiles. In light of the importance of risk attitude, risk-related information of retirement products (e.g., interest rate, expected return, volatility, etc.) should also be highlighted. We recommend that future research on retirement saving investigates the association between risk attitude and risk exposure of investment portfolios in other countries.

Our research is not free from limitations. The first limitation is that the measurement of risk attitude may have an effect on decision-making in retirement saving. In our experiments, individuals' risk attitudes were assessed but MPF and ISA providers do not do this in real-life situations. Because both of our studies were conducted on an online platform and risk attitudes had been measured prior to the investment tasks, this assessment might have made individuals' own risk preference more salient. That is, when they considered whether guaranteed returns from government bonds or putting money in a stock would reflect their own preference, it may have made them more aware of their true preference of risk than they would have been without this being assessed. Future research should consider this potential effect by measuring individuals' risk attitude *after* completing the MPF or ISA investment task. Nonetheless, we suggest that people need to be fully aware of their own risk attitude so that the retirement investment truly reflects their preferences.

Second, we did not take individual differences into account. Prior studies have shown that personality (e.g., high extraversion) is associated with risk-taking behavior in finance (Nicholson, Soane, Fenton-O'Creedy, & Willman, 2005), and that individual differences in future self-continuity (i.e., the degree to which individuals feel connected and similar to their future self) changes how much people would save (Ersner-Hershfield, Garton, Ballard, Samanez-Larkin, & Knutson, 2009). Future studies should investigate the potential interplay between risk attitude and individual differences in retirement saving.

Finally, we used the measures of cultural dimensions developed by Hofstede (1991) to explain our findings that UK participants were generally more risk-averse than HK participants were. Hofstede's work is seminal, but it was published over 25 years ago. The lack of follow-ups of Hofstede's work may be seen to detract from our explanation of the more risk-averse investment decisions in the UK sample.

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