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Pension fund trustee competence: decision making in problems relevant to investment practice

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Abstract

Government-sponsored inquiries into trustee competence, and legislation regarding the protocols and practice of trustee decision making, have raised questions about the competence of trustees to make investment decisions consistent with the long-term interest of defined benefit pension plan beneficiaries. In this paper, we report the results of an analysis of trustee competence in solving problems relevant to their investment responsibilities. Based upon a set of widely recognized problems drawn from the psychology literature, we assess their discount functions, their willingness to risk their own money and others' money, their appreciation of probability, and their use of evidence to solve problems. For comparison, where appropriate we report the results of the same testing regime applied to a group of Oxford undergraduates. Our goals are fourfold: first, to demonstrate the nature of trustee competence in decision making; second, to demonstrate the range of trustee responses to problems relevant to investment; third, to assess trustees' risk appetites in relation to their own and others' money;

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and fourth, to draw implications from these results for the governance of trustee boards and their relationships with advisers and service providers. It is shown that trustee competence is surprisingly heterogeneous, and the lack of common approaches to problems relevant to investment practice has significant implications for fund governance.

Key words: Trustees, competence, reasoning, decision making, fund governance

Introduction

There has been considerable debate about the competence of UK pension fund trustees reflected, for example, in Bunt *et al*. (1998) and Thomas *et al*. (2000) on the implementation of the UK Pensions Act (1995), the Myners Report (2001) on investment decision making, and the Pensions Act (2004) establishing the Pensions Regulator and foreshadowing the formulation of trustee codes of practice. Throughout industry, many decry the amateur status of pension trustees; it is widely believed they lack the competence to make investment decisions consistent with the best interests of plan sponsors and beneficiaries in a financial world of increasing complexity that demands high levels of expertise.

For all the debate about these issues, there are few formal studies of the nature and scope of trustee decision making. By contrast, there are many studies of individual decision making as regards the framing of problems, risk aversion, and temporal consistency (see Kahneman, Slovic, and Tversky, 1982; Benartzi *et al*., 2006; Venti, 2006 relevant to pensions). Our research begins with the insights and perspectives offered by this diverse and challenging literature. However, it is widely recognized that much of this literature is devoted to but one blade of Simon's (1956) scissors: most studies are about generic cognitive ability rather than task-relevant decision making, notwithstanding the fact that it is at the intersection between cognition and responsibility where decision making takes place.

In this paper, we consider the scope of UK trustee problem-solving skills and, in particular, their discount functions, their willingness to take risks with their own money and other people's money, their understanding of probability, and their efficiency in processing information. Responses to these problems are compared with the responses of Oxford undergraduates so as to gauge the generality of findings. While trustees operate in collegial environments where decision making is a shared responsibility (Clark, 2000), it is individuals who contribute to group decisions. It was found that trustees approach problems relevant to investment in an unexpected variety of ways; for all their shared responsibilities, it cannot be assumed that they share common and consistent techniques for solving investment-related problems. If indicative of the nature and range of trustee decision making, these results have important implications for the coherence of collective decision making and the role of fund advisors and service providers.

In the next section, recent UK debate about trustee performance and the introduction of statutory requirements regarding codes of practice aimed at enhancing governance procedures and decision making are noted. Thereafter, our perspective on rationality is aligned with analysts, such as Paul Samuelson, who stress the

significance of evaluating decision making in the context of alterative options with mixed pay-offs and variable levels of risk and uncertainty (cited in Ho and Lee, 2004: 516). We explain the design and conceptualization of the problems used to test trustee competence, and the characteristics of the trustees and undergraduates enrolled in the testing regime. In the penultimate section of the paper, the results of the testing regime are reported comparing the responses of trustees with the responses of a group of Oxford undergraduates. The paper concludes by drawing implications for the governance of the trust institution and the relationships between trustees, their advisers, and service providers.

Given the limited numbers of trustees and undergraduates involved in the testing regime it is only proper to be circumspect about the reach of our conclusions. We are not aware of empirical studies published in peer-reviewed journals that directly assess the competence of pension trustees in relation to investment-related problems. At most, studies suggest by implication that trustees either lack competence and/or are hamstrung by poor organizational structures (see Lerner *et al.*, 2005; Merton and Bodie, 2005). In any event, we are neither idealistic about the decision-making competence of people in these situations, nor are we pessimistic about the role that education and training can have in developing the expertise necessary to recognize problems and to employ appropriate decision-making protocols (Clark, 2004). Here we follow the lead of others such as Lo (2005) in utilizing a research strategy at the interface between economics and psychology designed to assess received wisdom and prompt re-consideration of common assumptions.

Pension fund trustees – expertise and responsibilities

While initially focused on the funding of venture-capital investment in UK high-tech sectors, the Myners Report (2001) considered the competence of pension fund trustees and the relationship between trustees, their advisors, and the investment management industry. The Report argued that standards of UK trustee expertise were less than desirable given their responsibilities – the volume of assets to be invested and the consequences of those investment decisions for the development of UK industry and the venture capital industry in particular. The Myners Report (2001) recommended the establishment of a set of standards that would enhance pension fund governance in ways consistent with their exacting responsibilities for managing pension fund assets and liabilities.

The Report's purpose was to determine 'the extent to which institutions' approaches to investment decisions are: rational; well-informed; subject to the correct incentives; and as far as possible, undistorted'. After brief comment regarding the significance of UK institutional investors, a survey of about 250 trustees for the review, Myners concluded 'many trustees are not especially expert in investment'. To illustrate this finding, the Report observed a majority of trustees had no professional qualifications in finance or investment, had little in the way of initial training, did not to attend training courses after the first 12 months of appointment, and spent hardly any time in the course of a week preparing for pension fund investment decisions. Pension fund trustees may be well intentioned but there is no

'legal requirement for trustees to have any particular level of expertise in investment matters'.[1]

The Myners Report recognized the broad spectrum of pension fund trustee responsibilities. The Myners Report also recognized that not all trustees need have the expertise of investment professionals. The evidence suggests trustees often owe their appointment to their social and professional roles rather than their qualifications or current responsibilities. In any event, one important responsibility of trustees is to 'represent' the interests of plan beneficiaries consistent with widely held notions of equity and justice (Clark, 2000).[2] The Myners Report emphasized the need for trustee boards to have a range of skills and expertise and the capacity to delegate those tasks that are more exacting in terms of financial expertise (skills, knowledge, and experience). In that regard, the Report recommended standards and procedures of pension fund governance that would enhance the investment decision-making process as well as the competence of decision making in general.

Myners dominated discussion about the regulation of employer-sponsored pension plans (defined benefit and defined contribution), culminating in the Pension Act (2004). The Act established the Pensions Regulator as well as requirements related to the funding of pensions and the security of fund assets. The Regulator is charged with the responsibility of issuing codes of practice having to do with the management and exercise of functions consistent with the responsibilities of pension plans and trustees. While some items listed in codes of practice have to do with the reporting of fund financial circumstances, other items include requirements for 'knowledge and understanding' by trustees of fund policies, especially those related to investment. This section of the Act provided the Regulator with the power to produce codified standards of fund performance, governance, and trustee competence.

Rationality (substantive and procedural)

In the social sciences there is deep disagreement about first principles: whether rationality is a natural trait and a substantive attribute of all human beings (a far-reaching assumption) or a social practice contingent upon the institutions, incentives, and circumstances in which people find themselves (a more circumspect vision). Substantive rationality is often given pride of place and is commonly defined as the capacity to draw logically correct conclusions from a given set of premises (i.e. reasoning by deduction). For example, if 'All people maximize utility' and 'Pension fund trustees are people' then 'Pension fund trustees maximize utility'. By implication, if 'Pension fund trustees are responsible for investment strategy' and 'Venture

[1] As the Myners Report noted, UK trust law requires trustees to act in good faith, to be honest, and to exclude their own interests with the care and attention devoted by 'an ordinary man of business'. By contrast, US statute requires trustees to act in a prudent manner consistent with someone in a similar capacity in an enterprise of 'like character'; by implication, trustees should act in accordance with the expertise of investment professionals.

[2] The Pension Act (2004) requires at least one third of trustees to be member-nominated and sets out the procedures whereby trustees are appointed and elected. In many respects, the Act is as much concerned with the 'representativeness' of trustee boards as the Act is concerned with establishing the institutions and procedures underwriting defined benefit and defined contribution pensions.

capital investments produce higher rates of return', it follows (given unstated premises) that 'It would be irrational not to invest in such opportunities'.

Three objections can be made to the status attributed to substantive rationality. First, even if rationality is a natural trait of human beings it is unlikely that human beings are equally endowed with the ability to exercise rationality in practice. Just as some people can run faster, some people can jump higher, and some people can swim further, we should expect performance in logical reasoning to vary a great deal amongst human beings. Second, logical reasoning may give rise to false conclusions. In the real world, it matters both whether underlying premises are correct and whether the reasoning process is valid. Third, substantive reasoning may be vulnerable to systematic discontinuities or anomalies. Thus, those that study the psychology of reasoning have been very concerned with how and why people are seduced by 'plausible, but fallacious conclusions' (Wason and Johnson-Laird, 1972). Moreover, it appears that many people whatever their socio-demographic status and educational qualifications are risk-averse (Kahneman and Tversky, 1979).

Assuming rationality is a human trait variously distributed across the population, the crucial issue is how and why people make decisions about specific issues. These decisions will frequently need to be made on the basis of probabilistic evidence (i.e. by inductive reasoning) (Lo, 2005). For example, if a jar is known to contain 90 red balls and ten black balls, it would be rational to guess the colour of a ball picked at random from the jar to be red. There is no guarantee, however, that a red ball as opposed to a black ball will emerge. Furthermore, if respondents do not know in advance the proportion of red and black balls in the jar, predicting the colour of the next ball drawn will depend upon the observed colours of previous balls drawn; that is, a hypothesis about the relationship between red balls and black balls. If a differential monetary value is attributed to red balls and black balls, then it matters a great deal whether the theory is correct and whether judgments made about the distribution of red balls and black balls are updated from one draw to the next.

Although probability theory and decision theory provide normative accounts of how people should reason, people are as prone to inductive error as they are to deductive error.[3] The insights of Simon (1982) and Tversky and Kahneman (1974) suggested that normative theories of rationality and rational decision making assume no limits on information gathering (temporal or financial), followed by similarly unbounded and errorless computation of the correct conclusion. In the real world, by contrast, there is a premium on obtaining a result that is good enough within the constraints imposed by cost effectiveness at all stages of the reasoning process (Simon, 1978). Rationality in this sense is about making the best possible decision and achieving the best possible outcome in the sub-optimal conditions in which, as finite and fallible creatures, we must all work. Fast and frugal heuristics that often give the right answer but occasionally give the wrong answer may be more useful

[3] For example, human decisions are often 'overly influenced by vivid but unrepresentative personal and case evidence and under-influenced by more representative and diagnostic, but pallid, statistical evidence' (Stanovich and West, 2000). Likewise, the commission of specific fallacies, e.g. the conjunction fallacy has been extensively investigated (Tversky and Kahneman, 1983).

than algorithms that are guaranteed give the right answer but only eventually (Gigerenzer *et al.*, 1999).

Experimental strategy

To study the nature of pension fund trustee decision making, the protocols and practices used in psychology and in experimental economics were followed (see Kagel and Roth, 1995) to test for the competence of trustee decision making based upon recognized problems relevant to investment. Where appropriate, trustees' solutions were compared against a reference group drawn from Oxford undergraduates.

About 40 trustees were recruited to take part in the research. No attempt was made to survey a representative sample of the tens of thousands of trustees that serve UK pension funds; it was vital to identify trustees willing to put aside the time necessary to work through a set of two problem papers that went beyond attitudes to the solution of investment-related problems. Each paper took at least an hour to complete.[4] Inevitably, the trustees identified and participating in the project were a group of experienced people conversant with their responsibilities and sensitive to the increasing scrutiny by government of their performance.

Of the 40 participating trustees, all but one was male. A slight majority of the trustees were member nominated trustees and had been trustees for more than five years. The average age of trustees was over 50 years with most trustees recording educational attainment at the high school or higher levels. On average, our trustees were better educated, had higher incomes, and had greater responsibilities than similarly aged UK citizens. Trustees came from a small number of large defined benefit pension funds with, in some cases, whole boards involved.

So as to provide a reference point to compare trustee solutions to the posed problems, 80 Oxford undergraduates were also recruited. This is a commonplace experimental strategy (see Bröder, 2003 and Viscusi and Zeckhauser, 2005). Undergraduates are relatively easy to recruit, and are intelligent and motivated, especially if participating in classes devoted to research methodology. The undergraduates were a useful complement to the smaller number of trustees; our findings were put in the context of responses by a select group of non-specialists without trustees' responsibilities. Given the specific nature of pension fund trustee responsibilities and obligations, undergraduates were not set problems that had a direct relationship to the governance and practice of investment strategy. Even so, the problems included issues that were relevant to both groups, such as risk-taking, the discount function, probability, and the techniques used to solve problems.

Just as the participating trustees were a select group of trustees, Oxford undergraduates are a special component of the UK population. They are very successful individuals given the national secondary school examination system, the required high grades needed for admission to Oxford, and the competition for college places

[4] In-depth interviews and case studies of UK pension fund trustees sponsored by the government have involved hardly any more trustees than we were able to recruit; see Thomas *et al.* (2000) (based on interviews with 43 trustees) and Horack *et al.* (2003) (based on 14 case studies of a diverse set of pension plans); even Myners was reputedly based on just 14 funds.

which emphasizes not only educational attainment but also demonstrated personal qualities. The participating Oxford undergraduates were young (about 18 years). A slight majority were women.

Two problem papers were designed based upon widely recognized problems drawn from the psychology literature. Problems relevant to investment decision making included those concerned with estimating an individual's discount functions, the use of information in decision making, and the willingness of respondents to risk their own money and other people's money under uncertainty. Each problem is linked to the relevant literature, and references are made in the next section to expected solutions. Where possible, the same problem was set in two different ways so as to test the consistency of respondents' solutions (results forthcoming). Finally, it is apparent in the tabulated results that trustees had trouble completing specific sets of problems, reducing the total returns in some cases. Care was taken throughout to present the problems in simple ways using common vernacular; that there were difficulties in this regard suggests that some trustees find formal problem-solving situations intimidating.

Problems and solutions – results of empirical analysis

Assuming rationality is an intrinsic human trait and is, most importantly, a process of calculation and response to circumstances (as suggested by Simon, 1978 and implied by Samuelson), in this section we work through a set of problems designed to evaluate trustee and undergraduate decision making. In presenting the analysis, the problems selected are introduced with reference to their significance in the psychology literature and reference is made to their significance with respect to investment decision making. The discussion summarizes a vast amount of academic material just as the results presented summarize the data collected.

Discounting the future

It is widely observed in the psychology and economics literatures that people prefer £100 today as opposed to £100 in a month or year's time. That people prefer an immediate reward over the same reward in the future is deemed to be consistent with economic rationality (Lowenstein and Elster, 1995). To explain, £100 now is more valuable than £100 in the future because it can be spent to gratify current needs or it may be invested so that its future value (after inflation etc.) is expected to be more than £100. Utility theorists assume that an individual's discount function is properly exponential in shape. Notice, of course, that a strong preference for immediate reward may be self-defeating if a lack of patience means that the individual concerned misses the opportunity to benefit from a higher reward in the future. The evidence, suggests that people may be quite sensitive to the short term, just as their preferences may be unstable over time such that they are unable to carry through plans for the future (weakness-of-will etc.; see Ainslie, 2001).

In our study, we were interested in two aspects of trustee and undergraduate discount functions: the particular shapes of those discount functions and the extent

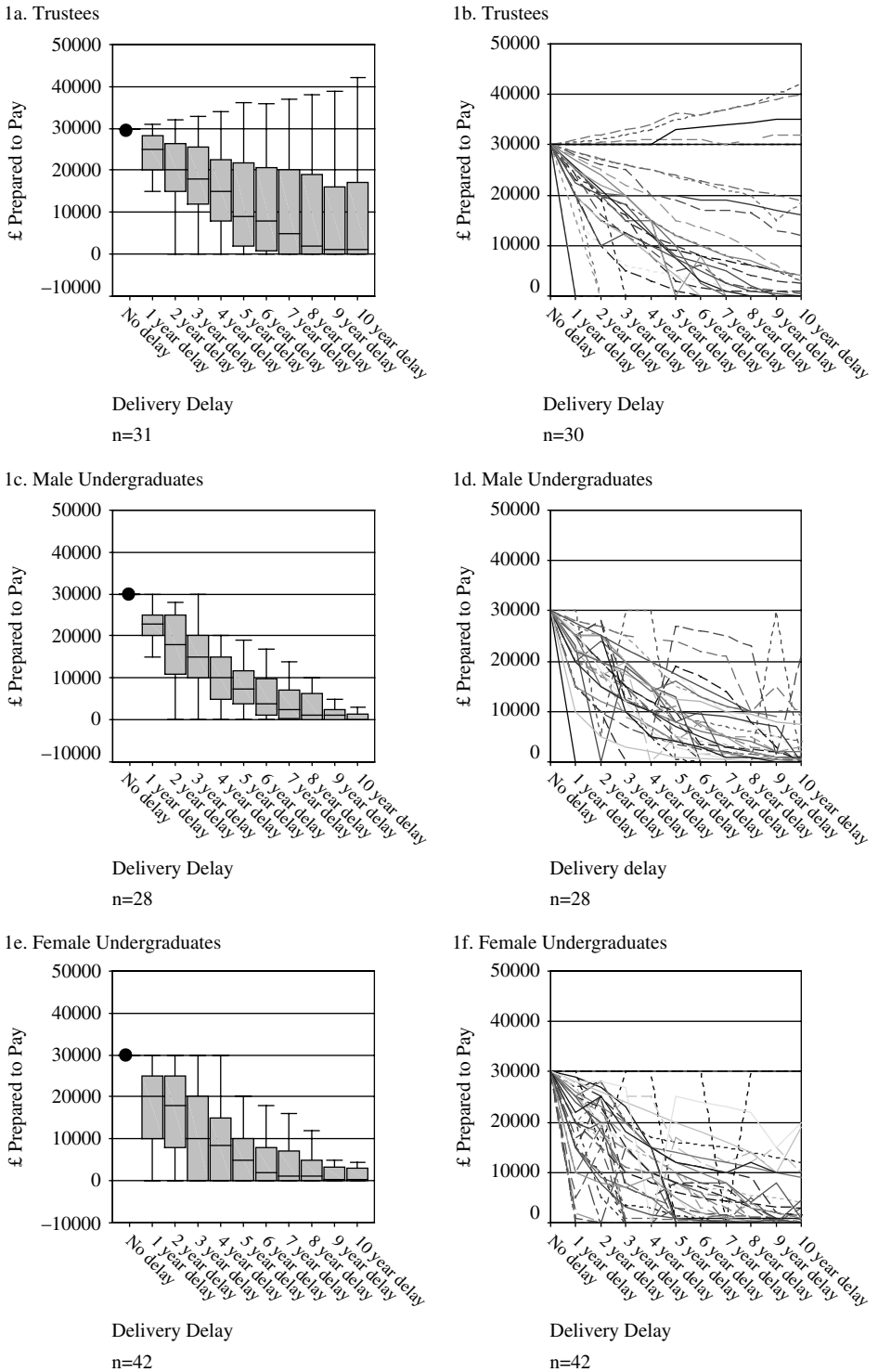

Figure 1. For legend see opposite page

to which discount functions had a common shape among trustees and amongst undergraduates. The specific problem set was as follows: participants were asked to assent to the proposition, 'You are prepared to pay £30,000 for your new car if delivered today.' They were then asked 'Disregarding inflation, what would you be prepared to pay for the same car if its delivery were to be delayed for X years?' To calibrate respondents' judgements 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 years were substituted for X and the questions were presented in pseudo-randomized order.

For trustees, the findings can be summarized as follows (Figure 1). First, while some trustees did exhibit exponentially shaped discount functions, many did not. Second, while most trustee discount functions had an identifiable shape, even if not always exponential in character, some did not. Third, while some trustees valued a short-term reward more than the longer-term rewards, other trustees had very shallow discount rates such that later rewards were judged to be almost as valuable as short-term rewards (compare Laibson, 1998). And, fourth, while an exponential discount function could be estimated for the mean or median trustee, it would be statistically insignificant if calculated from individual trustee discount curves (1a and 1b).

For undergraduates, when men were distinguished from women the former seemed to have exponentially shaped discount functions such that short-term rewards were preferred over long-term rewards (see Figures 1c, 1d, 1e, 1f). While difficult to characterize, it was perhaps more difficult to generalize the discount functions of female undergraduates, recognizing not only the shallowness of their discounting but also some evidence of inconsistency over time in their preferences for rewards now, in the near future, and over the longer-term future. If plausible, this is an intriguing finding. It does accord with related findings in the psychology literature such that younger men are more impulsive and short-term oriented than younger women (Zuckerman, 1991). Older men (trustees) with specific investment-related responsibilities appear to be quite unlike young men in this regard.

***Risk aversion* (*and other people's money*)**

One of the most important observations made about propensity to carry risk is that, more often than not, individuals prefer certainty over uncertainty (Kahneman and Tversky, 1979). This preference can be shown in a variety of different ways utilizing simple calculations comparing two sums: one lower with certainty of receipt and another higher but weighted by a known probability of occurrence. When combined with the notion of regret where individuals tend to overweight loss but underweight potential gain, this suggests that many people systematically avoid risk. It has been also observed by psychologists and decision theorists that risk avoidance and, by implication risk-taking, may be a personality trait – some people may actually

Figure 1. Discount functions for trustees, male undergraduates and female undergraduates
Notes: The left-hand graphs (a, c, e) show means, inter-quartile ranges (black rectangles), and ranges; the right-hand graphs (b, d, f) show the individual data from which the descriptive statistics in a, c, and e have been calculated.

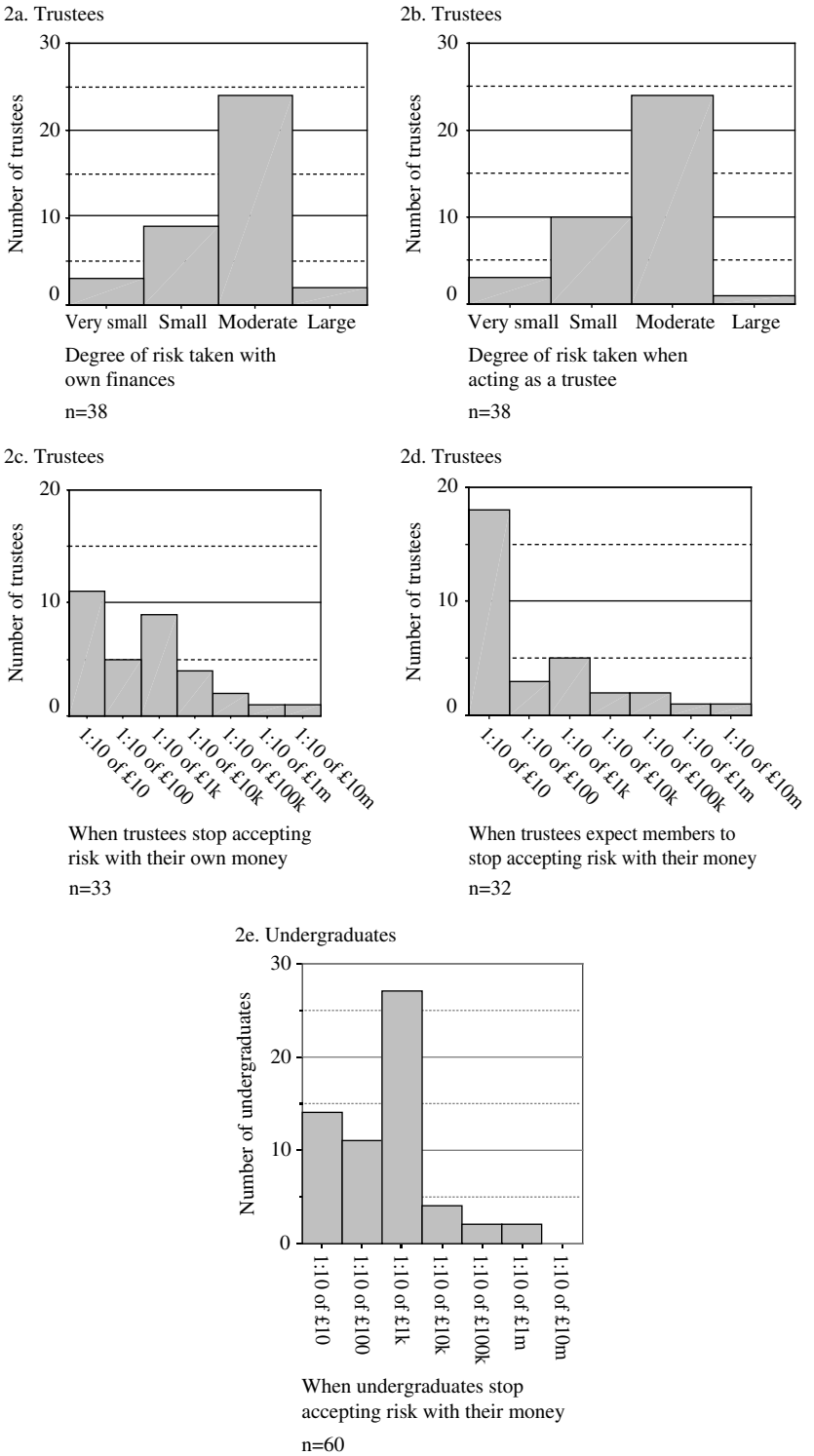

Figure 2. For legend see opposite page

embrace risk even if most do not (Zuckerman, 1991). There may be considerable variation across the population in terms of risk preferences and risk behaviour (March, 1994).

Even so, we should recognize that pension fund trustees hardly ever risk their own money when making an investment. Rather, they invest other people's money. They do so by virtue of their duties and responsibilities articulated in the rules and regulations governing the trust institution. At issue, in this context, is whether they carry-over their own risk preferences, including their propensity for risk (aversion) to their roles as trustees. Given their obligations to the welfare of others, does this increase or decrease their preference for certainty? In the literature, some doubt the robustness of social duties, obligations, and altruism. Indeed, some theorists explain care for others' welfare in terms of the utility functions of those involved, arguing that, at base, individuals are profoundly selfish and that their risk preferences (including aversion) are so deeply embedded that an obligation to others' welfare is a rhetorical claim rather than a genuine (change in) behaviour (see Kahneman and Tversky, 1979 and Axelrod, 1984 for discussion).

To examine risk preferences, trustees were asked to respond on a four-point scale to the question 'When making decisions about your own finances, are you prepared, if the rewards are large, to accept (1) a large degree of risk, or (2) a moderate degree of risk, or (3) a small degree of risk, or (4) a very small degree of risk?' The same scale was used with the question 'When acting as a trustee …?' Our volunteers were asked to choose whether they would for themselves prefer £1 with certainty or one chance in ten of obtaining £10. The choices were raised (in orders of magnitude) to £10,000,000 with certainty or one chance in ten of obtaining £100,000,000. These questions were then asked again (trustees only) but in terms of what the trustees would 'expect the average beneficiary of the pension fund of which you are a trustee would prefer'.

Findings for these tests are summarized in Figure 2. In the first instance, trustees indicated that the risk they would willingly assume was no different whether they acted on their own behalf or on the behalf of others (being 'moderate' in both cases). This finding suggests that their role had little impact on their attitude to risk (compare Figures 2a, 2b). But, when asked to calibrate the risk willingly assumed comparing a certain outcome against a set of payoffs with different levels of risk (Figure 2c), they tended to choose certainty over risk-related larger gains. There was a subset of individuals willing to embrace less certainty, although very few were willing to entertain the level of risk implied by their attitudes. As expected, there was a systematic decline in the willingness of individuals to assume risk as the stakes involved became progressively higher. When asked to calibrate risk and reward

Figure 2. Risk assessment by trustees and undergraduates

Notes: Histograms 2a and 2b show the degree of risk that trustees judge they would accept in making decisions about their own finances (a) or when acting as trustees (b). Histograms 2c and 2d, and 2e show the monetary values at which trustees and undergraduates prefer a certain reward versus a 1/10 chance of a reward that is ten times larger. In 2c and 2e, the participants express their own choices; in 2d the trustees indicate what they believe to be the average beneficiaries' risk preference.

'as if' they represented the average beneficiary, trustees were ultra-cautious (Figure 2d). Trustees believe that their beneficiaries would not, all things being equal, assume any risk if they could avoid it; one of the most important tasks of any new trustee must be to learn from their peers and advisors the accepted risk parameters of investment.[5]

By contrast, undergraduates (and young men in particular) were more willing to embrace risk, with a significant number of respondents choosing higher risk options than was the case with trustees (Figure 2e). This evidence reinforces claims to the effect that younger men are more willing, on average, to assume risk than older people. Our findings are consistent with anecdotal claims made by some observers to the effect that those that become trustees are more risk averse than many of the younger men who dominate the investment management industry.

Probabilistic reasoning

It is widely recognized that most people have difficulty with calculating and interpreting the probability of events; even simple estimation problems are better understood when framed in natural frequencies and proportions than pure probabilities (Hoffrage *et al*., 2000). If the Pr (Black) = 0.50 given 100 balls of which 50 are red and the balance black, or Pr (Black) = 0.25 with 75 red balls and the balance black, people are more comfortable dealing with whole numbers like 50 out of 100 (and balance 50) and 75 out of 100 (and balance 25). These simple examples assume a known population and frequencies of occurrence (base rates). However, the base rate is just one piece of information needed to make probability estimates sensitive to current circumstances. Bayes (1763) showed that estimation about specific events combines base-rate information with information on the likely measurement errors (indicant information) involved providing a more sensitive and responsive means of calculating the odds. It is widely believed that, if people could be taught to calculate the odds, they would also benefit from estimating probability using Bayes' theorem (see Raiffa, 2002).[6]

Given the importance of probabilistic reasoning for investment, trustees and undergraduates were asked to solve a set of related problems (Figure 3). In particular, we sought to determine whether respondents appreciated the steps necessary to solve problems of probability and the manner in which they used the available information to solve these problems (Koehler, 1996). To examine these issues, our volunteers were presented with two classic statistical problems: the jury problem (see Barron,

[5] Readers of a previous draft of this paper found these findings difficult to reconcile with the fact that UK pension fund trustees have, historically, assumed a great deal of risk in terms of the proportion of fund assets allocated to equities. We would suggest either trustees do not think of equities as risky (given the past 15 years or so of higher than average performance – a problem of temporal framing) or understand risk as the deviation of plan investment strategy from their industry peers (a framing problem involving social reference). Just as plausible may be the enormous influence of advisors, given the lack of agreement amongst trustees regarding their conceptions of risk, the virtues of certainty, and the valuation of time.

[6] In this respect, Markowitz *et al*. (1987: 87) contended 'the rational investor is a *Bayesian* or engages in *Bayesian* inference', suggesting that the best investment managers combine an understanding of the underlying economic processes driving securities markets with sensitivity to market momentum and the prospects of being wrong (errors about the measurement of current circumstances and the possible incidence of events).

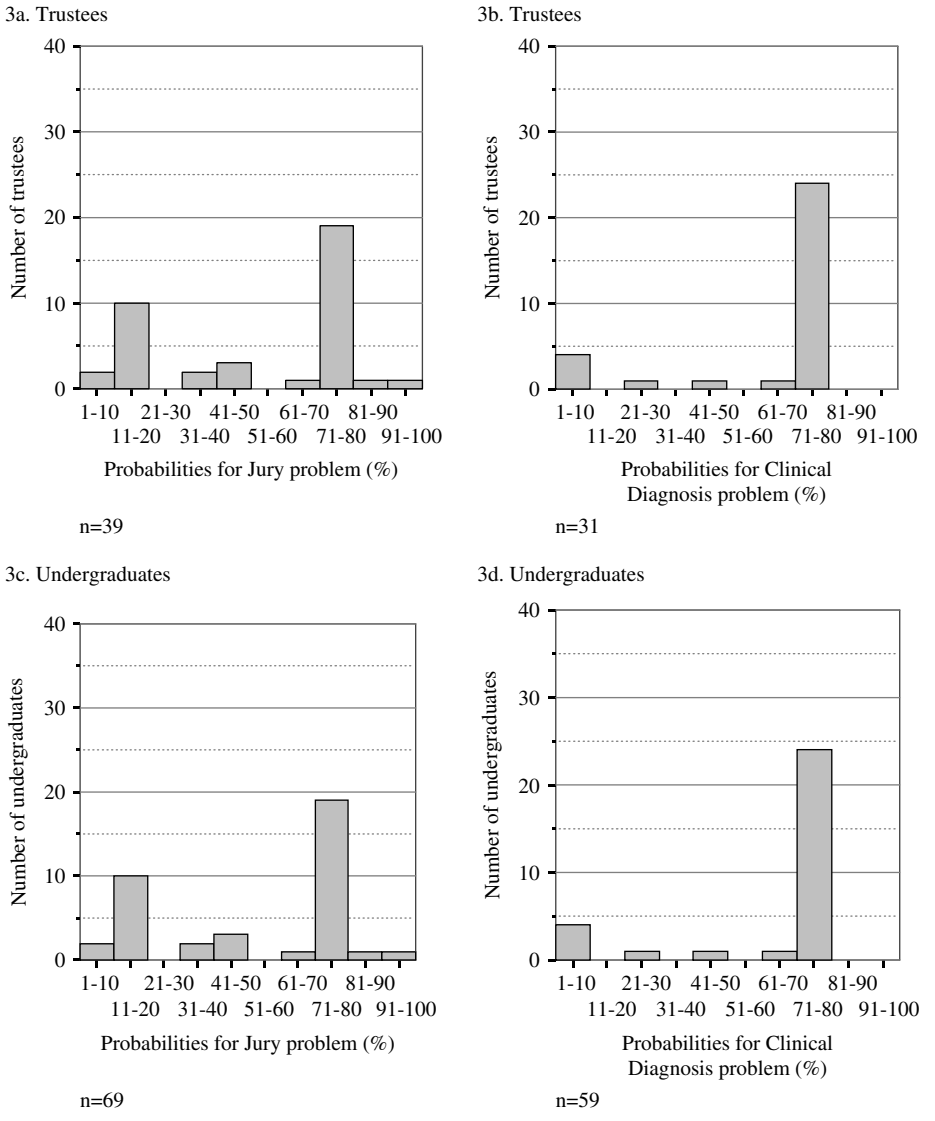

Figure 3. Trustees' and undergraduates' probability judgements of a particular outcome in two problems

Notes: For the jury problem (3a, 3c) the indicant probability is 80%, the base rate probability 15%, and the Bayesian probability 41%; for the clinical diagnosis problem (3b, 3d), the indicant probability is 79%, the base rate probability 1%, and the Bayesian probability 9%.

1994), and the clinical diagnosis problem (see Casscells *et al.*, 1978). Consistent with the relevant literature (Sedlemeier and Gigerenzer, 2001), it was found that neither trustees (3a, 3b) nor undergraduates (3c, 3d) had a comprehensive understanding of probability. Most respondents used only indicant information to solve the problems (represented on the right-hand side of each graph in Figure 3). Consistent

with the psychology literature (Bar-Hillel, 1980), it was found that trustees and undergraduates tended to ignore the base-rate information, although this varied somewhat with the problem.[7] Finally, trustees were more sensitive to indicant information than undergraduates, the latter being more sensitive than trustees to base rate information.

Confirmation bias (*information efficiency*)

It is widely recognized in the psychology literature that people are less efficient in using and processing the available information than conventional economic theory would assume. Most importantly, it has been shown that most people do not use the available information to test presuppositions, are inefficient in searching for information that would confirm or more crucially reject presuppositions, and tend to ignore experience that would lead them to question or invalidate planned actions (Zuckermann *et al*., 1995). It appears that many people select the available information in ways that confirm their presuppositions. Some analysts believe, however, that people naturally economize on information and procedures of evaluation, although this is highly contested in the literature (see Todd and Gigerenzer, 1999, 2000).

In this study, the well-known Wason (1960) four-card problem (with letters and numbers) was used to test trustee and undergraduate decision-making strategies, emphasizing how they selected from the available data (results are summarized in Figure 4). Volunteers were shown four cards which respectively showed an E, a 7, a K and a 4. They were told that each card had a letter on one side and a number on the other side and were given the rule, 'If a card has a vowel on its letter side, then it has an even number on its number side.' Their task was to decide which card or cards must be turned over in order to find out whether the rule is true or false. The optimal strategy is to turn over E and 7; these are the only cards whose verso would disconfirm the rule. An odd number on the verso of E or a vowel on the verso of 7 is incompatible with the given rule. The versos of K and 4 are irrelevant.

It was found that the over-whelming majority of trustees and undergraduates were unable to solve the original 'abstract' problem, being seduced by confirmation bias (turning over E correctly and 4 irrelevantly) (Figure 4a, 4b). Of those prone to confirmation bias, most undergraduates and many trustees were inefficient in the use of the available data, often using too many steps in the search procedure for solution (i.e. turning over 3 or 4 cards). However, a number of trustees used too little information, either guessing the answer or relying upon their intuition by turning over only one card (Figure 4).

Another test of confirmation bias was used, one with a social rule concerning the evidence required to confirm or reject a likely answer (Figure 4c, 4d). The rule in this case was, 'If a person's drinking beer then the person must be over 18 years of age.' The four cards now showed respectively the information: Drinking beer,

[7] In the clinical diagnosis problem (Figure 3b, 3d), the histogram for responses in the range 1–10% does not distinguish between people using the base rate only (1%) from people using Bayesian probability (9%). The actual numbers are easily calculated.

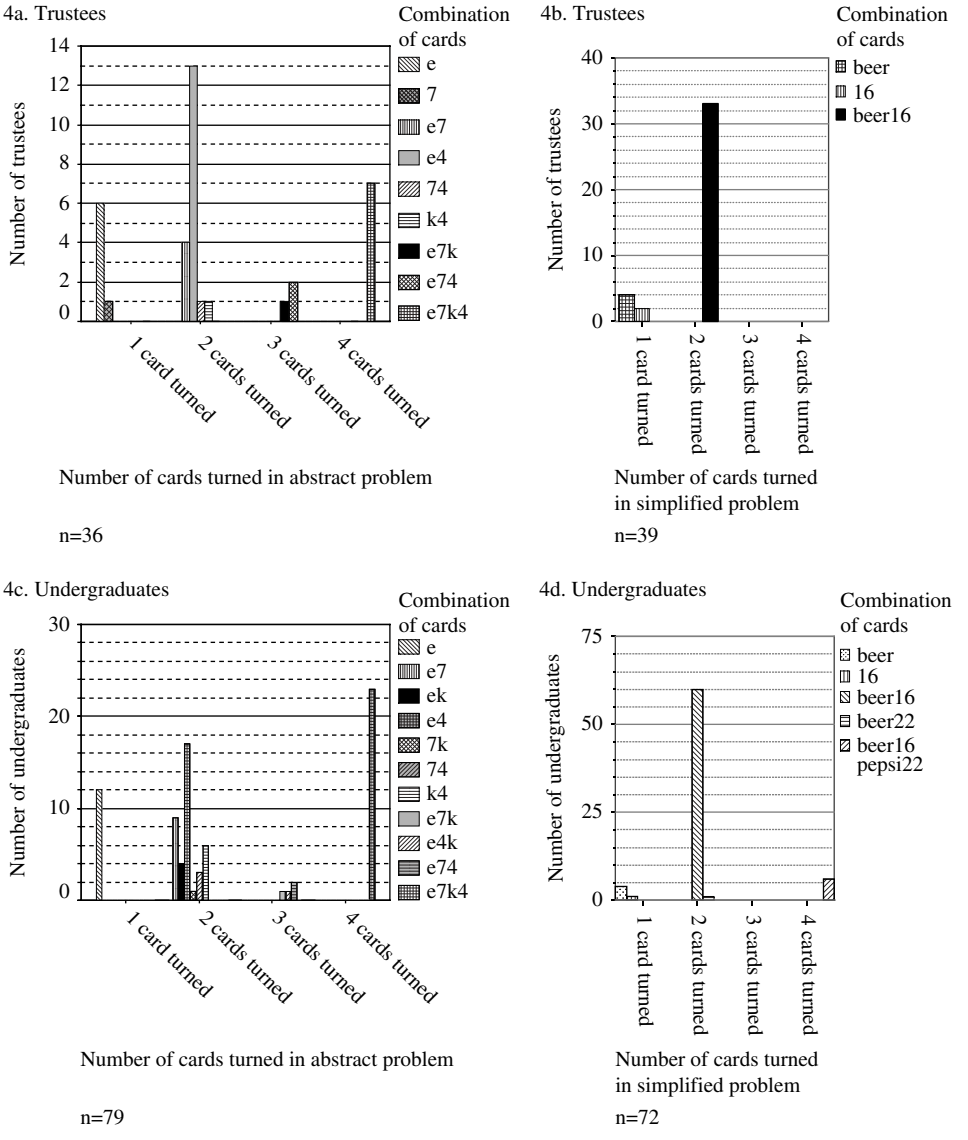

Figure 4. Results of the Wason selection task
Notes: The histograms show how trustees responded to the alphanumerical task (4a) and the social rule task (4b) and how the undergraduates responded to those tasks (4c, 4d) by turning over a particular card or combination of cards.

Age 22, Drinking Pepsi, and Age 16. The volunteers were told that on one side of each card was a person's age and on the other side what that person is drinking. They were asked to turn over the card or cards that would determine whether or not the people are violating the rule (Gigerenzer and Hug, 1992). The majority of trustees and undergraduates were able to solve the problem, turning over the appropriate cards ('Drinking beer' and 'Age over 16'). In this case, proportionally slightly more

trustees than undergraduates solved the problem and they did so by economizing on the use of the available information (by turning over only two cards not four cards). Undergraduates, at the margin, tended not to economize on the use of information and used more information than required to solve the problem.

Conclusions and implications

In this paper, the nature and range of pension fund trustee decision making was investigated utilizing well-recognized problems drawn from the psychology literature. These problems are important in debate about human cognitive ability and have implications for assessing investment decision making. A group of Oxford undergraduates were used as a point of comparison, focusing on what may be distinctive about pension fund trustees relative to this select group of the UK population. This analysis is not definitive; its limits are mentioned below. But the experimental strategy has produced calibrated insights regarding trustee competence relative to an undergraduate population. These insights challenge common assumptions made about the nature and range of trustee decision making with significant implications for the governance of pension funds and related institutions.

In summary, four sets of findings were derived from the experimental strategy, including comparison with the undergraduate reference group.

- First, it was shown that many of our pension fund trustees have shallow and often non-exponential discount functions. Moreover, for the group of trustees analysed, it was virtually impossible to specify a simple discount function that would capture the heterogeneity of time-dependent monetary valuation. By contrast, it was found that younger men had, on average, a reasonably well-defined exponential discount function. They heavily discount the future.
- Second, it was found that trustees would assume a 'moderate' amount of risk when asked their attitude to risk taking. When asked to calibrate their risk preferences it was found, however, that pension fund trustees are on the whole risk averse (a finding consistent with the literature; see Kahneman and Tversky, 1979). Their risk tolerance varies considerably and is, more often than not, more significant when compared to their assessment of the risk tolerance of the average beneficiary. By contrast, young undergraduates (especially men) were found to be more risk tolerant.
- Third, it was found, consistent with the literature (Kahneman, Slovic, and Tversky, 1982), that pension fund trustees, like undergraduates, are poor probability analysts. Without training, few people seem to appreciate the steps involved in calculating probability. More importantly, it is shown that neither trustees nor undergraduates are consistent in their approach to problems that require probability analysis. That is, some emphasize the base rate, some emphasize current information, and some appear not to understand the problem. Again, heterogeneity rather than homogeneity best characterizes the problem-solving techniques brought to probability problems by trustees and undergraduates.

- Fourth, consistent with the literature (Klayman, 1995), trustees like undergraduates, do not use the available data in an efficient manner to test solutions to problems. Neither group are 'efficient' users of information, especially when confronting a problem that is quite abstract (as implied by Todd and Gigerenzer, 2000). On the other hand, with a social rule, trustees were marginally better able to use that rule and in an information-efficient manner than undergraduates. In this respect, perhaps they trust their judgement – the product of age and experience? Even so, there remained some heterogeneity amongst trustees in how they utilized the information given.

It is clear that pension fund trustees are prone to the cognitive anomalies and biases that researchers in psychology have attributed to the population at large. One virtue in using widely recognized problems drawn from the psychology and economics literature is the opportunity to test our reference groups against those expectations. There remains, of course, disagreement in the literature over whether, for example, the Wason selection task does actually measure confirmation bias or rather a matching-bias effect (Evans and Lynch, 1973). These controversies do not affect our most crucial finding: that trustees and undergraduates conceptualize important problems of judgement in various ways and use a variety of techniques to solve problems.

By our assessment, the range of trustees' solutions to problems was greater than anticipated. This was immediately obvious when comparing the discount functions of trustees and the fact that any curve used to summaries their discount functions would be quite misleading. Although less apparent with respect to risk aversion, heterogeneity was apparent in the techniques used to solve problems that would require a probability approach and the degree to which trustees used the available information to check on their decision-making strategies. Trustees do not share common notions of the most important (albeit abstract) principles underpinning modern investment theory and practice. While they tend to share common attitudes to risk-taking, their judgements in this regard are inconsistent with their assessment of risk in the context of a sequence of calibrated pay-offs.

Trustees operate in an environment where advisers, consultants, and service providers share a distinctive language of finance (Clark, Hebb, and Wójcik, 2006): standard ways of measuring the risk-adjusted rate of return, the relevance of underlying economic processes and current circumstances when estimating the probability of outcomes, and a presumption that investment strategy must be tested and re-tested using the available data in a cost-efficient manner against changing circumstances. Given the diversity of trustee judgement and perspective, it may be difficult for a trustee board to challenge received opinion and advice. Furthermore, some trustees have indicated that they are not confident in sharing with one another misgivings about what they understand or do not understand about the language of finance. We should not be surprised if individual trustees and trustees together defer to the advice of their advisers, consultants, and service providers. Given the mixed competence of individual trustees, decision-making protocols and codes of practice may be vital for ensuring the coherence of collective decision making.

There is evidence from psychology (and social science in general) that institutional norms, practices, and rules can have positive effects on the coherence and focus of collective decision making (see Gigerenzer and Hug, 1992). Even so, we are not as confident as some that institutional form can *ipso facto* overcome the heterogeneity of trustee competence (compare with Merton and Bodie, 2005). This is possible *if* members of trustee boards and investment sub-committees are selected for their expertise, *if* there are deliberate mechanisms of engagement on issues of unspoken disagreement, and *if* sufficient time is set-aside for second-order evaluation of trustee judgements and expert advice (Ambachtsheer *et al*., 1998). In the absence of mechanisms for enhancing trustee decision making and the interrogation of colleagues' judgements, institutional rules may become sanctuaries for those unable or unwilling to join others in affirming a calibrated, time-dependent, and risk-based investment strategy (Clark, 2004). Trustees may be more reliant than perhaps appropriate on the leadership qualities and skills of board chairs, and may be forced to defer to the advice proffered by external advisors.

These implications should be evaluated and tested on other groups of trustees in a variety of different settings. Given the specific focus of this paper we have not reported the results of tests of the significance of variables such as education, experience, and training in issues relevant to investment practice (see Clark, Caerlewy-Smith and Marshall 2006). While we made every attempt to frame the problems in ways familiar to trustees and undergraduates, testing regimes may not be sensitive to the *particular* context in which these types of problems are typically solved. Context (doing problems in Oxford) may make unintelligible those problems that are routinely solved in ordinary life (see Moldoveanu and Langer, 2002 on how testing regimes may appear to make smart people stupid). However, as is the case in a great deal of research in psychology in the social sciences, these types of studies are very useful in challenging assumptions made about the idealized nature of decision making (Clark and Marshall, 2002).

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