Managerial Finance

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Risk management behaviour in banking

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Abstract

Purpose – Risk management is now considered the responsibility of all financial services professionals, not just senior leaders or risk specialists. Very little is known about the role of staff in risk management, so the purpose of this paper is to, first, clarify what constitutes "desirable" risk management behaviour by financial services staff based on the practitioner and regulatory literature. Based on this understanding, the authors analyse the characteristics of those who are most likely to display such behaviour.

Design/methodology/approach – The paper analyses some 36,000 survey responses across ten banks headquartered in Anglo countries.

Findings – Desirable risk management behaviour at the employee level includes compliance but goes well beyond mere compliance to include speaking up, thoughtful engagement with and accountability for the risk management framework. The authors find a significant negative association between individual risk tolerance and desirable risk management behaviour. Older workers as well as those with greater seniority are more likely to report desirable risk management behaviour. The link between female gender and risk management behaviour is not supported after controlling for individual risk attitudes. The authors provide evidence that females who succeed in financial services do not conform to traditional female stereotypes.

Practical implications – Findings suggest financial institutions should hire/retain more older workers and those with lower risk tolerance to improve risk management. Hiring more females, however, is not likely to lead to better risk management.

Originality/value – The paper is the first to investigate risk management behaviour in financial services staff. The research exploits a unique, difficult to obtain data set.

Keywords Gender, Banking, Risk management

Paper type Research paper

1. Introduction

In the post-crisis environment, effective risk management has become the *sine qua non* of the financial services industry. Numerous reports during and in the immediate aftermath of the crisis highlighted the need for better risk management (Senior Supervisor's Group, 2009; Basel Committee on Banking Supervision, 2010). Strategic risk-taking choices at board level have rightly come under scrutiny (Laeven and Levine, 2009; Pathan, 2009; Jiménez *et al.*, 2013; Raviv and Sisli-Ciamarra, 2013). What is far less understood is the role of financial services employees in risk management—a gap which this paper seeks to address.

In the regulatory and practitioner literature, there is broad agreement that risk management is the responsibility of all staff, not just senior leaders and risk specialists (Institute of International Finance, 2009; McKinsey, 2016; Basel Committee on Banking Supervision, 2015; Financial Stability Board, 2013; Harle *et al.*, 2016). Under the widely adopted "Three Lines of Defence" model (Institute of Internal Auditors, 2013), the first and primary risk management responsibility lies with the risk takers, i.e. those who make loans, trade securities and derivatives, manage assets, advise clients, underwrite insurance and

JEL Classification — G21, G32, M14

provide transaction/brokerage services. Consistent with this, a very recent experimental study by Cohn *et al.* (2017) confirms the extent to which risk management is now prioritised in professional norms.

This raises questions about the type of employee who is most successful in fulfilling the enhanced risk management expectations. The purpose of this study is to provide greater understanding of what constitutes "desirable" risk management behaviour by financial services staff and the characteristics of those who are most likely to display such behaviour. To what extent are attributes such as age, gender, tenure, seniority and personal risk tolerance correlated with risk management behaviour? Such an understanding is potentially useful for guiding recruitment, retention and other managerial policies and ultimately improving risk management practice within financial institutions.

The study is related to the literature examining the role of directors and senior executives in risk management. Several studies have now demonstrated the favourable outcomes associated with risk governance in financial institutions (Ellul and Yerramilli, 2013; Aebi *et al.*, 2012; Magee *et al.*, 2017). Related to this is a literature on board diversity that sheds light on the characteristics of directors in relation to risk-taking (Berger *et al.*, 2014; Adams and Ragunathan, 2015; Sila *et al.*, 2016).

An impediment to research on the role of employees in risk management is the availability of data at the employee level. Very few studies have accomplished this although some have investigated the role of credit officers—a role that incorporates significant elements of risk management (Beck *et al.*, 2012; Bellucci *et al.*, 2010). These studies investigate the link between the gender of the lender and loan performance.

Our analysis is based on an extraordinary data set of some 36,000 survey responses from ten banks headquartered in Australia, Canada and the UK. The survey questions capture demographic data (age, gender, seniority and business line), individual risk tolerance and self-report risk behaviour (with several steps taken to address potential social desirability bias). They provide a fascinating window into risk management behaviour in banks in the Anglo setting.

Based on analysis of the practitioner and regulatory literature, we find that desirable risk management behaviour is "compliance plus", i.e. respecting and prioritising risk policy/ limits while simultaneously being willing to question the risk framework, identify/report risk issues and accept accountability for the risk management framework. Age, seniority and to a lesser extent tenure are positively associated with desirable risk management behaviour while the reverse is true of individual risk tolerance.

The relationship between gender and desirable risk management behaviour is complex. After controlling for risk tolerance the hypothesised association between female gender and desirable risk management behaviour disappears. Our data suggest that this is due to the possibility that females who succeed in financial services do not conform to traditional female stereotypes.

2. Literature and hypothesis development

2.1 Desirable risk management behaviour

Risk-taking is a crucial aspect of banking so the goal of risk management is not to eliminate risk (see, e.g. Stulz, 2015). International risk management standards (International Organisation for Standardisation, 2009) emphasise that the goal of risk management is to ensure that the organisation meets its objectives. In consultation with stakeholders, the senior leaders of a financial institution determine those objectives, choose which risks are appropriate for the firm to take in order to meet those objectives and set the risk appetite subject to regulatory constraints[1]. Finally, they implement risk policies and frameworks designed to ensure that business operations are consistent with these choices.

This approach has been echoed in numerous post-crisis regulatory documents which emphasise that the board must accept responsibility for risk appetite and for creating an appropriate control environment to ensure risks are constrained within the boundaries agreed (e.g. Financial Stability Board, 2013; Basel Committee on Banking Supervision, 2015). The risk appetite framework sets limits across all risks types (credit, market and operational) which then cascade down to the various business units. Numerous scandals involving compliance failures suggest, however, that the control environment remains an ongoing challenge. Some examples include: breaches of anti-money laundering policies at HSBC (Guardian, 2012), manipulation of interest rate and foreign exchange benchmarks (McConnell, 2017), rogue trader cases at Barings, NAB, Allied Irish Bank, Societe Generale, J.P. Morgan, UBS, etc. (McConnell, 2014), opening accounts without proper customer authorisation at Wells Fargo (Tayan, 2016).

In a world where controls are inevitably imperfect, what is the role for employees generally in risk management? According to the regulator and practitioner literature, few staff in a large financial institution have any significant input to decisions regarding risk appetite. Rather the primary role of staff in the risk management process is compliance with risk policy and appetite (see Financial Stability Board, 2014; Basel Committee on Banking Supervision, 2015). For example, a proprietary trader or loan officer is allocated limits or boundaries constraining the amount and type of trades/loans (s)he can make. Staff are expected to generate profits by taking risk on behalf of the organisation but to stay within those prescribed boundaries.

But desirable risk management behaviour goes beyond "mere compliance" as highlighted by Federal Reserve Governor Daniel Tarullo (Tarullo, 2014). Employees should internalise the importance of risk management so policies and limits are treated with respect rather than as something to be gamed. Staff also play a role in identifying new and emerging risks, reporting and learning from risk events including policy breaches, highlighting problems with the risk management framework and proposing improvements (Institute of International Finance, 2009, especially Appendix III; Financial Stability Board, 2014). Employees ideally behave with a sense of diligence and accountability for the resilience of the firm (McKinsey, 2010; EY/IIF, 2016). To summarise, desirable risk management behaviour includes compliance but goes well beyond mere compliance to include thoughtful engagement with and accountability for the risk management framework.

2.2 Desirable risk management behaviour and risk tolerance

For employees working in financial institutions, the relationship between desirable risk management behaviour and individual risk tolerance is not immediately obvious. After all, employees are not typically taking risk with their own money but rather on behalf of the employer. Even a highly risk averse person may be willing to take high risk on behalf of an employer if instructed to do so. Risk flows to the employee indirectly, perhaps through profit-based incentive schemes, although employees do not normally share the downside risk except in extreme cases such as firm insolvency.

Financial services employees are most likely to experience risk through the compliance system. The behaviour of front-line employees (the first line of defence) is scrutinised by independent risk managers and compliance officers (the second line of defence). The overall functioning of the risk management system is monitored by internal audit (the third line of defence). An employee who breaches risk policy runs the risk of being caught and penalised via these mechanisms. Non-compliant behaviour can, therefore, be considered as a classic risk-return trade-off where the employee weighs up the probability of being caught, the expected penalty for non-compliance and finally the benefit of non-compliance (such as higher short-term profits and hence rewards). Accordingly, staff who are more risk averse are less likely to risk non-compliance.

As noted above, desirable risk management behaviour is far more than mere compliance, including actions that help improve the functioning of the risk management framework. We hypothesise that staff who are more risk averse are more likely to see value in risk management frameworks and policies and, therefore, will work to improve/promote them.

H1. Individual risk tolerance is associated with less desirable risk behaviour in banks (where desirable risk behaviour is defined as "compliance plus").

2.3 Desirable risk management behaviour and gender

Increased female representation in the finance industry has been promoted by a number of regulators and commentators as a means of promoting better risk management. According to the "Lehman Sisters Hypothesis", the failure of Lehman Brothers was directly related to the dominance of males and an aggressively masculine culture (Kroes, 2009, p. 3).

According to the 2014 UK Parliamentary Committee into Banking Standards:

> [t]here is still much to do in promoting diversity within banks. There is a need to hold banks' feet to the fire in encouraging the gender diversity of their workforce. The culture on the trading floor is overwhelmingly male. The Government has taken a view on having more women in the boardroom through [...] recommendations that FTSE 100 companies increase the number of women directors who serve on their boards. If that is beneficial in the boardroom so it should be on the trading floor. The people who work in an industry have an impact on the culture of that industry. More women on the trading floor would be beneficial for banks. The main UK-based banks should publish the gender breakdown of their trading operations and, where there is a significant imbalance, what they are going to do to address the issue [...]. (Parliamentary Commission on Banking Standards, 2013, p. 365)

Although not explicitly stated, the recommendation above probably reflects a widespread understanding of typical gender differences in risk attitudes, i.e. that the average woman is more risk averse and less overconfident than the average man (Barber and Odean, 2001; Byrnes *et al.*, 1999; Croson and Gneezy, 2009).

The expectation that greater representation of females will improve the behaviour of bankers relies crucially on the assumption that females that pursue banking careers will conform to these female stereotypes. Yet we know that behind gender stereotypes that might apply to the "typical" individual, there is a wide range of risk attitudes as, e.g., Nelson (2012) shows. Studies of financial sector employees provide mixed results. Kumar (2010) finds that female equity analysts provide bolder forecasts suggesting that successful females in the finance industry may not reflect traditional female stereotypes. Beck *et al.* (2012) find that females loan officers make better lending decisions when lending to other women; this is attributed to greater skill in building trust relationships and exploiting monitoring possibilities. Bellucci *et al.* (2010) find the female loan offers tend to restrict credit availability to new, unestablished borrowers more than their male counterparts; this is attributed to greater risk aversion.

Due to the importance of compliance with risk policy in risk management, the compliance literature is potentially relevant to our research question. In a study of compliance with safety procedures in the manufacturing industry Jiang *et al.* (2010) report no gender effect. Gender based analysis of pedestrian accidents suggests that males are less compliant than females in relation to pedestrian road rules (Tom and Granié, 2011). A large literature now exists in relation to tax compliance. While age is consistently and positively related to compliance, the results for gender are less clear (see the literature review within Kastlunger *et al.*, 2010). A number of studies report no gender difference in tax compliance; of those that find a gender difference, the majority (but not all) find women to be more compliant:

H2. Female gender is associated with more desirable risk behaviour in banks (where desirable risk behaviour is defined as "compliance plus").

2.4 Desirable risk management behaviour and age

The role of age is of interest in this study because of the tendency for certain parts of the finance industry to employ young people in disproportionate numbers. In their study of financial risk-taking on a London trading floor, Coates and Herbert (2008) note that the traders in their sample are drawn from a narrow range: 18 to 38 years. They further note that the demographics of their sample (dominated by young males) are typical for such work environments.

Research into traffic accidents shows that younger drivers are significantly more likely to be involved in casualty accidents (even when controlling for driving experience) and this is attributed to greater risk-taking behaviour (Jonah, 1986). Vroom and Pahl (1971) find a negative association between age and risk-taking in a cohort of managers. In these studies, age and risk-taking are typically negatively associated, suggesting prima facie that age and risk management may be positively associated.

The value that older workers bring to financial risk management potentially comes from the experience of past economic cycles, past scandals and past risk management failures. Such experience brings an appreciation for the value of risk management that is invaluable for balancing the enthusiasm of youth. In other words, older workers bring wisdom to the risk management process (Ilmarinen, 2001).

Other supportive evidence for this hypothesis comes from Beck *et al.* (2012) who observe a small but significant performance advantage for older loan officers. As noted in the previous section, age is consistently and positively associated with tax compliance. Turning to the safety literature, Tucker and Turner (2013) find that young Canadian workers usually avoid speaking up when having safety concerns. Turner *et al.* (2015) state that among 19,547 young workers, the youngest age group (15–18) is the most likely to neglect safety procedures:

> *H3.* Age is associated with more desirable risk behaviour in banks (where desirable risk behaviour is defined as "compliance plus").

2.5 Desirable risk management behaviour and seniority/tenure

Tenure is an important managerial consideration in the financial services industry. Some firms prefer to develop their own talent from within while in other firms high performing individuals are recruited laterally from competitors. The obvious danger of the latter strategy is that lateral hires may behave like hired mercenaries with little regard for the long-term resilience of their current (possibly short-term) employer. The Salz review into Barclays' business practices provides an illustrative case study (Salz, 2013); the rapid expansion of Barclays Capital from 2003 to 2007 was achieved largely by recruiting from the competition and this potentially contributed to a culture that focused on short-term profits.

We hypothesise that risk management behaviour will be positively associated with tenure due to greater commitment to the organisation and concern for its resilience. In a major meta-analysis on the relationships between organisational tenure and job behaviours, Ng and Feldman (2010) find a link between tenure and core-task behaviours (basic required duties of a particular job such as compliance with policy), as well as between tenure and citizenship behaviours (behaviours that actively promote and strengthen the organisation's effectiveness).

While tenure and seniority are clearly related, there are additional reasons why more senior staff might be expected to display desirable risk management behaviour. First, senior staff have much more to lose (reputation, future income) in the event of a compliance breach. Second, in firms where risk management is a priority, more senior staff will be expected to play a significant role in promoting risk management frameworks. Numerous regulatory

documents promote "tone at the top" as crucial for firms wishing to establish strong risk management norms (e.g. Financial Stability Board, 2014).

H4. Tenure and seniority are both associated with more desirable risk behaviour in banks (where desirable risk behaviour is defined as "compliance plus").

3. Data collection and participants

Within 26 months (from July 2014 until August 2016), we collected survey responses from 36,223 employees from ten banking institutions headquartered in Australia, Canada and the UK. The employees participating were working across all major business lines. By working closely with the banks, we captured a representative cross-section of each bank ranging from front-line staff to senior management (although the sample does not include the most senior executive committee). Those in senior roles, older staff and males are overrepresented in our sample relative to the population of bank employees.

All banks took part in the study voluntarily and under the condition that results would only be published on a de-identified basis. Additionally, they received a confidential risk culture assessment of their own institution. Results were provided to the banks at the business unit level but only for units having at least 30 employees to ensure anonymity of the participants (and, thus, to encourage candour). After being invited to participate via email, the employees had a time window of two weeks to answer an anonymous online questionnaire including the following elements:

- demographics (categorical questions on gender, age, tenure, seniority, […]);
- individual risk tolerance (three-item scale due to Pan and Zinkhan, 2006); and
- risk behaviour (12-item scale due to Sheedy and Griffin, 2017).

In total, 7 of the 10 participating banks are within the top 50 banks worldwide by assets as well as by market capitalisation ($10bn and bigger) and employ several tens of thousands workers. The three remaining banks are smaller in nature (between roughly 1,000 and 20,000 employees), hence still well-known and established in their country of origin. Out of the three smaller banks one is a mid-cap company (market cap between $2bn and $10bn), one a small-cap company (market cap less than $2bn) and one is privately held. By incorporating smaller as well as bigger banks we created a more diverse sample. The larger sample banks are all commercial banks with significant institutional banking businesses while the three smaller banks in the sample are retail banks. The response rate of employees invited for participation was between 21 and 63 per cent (mean of 46 per cent) for each bank.

Each participating bank provided general information about their remuneration policies but we did not collect individual remuneration data. Variable remuneration schemes are typically offered to all staff. The banks report that their performance measures (upon which variable remuneration is based) take account of risk and compliance criteria.

According to Financial System Stability Assessment reports by the International Monetary Fund (IMF, 2012, 2014, 2016) the financial industry as a whole in all three countries is resilient. Based on the same reports, we assume that the regulatory environment in all three Anglo sphere countries is strong. We nevertheless control for country and size differences as well as firm fixed effects. All ten banks are currently rated between AA and BBB by S&P's issuer credit rating.

Table I summarises the main demographic characteristics of participating employees. Overall the gender distribution of our sample is fairly equally balanced (46.58 per cent male, 50.19 per cent female with the remainder choosing not to respond to this question). For the banks in our sample the proportion of females in the population varies from 53 to 64 per cent, with median of 60 per cent, highlighting that females are generally well represented in the sample banks.

	Percentage of respondents (number of valid answers)
Gender	(35,053)
Male	46.58%
Female	50.19%
Age	(35,060)
Less than 25 years	3.24%
25–34 years	22.38%
35–44 years	29.30%
45–54 years	27.81%
55 years and above	14.05%
Tenure	(35,014)
Less than 6 months	4.04%
6 months to less than 1 year	4.51%
1 year to less than 3 years	14.55%
3 years to less than 5 years	12.85%
5 years to less than 10 years	20.62%
10 years to less than 15 years	14.08%
15 years or more	26.00%
Banks' country of origin	(36,223)
Australia	25.05%
Canada	65.05%
UK	9.90%
Business Line	(32,687)
Retail banking	34.15%
Institutional banking	10.10%
Wealth management	12.07%
Risk management	11.11%
Other functions	22.80%
Seniority	(34,493)
Team member/front-line employee	22.87%
Professional employee (but not a manager)	20.97%
Team leader	23.63%
Middle management	16.19%
Report to senior management	7.65%
Senior management	3.91%

Table I.
General characteristics
of collected data

Notes: Numbers in brackets indicate the sum of all valid answers for the relevant attribute. Percentages give the share of responses in each category (will not always add up to 100 per cent as missing values are not displayed).

In our analysis of age diversity, we define older workers as those aged 45 and over; 41.86 per cent of our sample falls into this category (higher than for the overall employee population). Staff are categorised according to business line, with the largest representation (34.15 per cent) coming from retail banking, followed by 22.80 per cent from other functions (these are typically headquarters functions such as marketing, legal, human resources or finance and technology). The smallest representation (10.10 per cent of the sample) comes from institutional banking. Risk staff (defined as specialist risk/compliance managers and internal audit) are overrepresented at 11.11 per cent of the sample.

The gender distribution of our sample (and by extension the population) varies significantly when analysed according to business line and seniority. Table II demonstrates that women are underrepresented in institutional banking and, to a lesser extent, risk. They are also underrepresented at senior levels and overrepresented in junior roles.

A different picture can be seen when looking at the age distribution based on the same dimensions. Older workers (45 or older) are overrepresented in senior roles (especially in the risk function). This is natural and reasonable as it takes time to climb the career ladder.

Proportion of women	Retail	Institutional	Wealth	Risk	Other	Weighted average (all BL levels)
Team member Professional employee	72.38% (3,943)	59.20% (527)	70.13% (1,115)	63.55% (439)	66.81% (1,603)	*69.46% (7,627)*
(not managers) Team leader	56.87% (2,527)	38.08% (780)	49.26% (940)	47.58% (828)	50.78% (1,918)	*50.98% (6,993)*
Middle	49.51% (2,947)	38.82% (845)	53.44% (1,018)	40.59% (786)	51.96% (2,219)	*48.66% (7,815)*
management Report to senior	42.34% (1,625)	30.20% (606)	47.75% (601)	38.62% (1,217)	47.31% (1,393)	*42.02% (5442)*
management Senior	43.56% (691)	24.93% (381)	42.22% (334)	40.56% (461)	49.44% (712)	*41.72% (2,579)*
management Weighted	29.06% (406)	15.68% (236)	30.77% (91)	29.95% (207)	38.69% (274)	*28.91% (1,214)*
average (all seniority levels)	*56.49% (12,139)*	*37.10% (3,375)*	*54.77% (4,099)*	*43.45% (3,938)*	*53.15% (8,119)*	*51.72% (31,670)*

Notes: Each cell presents the proportion of females comprising a particular segment of the workforce defined by seniority and business line (in brackets: the number of participants within that segment). Those who did not answer the gender, seniority or business line questions are not included in this table

Table II.
Gender distribution by business line (BL) and by seniority

Older workers, with greater business experience, may be considered more suitable for specialist risk roles. The proportion of older workers is quite consistent across the other business lines but they are somewhat underrepresented in institutional banking (Table III).

4. Method
This study investigates differences in risk management behaviour using survey responses. Social desirability bias is a challenge for surveys of this type as respondents may be unwilling to report behaviour that is undesirable in the workplace. We address this issue in several ways, but first and foremost by careful design and selection of survey items that are less likely to invoke a biased response.

Proportion of older	Retail	Institutional	Wealth	Risk	Other	Weighted average (all BL levels)
Team member Professional employee	40.32% (3,941)	29.73% (528)	42.78% (1,115)	37.41% (441)	39.78% (1,609)	*39.66% (7,634)*
(not managers) Team leader	35.99% (2,534)	30.74% (784)	39.17% (937)	40.90% (824)	36.25% (1,917)	*36.48% (6,996)*
Middle	40.91% (2,958)	27.98% (847)	45.89% (1,022)	40.00% (785)	36.88% (2,218)	*38.93% (7,830)*
management Report to senior	57.09% (1,622)	40.59% (606)	48.07% (597)	48.89% (1,219)	47.27% (1,394)	*49.91% (5,438)*
management Senior	55.84% (693)	56.73% (379)	58.21% (335)	55.87% (460)	51.61% (713)	*55.12% (2,580)*
management Weighted	67.81% (407)	63.40% (235)	64.84% (91)	73.56% (208)	58.18% (275)	*65.54% (1,216)*
average (all seniority levels)	*43.60% (12,155)*	*36.85% (3,379)*	*45.25% (4,097)*	*46.28% (3,937)*	*41.10% (8,126)*	*42.79% (31,694)*

Notes: Each cell presents the proportion of older participants (older is defined as being 45 years of age or older) comprising a particular segment of the workforce defined by seniority and business line (in brackets: the number of participants within that segment). Those who did not answer the age, seniority or business unit questions are not included in this table

Table III.
Age distribution by business line (BL) and by seniority

Second, the survey was conducted in a manner to encourage candour, i.e. by university-based researchers with strong and repeated assurances to participants that individual responses would not be provided to employers. Individual participation in the surveys was not compulsory and was not tracked in any way; as a result, no employee could be pressured to respond as is often the case in employee engagement surveys. Demographic questions were not forced so individuals concerned about possible identification (and resulting repercussions) were free not to respond to those particular questions.

Finally, we note that the aim of the analysis is not so much to measure behaviour in an absolute sense but to understand how and why it varies between individuals. Therefore, provided that pressure for social desirability is felt uniformly or randomly by participants, it should not impact on the research findings.

The set of survey questions assessing risk-related behaviour of staff is consistent with the discussion in Section 2.1. It captures not only the compliance dimension, but behaviours that reflect thoughtful engagement with and even advocacy of the risk management framework.

One important way of ensuring the reliability of survey measures is to focus on factors (groups of survey items) rather than individual items. Cronbach's α is used to assess the internal consistency of the items, i.e. to ensure that the group of items are related in a meaningful way. Values of 0.70 and over are considered acceptable in most research applications. The two factors capturing self-reported behaviour are as follows:

(1) Positive risk behaviour: respondents self-report their own behaviour that supports risk management objectives by answering a set of four items. Here all items are worded in the positive and relate to the aspects of risk management behaviour beyond mere compliance (Cronbach's $\alpha = 0.81$):

- "In the last year I actively promoted risk management within my business unit".

- "In the last year I felt a sense of personal responsibility for the organisation's future success when doing my work and making decisions".

- "I have a good understanding of the current boundaries of acceptable risk-taking when performing my role".

- "I know how to report a risk issue, incident or concern"

(2) Negative risk behaviour: respondents self-report their behaviour with three items worded in the negative. Note that this group is more related to compliance behaviour, with items carefully worded to avoid social desirability bias (Cronbach's $\alpha = 0.71$):

- "In the last year I sometimes needed to bend the rules in order to get my work done".

- "I often don't have time to think about all the risk implications when making work decisions".

- "I feel anxious about questioning business practices because my manager or my colleagues may react negatively".

The first part of Table IV shows descriptive statistics for the two behaviour factors. While high scores are favourable in relation to positive risk behaviour, it is quite the opposite for negative risk behaviour. To ensure validity, factor scores are only created if the participant responds to all related items. The last column in the table shows the number of valid responses received by the researchers out of the total sample set of 36,223.

Table V reports a Pearson correlation matrix for demographic as well as factor variables of our study. All correlations are in the expected direction although there is no significant association between gender and positive risk behaviour.

We create the factor individual risk tolerance based on three of the items for risk awareness introduced and validated by Pan and Zinkhan (2006). These items were used in

	Mean	Median	25th Percentile	75th Percentile	Standard Deviation	Skew	n
Positive risk behaviour (self-reported)	4.97	5.00	4.50	5.50	0.76	−1.12	31,103
Negative risk behaviour (self-reported)	2.25	2.00	1.67	2.67	0.92	0.79	31,790
Risk tolerance	3.01	3.08	2.25	3.50	0.95	0.19	22,059

Notes: Factors are derived from survey responses. Participants were able to indicate agreement or disagreement to the items according to a six-point scale, i.e. from Strongly Disagree (1) to Strongly Agree (6). Factor scores were created for each individual as a simple average of item scores; n gives the overall number of valid factor scores (any unanswered item from a factor resulted in a missing factor score for that individual). High scores are undesirable in the case of negative risk behaviour

Table IV.
Descriptive overview of factor scores

	1	2	3	4	5	6	7
1. Gender (female)	1						
2. Age	0.04**	1					
3. Tenure	0.09**	0.47**	1				
4. Seniority	(0.20)**	0.19**	0.10**	1			
5. Positive risk behaviour	0.00	0.16**	0.14**	0.18**	1		
6. Negative risk behaviour	(0.01)*	(0.09)**	(0.04)**	(0.08)**	(0.41)**	1	
7. Individual risk tolerance	(0.18)**	(0.23)**	(0.17)**	0.06**	(0.15)**	0.22**	1

Notes: Showing the Pearson correlation of demographic as well as factor variables. *,**Significant at 95 and 99 per cent confidence interval, respectively. Numbers in brackets indicate a negative correlation

Table V.
Correlation overview of demographics and factor scores

surveys of eight of the ten participating banks. For the remaining two we are missing this factor, leaving 25,447 responses. Descriptive statistics for this factor are found in Table IV. The factor consists of the following items (Cronbach's $\alpha = 0.71$):

- "If there is a great chance of a reward, I will take high risks".

- "If there was a great chance to multiply my money, I would invest even in the shares of a completely new and uncertain firm".

- "To achieve something in life, one has to take risks".

5. Results and discussion
We use a two-step regression model to test the association between demographics and risk management behaviour. Individual risk tolerance is introduced in the second step due to the association between risk attitudes and gender/age/tenure which was established in the correlation analysis. The two step-process allows us to determine to what extent a link between demographics and behaviour may be explained by risk attitudes.

The regression analysis controls for country/size, individual firm (not reported to preserve anonymity) and finally for business line. To ensure robustness of the models we additionally run unreported logistic regressions[2] and also a multi-level model (random intercept and random slope), both of which confirm the linear regression findings.

As shown in Table IV, the self-reported behavioural variables have skewed distributions and usual tests for normality fail (e.g. χ^2 or Jarque-Bera). For significance testing, we, therefore, use bootstrapped confidence intervals, re-sampling 10,000 times to enhance the stability and reliability of the results.

Table VI shows all four regressions (two sets of two-step regressions). In Step 2, risk tolerance is significantly negatively associated with positive risk behaviour and positively associated with negative risk behaviour, supporting *H1*.

We find that females are significantly more likely to report positive risk behaviour and significantly less likely to report negative risk behaviour (see Step 1). While consistent with expectations, the effect size is quite small compared with other explanatory variables such as seniority, business line and country/size. The addition of individual risk tolerance in Step 2[3] allows us to better understand the explanatory mechanism; in the case of negative risk behaviour the gender effect completely disappears, suggesting that the small link between gender and negative risk behaviour is largely driven by risk attitudes. In fact, after controlling for risk attitudes, the relationship between female gender and positive risk behaviour is slightly negative, i.e. females less likely to report positive risk behaviour. This small but statistically significant finding could potentially be explained by the possibility that females in financial services do not conform to traditional female stereotypes (see further analysis below). The finding is confirmed in unreported propensity score matching analysis; overall we find insufficient evidence to support *H2*.

Predictors	Positive risk behaviour		Negative risk behaviour	
	Step 1	Step 2	Step 1	Step 2
Gender (female)	0.02** (0.01, 0.04)	−0.02* (−0.04, 0.00)	−0.05** (−0.07, −0.03)	0.01 (−0.02, 0.04)
Age	0.06** (0.05, 0.07)	0.05** (0.04, 0.06)	−0.05** (−0.06, −0.04)	−0.02* (−0.03, 0.00)
Tenure	0.03** (0.02, 0.03)	0.02** (0.02, 0.03)	0.00 (−0.01, 0.00)	0.00 (−0.01, 0.01)
Seniority—team member	−0.08** (−0.11, −0.05)	−0.10** (−0.13, −0.06)	0.07** (0.03, 0.10)	0.09** (0.05, 0.12)
Seniority—team leader	0.06** (0.04, 0.09)	0.05** (0.02, 0.08)	0.03 (0.00, 0.06)	0.04* (0.00, 0.08)
Seniority—middle mgmt	0.15** (0.12, 0.18)	0.13** (0.09, 0.16)	−0.07** (−0.10, −0.03)	−0.08** (−0.12, −0.04)
Seniority—report to senior mgmt	0.28** (0.24, 0.31)	0.28** (0.23, 0.31)	−0.14** (−0.18, −0.10)	−0.17** (−0.22, −0.12)
Seniority—senior mgmt	0.38** (0.33, 0.42)	0.51** (0.44, 0.57)	−0.26** (−0.31, −0.20)	−0.37** (−0.44, −0.29)
Business line—institutional	−0.12** (−0.15, −0.09)	−0.09** (−0.12, −0.05)	−0.07** (−0.10, −0.03)	−0.11** (−0.15, −0.07)
Business line—wealth	−0.10** (−0.13, −0.07)	−0.09** (−0.12, −0.06)	−0.01 (−0.05, 0.02)	−0.04 (−0.07, 0.00)
Business Line—Risk/Audit	0.06** (0.03, 0.09)	0.10** (0.06, 0.13)	−0.05** (−0.08, −0.01)	−0.09** (−0.13, −0.05)
Business line—others	−0.17** (−0.19, −0.14)	−0.14** (−0.17, −0.11)	0.10** (0.08, 0.13)	0.06** (0.02, 0.09)
Bank origin—Canada	−0.11** (−0.15, −0.07)	−0.05* (−0.09, 0.00)	−0.08** (−0.14, −0.02)	−0.21** (−0.27, −0.15)
Bank origin—UK	−0.23** (−0.28, −0.18)	–	−0.06* (−0.13, 0.00)	–
Bank origin—Australia (small)	−0.22** (−0.31, −0.13)	−0.19** (−0.28, −0.10)	0.11 (0.00, 0.23)	0.04 (−0.07, 0.15)
Individual risk tolerance	–	−0.11** (−0.12, −0.10)	–	0.23** (0.22, 0.25)
Firm effects	Yes	Yes	Yes	Yes
Adj. R^2	(0.069, 0.082)	(0.082, 0.099)	(0.026, 0.033)	(0.078, 0.093)
n	27,972	19,627	28,608	20,188

Notes: Reporting coefficients of linear regressions with bootstrapped confidence intervals on a 95% significance level in parenthesis. *,**Significant with 95 and 99 per cent confidence interval, respectively. Values of adj. R^2 are also bootstrapped on 95% CI. Replicates for bootstrapping were set to 10,000; the dependent variables (as well as the independent variable individual risk tolerance) are derived from survey responses. Staff may indicate agreement or disagreement to survey items according to a six-point scale, i.e. from Strongly Disagree (1) to Strongly Agree (6). From these responses factor scores are calculated for each individual as an average of related survey items. Positive risk behaviour: self-reported behaviour that supports risk management objectives; Negative risk behaviour: self-reported undesirable behaviour; individual risk tolerance: assessing risk preferences in the domain of personal investments; gender, age and tenure are all categorical variables. Dummy variables are used for Seniority (referenced to senior employee/professional but not a manager), business line (referenced to retail banking) and country/size (referenced to large Australian banks). Firm dummy variables are used (but not reported) to account for differences in behaviour at the firm level. The UK dummy drops out in Step 2 because individual risk tolerance data were not collected in the UK sample

Table VI.
Explaining individual risk management behaviour

The evidence to support a link between age and risk management behaviour is much stronger. Even after controlling for risk attitudes and tenure, we observe that older workers are statistically more likely to report positive risk management behaviour and less likely to report negative risk management behaviour. This confirms that the advantages of wisdom/experience go beyond just risk aversion and years of service.

With regard to tenure the results are mixed. Tenure is significantly associated with positive risk management behaviour (although the effect is small) while we observe no link with negative risk management behaviour. Results are much stronger for seniority providing some support for *H4*. Those in senior roles are significantly more likely to report positive risk management behaviour and significantly less likely to report negative risk management behaviour.

5.1 Further gender analysis

To better understand the results in relation to gender, we investigate gender differences in risk tolerance according to seniority and business line. To the extent that risk-taking is regarded as a masculine attribute (see Meier-Pesti and Penz, 2008; Wilson and Daly, 1985), we can use individual risk tolerance as a proxy for masculinity.

Table VII presents differences in the means while Figure 1 shows the distribution density. Consistent with prior literature, a significant different exists between the mean male and female risk tolerance scores, but the difference diminishes with seniority due to increasing risk tolerance for females (while male scores remain consistent across all seniority levels). This pattern is consistent with findings by others that successful females in financial services do not conform to traditional gender stereotypes (see Kumar, 2010).
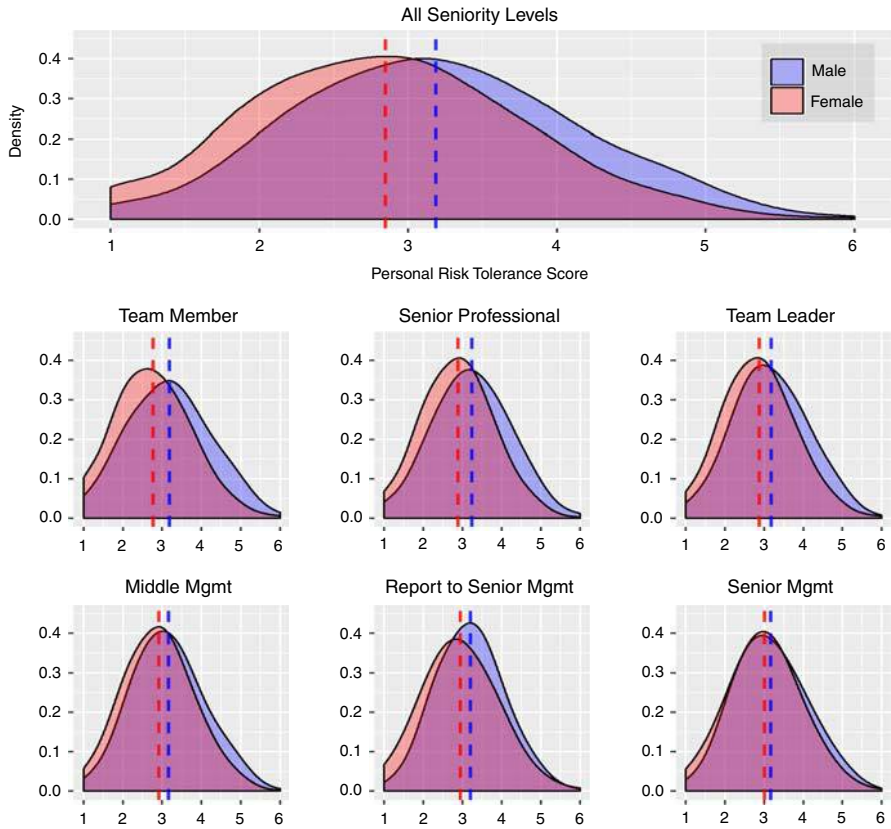
It is important to note in Figure 1 that the distribution of scores is very wide for both genders; as a consequence there are many individual females who are more risk tolerant than the average male (46.43 per cent of females). In other words, no individual male (female) can be assumed to be risk tolerant (averse).

For the sample of staff in senior management, the density of female scores overlaps the density of male scores almost exactly (χ^2 goodness-of-fit test fails to show a significant difference between both densities, *p*-value = 0.59), suggesting that the gender difference is more

Mean score of individual risk tolerance	Male (a)	Female (b)	Difference (b–a)	95% CI (bootstrapped)
Seniority				
Team member/front-line employee	3.17 (1827)	2.76 (3810)	−0.41**	(−0.47, −0.35)
Senior employee/professional	3.23 (2310)	2.88 (2192)	−0.36**	(−0.41, −0.30)
Team leader	3.18 (2324)	2.86 (2287)	−0.31**	(−0.37, −0.26)
Middle management	3.15 (2382)	2.90 (1612)	−0.25**	(−0.30, −0.19)
Report to senior management	3.19 (1188)	2.93 (804)	−0.25**	(−0.34, −0.17)
Senior management	3.16 (395)	3.00 (173)	−0.16*	(−0.32, −0.01)
	Male (a)	Female (b)	Difference (b–a)	95% CI (bootstrapped)
Business line				
Retail	3.06 (3372)	2.70 (4265)	−0.36**	(−0.41, −0.32)
Institutional	3.28 (1742)	2.96 (951)	−0.31**	(−0.38, −0.24)
Wealth	3.26 (1563)	2.84 (1805)	−0.42**	(−0.48, −0.36)
Risk	3.21 (1789)	3.02 (1313)	−0.18**	(−0.25, −0.12)
Other	3.23 (2120)	2.95 (2557)	−0.28**	(−0.33, −0.23)
Weighted average (all participants)	3.19 (10792)	2.84 (11087)	−0.34**	(−0.37, −0.32)

Notes: Reporting the mean score of the factor individual risk tolerance split by gender as well as seniority (upper part) or business line (lower part). Significance of difference between genders is tested by a bootstrap approach. *,**Significant with 95 and 99 per cent confidence interval, respectively. Replicates for bootstrapping were set to 10,000. Individual risk tolerance is derived from survey responses. Staff may indicate agreement or disagreement to survey items according to a six-point scale, i.e. from Strongly Disagree (1) to Strongly Agree (6). From these responses the factor score is calculated for each individual as an average of related survey items

All Seniority Levels

Team Member

Senior Professional

Team Leader

Middle Mgmt

Report to Senior Mgmt

Senior Mgmt

Figure 1.
Differences in
Individual Risk
Tolerance by Seniority

Notes: Showing smoothed density plots of the factor individual risk tolerance separated by gender (blue and red density plot) and split into the different seniority groups. Vertical lines indicate the mean score for each of the two groups. Individual risk tolerance is derived from survey responses. Staff may indicate agreement or disagreement to survey items according to a six-point scale, i.e. from Strongly Disagree (1) to Strongly Agree (6). From these responses the factor score is calculated for each individual as an average of related survey items

or less non-existent at senior levels. Given the likely importance of leaders in making consequential decisions and setting an example for others to follow, this is a significant finding.

The lower panel of Table VII presents risk tolerance by business line. We note that a significant gender difference in means occurs in all business lines. It is notable that for both genders, the individual risk tolerance in institutional banking is significantly higher than for retail banking (on a 99 per cent confidence level—not reported within table). We interpret this as possible evidence that institutional banking is a more masculine environment than retail banking, consistent with qualitative evidence presented by North-Samardzic and Taksa (2011). Recall the earlier evidence presented in Tables II and III that females and older workers are relatively underrepresented in institutional banking.

Overall, our data do not support the "Lehman Sisters Hypothesis", i.e., that recruiting more females into the financial services industry will improve risk management practices. Females that are attracted to this industry and succeed in it appear very similar to their male counterparts with regard to both risk tolerance and risk management behaviour.

6. Conclusion

Risk management behaviour is now considered a core banking skill yet little is established in the academic literature either about the behaviour itself or the people most likely to display it. Based on review of the regulatory and practitioner literature, we find that desirable risk management behaviour by staff, as opposed to senior leaders, can be defined as "compliance plus". That is, staff are expected to act consistently with risk policy/appetite but also to thoughtfully engage with the risk management process. This includes contributing to improvements to the risk framework by raising issues, reporting risk events, identifying new and emerging risks and even acting with accountability.

We find a significant negative association between individual risk tolerance and desirable risk management behaviour. This is likely to be caused by anxiety by more risk averse employees about the likely consequences of non-compliance with policy if discovered. Those who are more risk averse are also more likely to see value in the risk management framework and, thus, work to improve it.

We find little evidence to support the "Lehman Sisters Hypothesis": that females in financial services display more desirable risk management behaviour. The female advantage in risk management behaviour is slight and entirely explained by the well-known gender difference in individual risk tolerance. A key finding of this study is that gender differences in risk tolerance are decreasing in seniority so the senior females who are likely to make crucial decisions and influence others are similar to males in this regard.

Turning to older workers, we find that greater age is associated with more desirable risk management behaviour. This effect is significant even after controlling for individual risk tolerance and tenure, suggesting that the risk management benefits of age go beyond simple risk aversion and experience. This age effect suggests that wisdom adds significant value to the risk management process and should encourage employers to value and retain older workers.

Seniority is significantly associated with desirable risk management behaviour and so too is tenure, but to a lesser extent. This could be the result of greater commitment to and concern for the long-term resilience of the firm; it may also relate to greater reputational cost in the case of non-compliance. Finally, senior staff are expected to play a greater role in promoting risk management in firms that are committed to risk culture.

Notes

1. In the case of a financial institution, it is important to note that moral hazard can produce excessive risk-taking with significant externalities for society as a whole (Dam and Koetter, 2012). This has led to a system of prudential regulation including capital and disclosure requirements (Hellman, Murdock and Stiglitz, 2000; Nier and Baumann, 2006). Therefore, senior leaders of financial institutions choose a risk appetite subject to regulatory constraints.

2. As behaviour factors are skewed, for logistical regressions we defined "good" behaviour as any score above the 75th percentile and "bad" behaviour as any score below it.

3. We note that individual risk tolerance data were not collected in the UK.

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