

Title: Risk management of Chinese food companies; A management perspective

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Abstract: This study investigated the current situation of food risk management (FRM) in Chinese companies and the factors that influence the effectiveness of risk management measures. FRM is considered from the perspective of food company managers in 161 food companies surveyed in the Provinces of Henan and Hubei, Central China. Results suggest that the current FRM situation in China is poor, and the most important factor influencing the effectiveness of FRM measures is the financial resource allocated to FRM. Other affecting factors include the level of corporate social responsibility (CSR) engagement of the company and the company size (measured by the number of employees). The better the CSR then the better the FRM, and the larger the company then the less effective the FRM measures. The paper provides some suggestions for policy-making and further research.

Key words: Risk management, food company, affecting factors, corporate social responsibility, China

1. Introduction

With the rapid economic and population growth in China over the past thirty years it is perhaps unsurprising that China's food industry has also developed rapidly. While the urban population increased from 19.4% of the country's total in 1980 to 51.3% in 2011 (NBSC, 2012), the average annual growth rate of the gross value of output from the food industry in China increased from 13% between 1980 and 2001 to 25.2% between 2005 and 2010 (Zhang et al., 2015). But along with this rapid development and increased urbanisation there has been an increasing concern with food safety, and this has been exemplified by a series of scandals.

One of the biggest food safety scandals broke in China in 2008 that some 294,000 children suffered from urinary tract stones, 51,900 infants were hospitalized, and from 6 up to 11 babies died due to melamine poisoning (Schoder, 2010). In April 2011, police in the north-eastern city of Shenyang seized 40 tonnes of bean-sprouts that had been tainted with banned food additives, which were used to make the vegetable grow faster and look "shinier" in market stalls (Jia and Jukes, 2012). Clenbuterol, known in China as "lean meat powder", can accelerate fat burning and muscle growth, making it an attractive feed additive, sports performance enhancer and slimming drug, but overdoses can cause illness and in rare cases death. This drug is banned in China yet stubbornly continues to be detected in foodstuffs as a

result of its widespread use in animal feed. In 2006, more than 300 people in Shanghai were sickened by pig products tainted with the drug. In 2009, 70 people were hospitalized in Guangzhou after eating tainted pig organs, while in 2010 13 people in Shenzhen were hospitalized after eating clenbuterol-tainted snake (Olesen, 2011). Published research has claimed that up to 10% of rice sold in China has been contaminated with cadmium, a heavy metal known to cause cancer due to heavy metal pollution in the soil (Jia and Wu, 2012). Other frequent incidents include fraudulent products, microbial contamination and the sale of food beyond its expiration date. The China Consumers' Association claimed that food was the third most complained about product in the first half of 2012, and 79.6% of the complaints about infant milk powder were quality related (CCA, 2012). Since March 2013, the outbreak of bird flu in China has triggered yet another food safety scare.

As a result of such problems with food, the Chinese government has begun to pay increasing attention to the country's food safety system. Companies were encouraged to implement voluntary food safety assurance systems such as a Green Food Certification system, Organic Food Certification system, China's Brand-name Product Authorization, Hazard Analysis Critical Control Point (HACCP) and ISO management systems, with the last two mainly focussed on process management while the others are focussed more on final product performance. At company level, managers were given training regarding risk management and risk communication, early warning systems were suggested to set up (Zhang et al., 2014). Zhang et al. (2014) further suggested the implementation of CSR in food companies as a way to promote reduce food safety risks. As a compulsory system, the Food Quality Safety Market Access System was introduced, by which tags visible to consumers are attached to products that passed an inspection and quarantine test. However, the most significant action that has been instigated by the government is the Food Safety Law of China which came into effect on the 1st June, 2009. The new Law contains 104 rules in 10 chapters, and intends to address the deficiencies of the previous food safety regulations such as institutional fragmentation with responsibilities spread out across several ministries (Chen, 2009), and to upgrade the official control infrastructure and introduce a recall system. Indeed given the scale and importance of the problem there have understandably been various research studies focussing on the area of food safety in China, and these have been centred mainly on three aspects.

Firstly, research has been undertaken on consumers' perceptions regarding food safety issues in China. Zhang (2005) explored this issue in a large Chinese city, Tianjin, and results suggest

that Chinese consumers are understandably very much concerned about food safety, particularly with regard to vegetables and dairy products. Wang et al. (2008) surveyed consumers in Beijing regarding their awareness of milk products which have been subject to HACCP management, and concluded that the demand for food safety attributes is increasing amongst Chinese consumers. Similarly, Zhang et al. (2012) found that Chinese consumers were willing to pay a significant price premium for traceable food.

Secondly, there has been research on relevant food policies in China and how they relate to experiences elsewhere. Bai et al. (2007) explored food safety assurance systems in China and argued that stringent government legislation can indeed be successful in pressurising the large food firms to produce safe food due to their high public visibility, but the food safety issue of millions of small food firms can only be solved by encouraging voluntary implementation of the legislation. More recently, Pei et al. (2011) compared the EU and Chinese systems of food safety regulation for dairies and noted that the Chinese system concentrates more on end-products while the EU quality assurance approach is arguably more robust as it considers risks throughout the food chain. They argued that the Chinese quality control system assumes that the removal of low quality end products is the major part of safety management, which is in accordance with the UN's (2008) statement that *"enforcement in China of food control places an excessive reliance on end-product testing with very little use of auditing as an inspection tool"*, and this is further confirmed by Broughton and Walker (2010). Pei et al. (2011) hence concluded that China's system is not a good system for safety management, and needs improvement. Lv (2011), on the other hand, investigated the flaws in the current Patent Law of China and found that a more stringent Patent Law could help prevent food safety issues emerging by rejecting the patent application that is purposely changing or hiding food substances. However, Lam et al. (2013) stated that although the government is responsible for a legislative environment, the assurance of food safety and the regaining of public trust require the Chinese food industry to recognise that they are ultimately responsible for food safety problems.

Thirdly, some food safety related studies have attempted to identify the factors that influence the effectiveness of food risk management measures implemented by companies. Yang et al. (2012) surveyed food control officials of 22 provinces in China and found that establishing food control systems was regarded as challenging by the local government, and existing regional laws and regulations regarding food safety were rarely enacted. They also found that

the biggest problem was the inadequate resourcing of food safety control. Bas et al. (2007) surveyed 115 food businesses in Ankara, Turkey, in order to determine the barriers for HACCP and food safety programmes for food business in that country. It was found that a lack of knowledge about HACCP and other food safety programmes was a major barrier for improving food safety in food business, and the cost of implementation for the business is a further barrier. These two factors were confirmed by Karaman et al. (2012) after investigating 28 dairy plants in Aydin Province, also in Turkey, as two main barriers with regard to HACCP implementation. Kong (2012) considered the food safety related scandals in China as a corporate social responsibility (CSR)-related event, and suggested that authorities should encourage CSR activities of food companies as this should potentially have a positive influence with regard to food safety. Rouvière and Soubeyran (2012) provided a theoretical analysis which suggested that firm size is related to food safety preventive efforts, such that when cross-contamination (pathogenic hazard) could occur then small firms could be more vulnerable at risk than medium or large firms whereas when there is no cross-contamination (chemical hazard) then small firms would implement higher safety effort than large firms. Zhang et al. (2014) considered CSR as a strategic platform for FRM and any measure that promotes CSR would promote FRM, *visa versa*. They considered the frequency of food safety incidents as an indicator of the effectiveness of FRM measures, and after interviewed 183 food company managers in 14 regions across China, they found nine drivers for both FRM and CSR which are implementation of international standards corporate value, training received, status of early warning system, budget for FRM and CSR, financial performance of the company, management support, whether or not CSR was an integral part of the company strategy, and the management attitude. The same study also found the external factors of FRM and CSR adoption to be government supervision and market competition.

China's food safety problem is obviously a complex one not only because the above mentioned major deficiencies of relevant government policies and insufficient resourcing, but also because of the sheer size of its food industry and consumer base. There are currently 450,000 different food producers in China and around 78% of them are small firms with less than 10 employees, and according to the UN (2008) it is the small firms that have caused highest food safety risks. In addition, there are numerous unregistered irregular food producers located at the rural-urban fringe that are hard to regulate.

However, with the strong consumer demand and clear government determination to reduce

the food safety risks, food companies are under increasing pressure to improve the quality of their food products. But how bad is the current situation regarding food safety risks in China and what are the incentives and barriers to the implementation of food risk management measures? As the main policy-makers at the company level, the perspectives of Chinese food company managers regarding the above questions are obviously important in terms of encouraging action to tackle the problems. Management perspective is defined as the strategic understanding of situations, facts etc. and judging their relative importance and influence on each other (Gagnon, 2012). However, research in this area, especially in China, is very scarce. The research reported in this paper aimed to address this gap by looking at food company managers' perspectives regarding FRM and the incentives and barriers for implementation of a more effective FRM system, with particular attention given to the potential role of CSR. The latter has sometimes been assumed to be of importance with regard to FRM but to date the empirical evidence for such a link is lacking. Hence the research aimed to check whether adoption of CSR had a positive influence on the adoption and effectiveness FRM.

The paper is structured the following. Methodology section will include the analytical framework for the whole paper, the sampling method, data collection and analysis methods will also be introduced in this section. The third section Results including all the results the paper found including reliability analysis, current FRM situation of the case companies, factors influencing the effectiveness of FRM, CSR and risk management of food companies, relationship of company ownership, size and history with FRM, and regional difference of current FRM and CSR situation. In the final part Conclusions and discussion, the contribution of the paper are further discussed, and the policy suggestions are made.

2. Methodology

2.1 Analytical framework

The basis for the research was an assumption that adoption of CSR was positively related to the adoption and quality of FRM. Hence it was necessary to explore both of these aspects of company activity. The analytical framework for the research was based upon that of Tallontire (2007). She employed a form of Value Chain Analysis (VCA) covering four aspects of the 'agri-food' chain:

- a) input-output structure
- b) territorial configuration
- c) governance structure
- d) institutional framework

Of these the aspect that is of especial relevance with regard to FRM is governance as it allows answers to the important question of how key players 'drive' the creation and implementation of standards. In food systems the emphasis is often said to be upon a buyer-driven process whereby manufacturers respond to the demands of large-scale retailers. But food chains have many actors, of course, beyond producers and retailers, including government agencies, civil society and various types of consumer. In terms of FRM the pressures are often assumed to operate vertically within the chain i.e. from government or 'buyers' (in the case of private standards initiatives; PSIs) down to producers. The polarity of power in terms of driving standards in terms of quality and production is thus a one-way street. However, Tallontire (2007) takes the interesting stance of considering what she refers to as 'horizontal governance' in food chains i.e. how various actors across the chain have formal and informal influence on the setting, monitoring, improving or implementing of standards (including safety). Thus one can imagine all sorts of interaction between a variety of actors within and peripheral to the food chain, especially with regard to PSIs but potentially also in terms of the setting of government-led initiatives. It is the broadening out allowed by the 'horizontal governance' which allows for a consideration of related initiatives in CSR to be considered as helping to set a favourable institutional 'environment' for FRM. This is an especially attractive concept in the Chinese context given the power (and number) of food companies and the relative paucity of government involvement in terms of policies and monitoring, but provides a significant practical challenge in terms of access within the Chinese context. Hence for this research the emphasis is primarily upon one important group of actors, notably the managers in food companies responsible for FRM. These actors were targeted so as to get a sense of the state of play of FRM in their companies and how this relates to their CSR.

2.2 Sampling frame

There are various ways in which the research could have been approached such as the use of in-depth case studies, but here it was decided to follow the approach taken by a number of researchers (i.e. Zhang et al., 2014, 2015; Jin et al., 2008) and adopt a structured questionnaire-based survey that covered the highlighted points in the analytical framework of Figure 1. Based on the geographic area and economic development level, 6 provinces, Henan, Hubei, Hunan, Anhui, Jiangxi and Shanxi belong to Central China. In 2013, the GDPs of Henan and Hubei were the highest among the 6 provinces, and counted for half of the total GDP of the 6 provinces. Henan was the largest agricultural province in China according to both its grain production and the number of food producing companies, and is known as China's "barn" and "kitchen". The main agricultural products of Henan are flour-based products, meat and dressings, while the main agricultural products of Hubei are rice, tea and meat. Wuhan, as the capital of Hubei Province, in 2010, was 5th in China based on the number of food producing companies and 10th in terms of grain production (CFIA, 2011). Food companies from Henan and Hubei were assumed (a priori) to be similar in a number of regards and thus it would be possible to combine the results, and the results of testing this assumption are set out later in the paper. This is the reason that Henan and Hubei are selected for this study. All the companies in Hubei Province were based in its capital, Wuhan City (Figure 2).

The target group for the research - managers - are very busy and experience of the authors suggests that they are more likely to respond to a structured questionnaire than something more semi-structured. A convenience sampling approach was employed. A total of 180 food companies based in Henan and Hubei were selected for the survey because they had business connections with one of the author's institution. Each sample company was given a questionnaire to complete, and the targeted respondents were managers responsible for product safety or if no individual was tasked specifically with that role then the General Manager was contacted. A total of 161(89%) managers returned a valid questionnaire (Figure 2). Of these returns:

- 126 (78%) were located in Henan Province and 35 (22%) were in Wuhan City, Hubei Province.

- 23 (14%) companies were founded 22 years ago, 68 (42%) were founded between 1990 and 1999, 49 (31%) were founded between 2000 and 2005, and 20 (13%) were founded after 2006.
- 83 (52%) were private, 35 (22%) were sino-foreign joint ventures, 19 (12%) were public listed companies, 17 (10%) were state-owned companies, and the rest were other type of companies.
- 156 indicated their registered capitals, of which 28 (18%) had 0.5 million Yuan and less of registered capital, 27 (17%) with 0.5-1 million Yuan, 39 (25%) with 1-5 million Yuan, 22 (14%) were with 5-10 million Yuan, while the rest 40 (26%) had more than 10 million Yuan of registered capital.
- 156 indicated the number of employees, of which 40 (26%) had 50 or less employees, 21 (13%) had 51-100, 51 (33%) had 101-500, 25 (16%) had 501-1000, and 19 (12%) had more than 1000 employees.

The above descriptive information for the sample indicates that it was broadly representative of the landscape of Chinese food companies.

<Figure 2 near here>

2.3 Data collection and analysis

The questionnaire was finalized after a pilot study was conducted in December 2011. The final version of the questionnaire comprised a mix of closed and open-ended questions aimed to uncover food companies' current FRM situation, the manager's attitude to food risks and CSR, the effectiveness of FRM measures as well as the affecting factors of their effectiveness. The fieldwork was undertaken in Henan and Hubei simultaneously from February to April 2012.

The Henan Province component of the survey was carried out by 5 undergraduate students based in Henan Agricultural University, and the Hubei part was carried out by one undergraduate student from Wuhan University. The questionnaires were administered via a combination of face-to-face interview, telephone interview and email. All students received survey skills training before the survey, including understanding of the survey questions, how

to approach respondents etc. Of the 161 valid questionnaires received, 100 in Henan Province and 20 in Wuhan were completed face-to-face, 10 in Henan and 2 in Wuhan were completed by telephone interview and 29 questionnaires in total were completed via email.

After investigating the food safety regulations and based on the outcome of the pilot study, a set of indicators were established to cover the current situation of FRM, the company's attitude to food safety risks and the effectiveness of FRM. The current situation of FRM was assessed using the following indicators:

1. Level of support that managers give to FRM
2. Changing trend of the level of support that the managers give to FRM in the past 5 years
3. Budget for FRM
4. Status of the early warning system
5. How alert are people to food safety issue (by learning from previous incidents in the industry)
6. Training managers received regarding risk communication
7. Training managers received regarding general risk management.

The budget for FRM (indicator 3) was measured based on the managers' responses to questions such as "what is the perceived percentage of the yearly budget that should be spent on FRM?" and "what is the actual spend?" The rest of the indicators were measured on a 5 point Likert scale with 1 being the lowest score and 5 being the highest. For example, when asking about the status of an early warning system for food safety, if the answer was "No early warning system at all", then the score allocated was 1, and if the answer was "yes, we have complete warning system" then the score given was 5, and the ranks of any other answers fell in between these extremes.

The company's attitude towards food risks was assessed by the managers selecting one of the following three attitudes that best represented the position of the company:

1. Defensive (taking no action when the crisis arises)
2. Passive/reactive (taking action during the crisis as a response to the public/media pressure)

3. Proactive (having measures in place before the crisis).

Finally the “effectiveness of FRM” indicator was assessed from the frequency of risks (FOR).

In order to explore how FRM may be related to CSR then CSR related indicators were also established spanning the perceived current CSR performance of the company and its claimed attitude towards CSR. The current CSR performance indicator was assessed based on the perception of respondents regarding their own companies’ CSR performance on a 1-5 scale with 1 being the lowest performance and 5 being the highest. The respondents’ view regarding the company’s attitude to CSR was chosen from three possible answers:

1. Defensive (no CSR and the focus entirely on profit making)
2. Passive/reactive (introducing CSR only when legally required)
3. Proactive (including CSR as an integral part of the company strategy).

3. Results

3.1 Reliability analysis

A computer software package (SPSS 19.0) was employed to store and analyse data. After taking out questions that have low relevance to the rest of the questions, a Cronbach’s alpha of 0.664 is reached, which indicates an acceptable level of internal consistency for the scale with this sample (Table 1).

3.2 Current FRM situation of the case companies

During the survey, the authors investigated FOR linked to the case companies for the past 3 years (Table 2). Based on the report from the managers, the most frequent risk was “product being illegally copied by competitors”, followed by “recall”, “sharp reduction of profit”, “resignation of senior management” and “major lawsuit”. This indicates that the two greatest perceived risks within the food industry were mainly linked to a product being illegally copied by competitors and product recall. This result is different from what perhaps would be expected to be the most frequent risk that food companies face, namely producing unsafe food.

However they are obviously closely linked as the product being illegally copied by competitors could be the reason behind many unsafe foods in China, and product recall might well be the result of this. Clearly, a more stringent copyright and patent legislation in food industry is needed for safe food production, as suggested by lv (2011).

<Tables 1 and 2 near here>

The above observation is further confirmed by responses received with regard to the current FRM situation of the company. Based on 1-5 scale, the average score of the level of alert to food safety issues was 3.64, and that of the status of early warning system was 3.53. If a score of 4 out of 5 is taken as being satisfactory (give the importance of food safety), and anything less than 4 as being unsatisfactory, then the companies did not seem to be as alert to previous incidents as they should have been. A more detailed analysis of the status of the early warning system indicates that more than 40% of the managers admitted that they did not have, or they did not know if they have, an early warning system in place for their company. No wonder that of those who claimed to be alert to food safety issues, only 35% said they had actually taken measures to prevent future incidents. It seems clear that the FRM situation of the surveyed companies was far from being encouraging, and based upon these results there is much room for improvement. Therefore it is perhaps not a surprise that the surveyed companies spent only 6.67% of their yearly budget on FRM even though the expected spend was 7.88%.

In contrast to the above, the results indicated that respondents were generally supportive of FRM (with an average score of 4.34), although they were less satisfied with the training they received regarding risk communication and risk management in general with average scores of 3.51 and 3.46 respectively. However, when they were asked about their company's attitude to risks, 93.2% of the surveyed companies claimed that they took proactive actions to minimise this. Hence there is a contradiction here. On one hand the managers claim to support FRM and said they took proactive steps to minimise risks, on the other hand FRM was not at all a priority for their company.

The status of FRM within the sample can also be reflected by the companies' implementation of international standards such as ISO9000, HACCP, ISO14000, SA8000, GMP, and SGS (Table 3). Of the 161 surveyed companies, 141 responded to the question regarding ISO9000

implementation, 135 regarding HACCP, 134 regarding ISO14000, 122 regarding GMP, and 116 regarding SA8000 and SGS respectively. All that responded to ISO9000, 53% had not only implemented it but also obtained ISO9000 accreditation while 13% had implemented it but not been accredited, another 34% claimed to be aware of ISO9000 but did not plan to implement it. Some 97% of 135 respondents were aware of HACCP, but around half of them did not plan to implement it. Only 36% had implemented HACCP and also received accreditation. Similarly, 97% of 134 respondents were aware of ISO14000, but more than half (57%) did not plan to implement it. Only 28% had implemented ISO14000 and received accreditation, while 3% were not aware of the standard. Other standards seem to be less popular amongst the sample of companies, with 87% being aware of GMP, 73% for SA8000, and 78% for SGS. Very low implementation and accreditation rates were recorded for GMP (8%), SA8000 (7%), and SGS (7%).

<Table 3 near here>

3.3 Factors influencing the effectiveness of FRM

Frequency of risks (FOR) is considered as an indicator of the effectiveness of FRM measures. To understand the relationship between the effectiveness and its affecting factors, a multiple regression analysis was carried out between FOR and possible affecting factors (Table 4). The results indicate that with a P value of 0.003, only the budget for FRM (F1) passed the significance test and hence is the only direct influencing factor of FOR. Some other factors i.e. status of the early warning system (F2), the amount of training managers received regarding risk management (F3), the perceived importance of FRM for improving organizational behaviour (F4) may well influence the FOR and some of these were certainly noted by respondents as being of importance, but there is no statistical evidence of causality.

<Table 4 near here>

3.4 CSR and risk management of food companies

The relationship between the company's attitude to CSR and risk is shown in Table 5. The

results provide some evidence for a link between CSR and FRM ($P < 0.001$), such that a positive view of CSR suggests a positive attitude towards risks.

Table 6(a) lists the CSR levels of sample companies and total FOR of those companies at each CSR level. It shows that the occurrence of food safety incidents for companies with CSR performance mark of 2.5-5 (better CSR performance) was 165, and for companies with CSR performance mark of 1-2 (worse CSR performance) it was 586. Clearly companies with good CSR performance experienced less food safety problem than those with poorer CSR performance. Further analysis (Table 6b) suggests that the levels of CSR performance and the total FOR at each CSR level were related ($P = 0.002$). It indicates that the CSR performance of a company does indeed have direct influence on the effectiveness of its FRM, which corresponds to Kong's (2012) conclusion. But of course more effective FRM measures (low FOR) would go with better CSR performance and less effective FRM measures with lower CSR performance.

<Tables 5 and 6 near here>

3.5 Relationship of company ownership, size and history with FRM

Correlation analysis between FOR and the company's establishment time, registered capital and number of employees shows that FOR and the number of employees were positively correlated (Table 7). Hence the more employees in the company, then the higher the FOR. Since the number of employees indicates the size of the company, this result to some extent echoes Rouvière and Soubeyran's (2012) conclusion, based on a theoretical analysis, that firm size should be considered when a food operator implements preventive measures to avoid food safety hazards. However, in this study, company ownership does not appear to be a significant factor that influences FOR.

<Tables 7 near here>

3.6 Regional difference of current FRM and CSR situation

To find out if there are regional differences between the food company managers regarding

the current FRM and CSR situation, t-tests were carried out to compare means of the score of the answers to the questions in the questionnaire (Table 8). As anticipated at the onset of the research, it seems that there is no difference ($P>0.05$) between the managers in Henan and Hubei regarding their views of the current FRM and CSR situation. This further proves the validity of the sampling frame of this paper that Henan and Hubei can be taken as one sample. The reason of the regional indifference regarding FRM and CSR situation could be that both Hubei and Henan are in central China and are in a similar stage of economic development. However the question of whether economic development is one of the influencing factors of FRM still needs to be answered.

<Tables 8 near here>

4. Conclusions and discussion

The research set out in this paper is the first study of its type in China and throws light on an important aspect of the country's development. The contribution of the paper includes the following. First, it investigated the risk management of food industry, an industry that is suffering from series international food safety scandals. Second, it looks at the manager's perspectives regarding FRM and the incentives and barriers for its implementation. Third, the potential role of CSR is given particular attention as an influencing factor to FRM implementation. The analytical framework of Tallontire (2007) proved to be useful in its assumption that 'horizontal governance' was an important consideration even if in this context the research focussed solely on the links between FRM and CSR within the food companies.

The surveyed companies are of different size, scale, ownership, and history, and located in two provinces in central China, Henan and Hubei, but they are nonetheless broadly representative of the large diversity of Chinese food companies. The results of reliability analysis and t-test indicate that the results and findings of this paper are reliable. However, only company managers were interviewed (one per company), so the results could be different if other employees were included in the survey. Second, the case companies are based in central China, which might make the cases less representative of companies in other areas of China. Understandably, apart from what has been reported here, there could be other factors such as the respondent's identification, surveyed companies' individual business culture or indeed regional characteristics etc. that could affect FRM.

One of the most important outcomes of the research is that even with a series of food safety scandals and increasing government attention FRM seems not to have been given enough attention by Chinese food companies. Although the managers claimed to support FRM, and the majority claimed that their companies were proactive in dealing with food safety problems, in reality they spent little money on FRM and almost half of the surveyed companies did not have an early warning system in place; a clear requirement of FRM. In addition, only around half of the companies had implemented and were accredited with ISO9000 and one third of them with HACCP. Many of the respondents did not even have knowledge of some of the most important international standards which were applied within China. So the results suggest that the whole FRM situation in China remains very serious, and this echoes results from earlier work such as Bai et al. (2007), Jin et al. (2008), Zhang et al., (2013, 2014).

Corresponding to the results of Bas et al. (2007) and Karaman et al. (2012) from Turkey, and Yang et al. (2012) from China, our results also suggest that the budget allocated for FRM is the direct causal factor in terms of the effectiveness of FRM measures. There is obviously a need for more investigation regarding the cost of these interventions and how this can be addressed with support from government. However contrary to the results mentioned above, the research reported here suggests that there is no statistically significant relationship between FOR and the training received by managers regarding risk management, and there is no link at all between the FOR and the extent of training received regarding risk communication.

As mentioned by Pei et al. (2011), one of the weak points of China's food safety system has often been claimed to be the lack of trained personnel, and in order to make up for this shortage the Chinese government has endeavoured to establish and reinforce training schemes. Hence the lack of statistical evidence linking training with FOR is perhaps one of the most unexpected outcomes of the research. The reason for this could be multiple, and one of them may be that data collected in this research regarding training was only the managers' self-reported training, which could cause some under- or over-estimation. Another reason could be that the managers themselves did not realize the importance of the training and it became something of a 'tick box' exercise while in fact they did not learn anything that helped with FRM. Hence it is the quality of the training rather than quantity that could be far more important with regard to FRM. Nonetheless, this provides a warning to those who think that

such complex problems can be easily resolved, and at a relatively low cost, by providing trainings.

The results also suggest that a food company's attitude (defensive/passive/proactive) to CSR affects its attitude to risk, and indeed the CSR performance of a company has an apparent positive link with the effectiveness of its FRM measures. Therefore one of the important measures to enhance FRM is arguably to promote CSR in these companies. This finding may not necessarily be all that surprising as, after all, one would expect a "good" company to have a strong CSR as well as a good FRM. Thus both become indicators of an underlying sense of social responsibility held by the company. It would be interesting to explore why it is that some companies in the sample had this sense of being socially responsible while others did not. One possibility is that the companies having a strong CSR and FRM had "champions" within them who see these as important and who had the power and influence to help make them a reality. It could also be the moral code adopted by the companies that is consistent with both Buddhist economics and Adam Smith's philosophy (Abeysuriya et al., 2007)

It is worth noting that there was a statistically significant relationship between the number of employees and the effectiveness of FRM measures (as assessed with FOR); larger companies had higher FOR. Thus it was not the type of company that mattered but the size. These results are perhaps not what would be anticipated as big companies would be assumed to be more careful about food safety due to their high public visibility and hence have low FOR, while private and small companies would be less careful due to their low public visibility and have higher FOR (Bai et al., 2007; UN, 2008). It also contradicts Jin et al.'s (2008) result that the larger the company, the more likely it is that they would adopt the HACCP system. There were obviously far more complex factors at play here, just as Rouvière and Soubeyran (2012) have found that both large and small food companies could theoretically have an advantage depending on the type of hazard. The reason could be the same as Zhang et al.'s (2014) finding that large companies have bigger supply chain which is always harder to control. Alternatively it may be that the "sustainability champions" mentioned above are more likely to be found in the smaller and private companies than in the larger ones, or such champions could have greater influence in the smaller companies. It could also, of course, be a function of all of these. There is clearly a need for further research to unpack these different factors, and given the importance of food safety in China and the scale of the challenges faced by that country this is research that is badly needed.

Based on above findings, some policy suggestions can be made regarding the improvement of FRM in China. First, there is a need to strengthen the current food safety policy and legislation and focus more on the whole food supply chain instead of solely on end-product inspection. Second, government should provide more resourcing (i.e. free training in FRM), and food companies should allocate an annual budget for FRM. The third point is actually related to the above two. Considering the sheer size of China's food industry comprising not only large companies but numerous small and illegitimate food producers then China's food safety policy and regulations should be made applicable to not only the big food producers but also the small food companies. Last but not the least, while mandatory implementation of international standards should be applied to the whole food supply chain, voluntary CSR activities should be encouraged as it is the best way to stop food safety incidents in small food companies.

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Table 1 Reliability analysis

<u>Cronbach's Alpha</u>	<u>Cronbach's Alpha Based on Standardized Items</u>	<u>N of Items</u>
0.659	0.619	26

Table 2 Frequency of food safety risk incidents in the past 3 years

Type of incident	Average frequency per company	Total frequency
1. Product being illegally copied by competitors	0.76	117
2. Recall	0.62	95
3. Employees being sluggish at work	0.60	92
4. Sharp reduce of profit	0.59	89
5. Resignation of senior management	0.37	57
6. Natural disaster	0.26	39
7. Impairment of brand	0.25	37
8. Loss of sensitive information	0.22	34
9. Impairment of reputation (negative comments from the media)	0.22	33
10. Major lawsuit (caused by product safety issues)	0.20	30
11. Fire, blast, chemical spill etc	0.16	24

Table 3 Case companies' implementation and accreditation of international standards

Implementation of international standards	Number of companies (percentage of total responded)					
	ISO9000	HACCP	ISO14000	GMP	SA8000	SGS
Implemented and accredited	75 (53)	48 (36)	37 (28)	10 (8)	8 (7)	8 (7)
Implemented but not accredited	18 (13)	15 (11)	17 (13)	11 (9)	13 (11)	7 (6)
Aware but not implemented	48 (34)	68 (50)	76 (57)	85 (70)	63 (54)	75 (65)
We do not know the standard	0 (0)	4 (3)	4 (3)	16 (13)	32 (28)	26 (22)
Total	141 (100)	135 (100)	134 (100)	122 (100)	116 (100)	116 (100)

Table 4 Regression analysis of FOR against four potential explanatory factors

	Unstandardized	Standardized	t	Sig
	Coefficients ^a	Coefficients		
	B (SE)	Beta		
Constant	4.505 (2.894)		1.556	0.122
Budget for FRM (F1)	0.204 (0.066)	0.265	3.079	0.003
Status of the early warning system (F2)	-0.585 (0.552)	-0.113	-1.059	0.292
Amount of trainings managers received regarding risk management (F3)	-0.800 (0.624)	-0.135	-1.282	0.202
Perceived importance of FRM for improving organizational behaviour (F4)	-1.225 (-0.742)	-0.186	1.651	0.102

^a Independent variable: F1, F2, F3, F4.

Table 5 Regression analysis of food company's attitudes to CSR and to risks.

	Unstandardized Coefficients ^a	Standardized Coefficients	t-value	Sig
	B (SE)	Beta		
Constant	4.057 (0.128)		31.620	0.000
Attitude to CSR	0.231 (0.054)	0.328	4.285	0.000

^a Independent variable: attitude to CSR.

Table 6 Level of CSR performance and total FOR of companies at each CSR level

a. Absolute number of CSR performance and total FOR

CSR Performance	Total FOR ^a
5.0	2
4.0	1
3.5	35
3.0	56
2.5	71
2.0	194
1.5	208
1.0	184

^a Total FOR is the total FOR of companies at each CSR level.

b. Regression analysis between CSR performance and total FOR of companies at the same CSR level

	Unstandardized	Standardized	t-value	Significance
	Coefficients ^a	Coefficients		
	B (SE)	Beta		
Constant	262.188 (33.765)		7.765	0.000
CSR performance	-59.845 (10.973)	-0.912	-5.454	0.002

^a Independent variable: CSR performance.

Table 7 Correlation analysis between company history, registered capital, number of employees, and FOR

	FOR	Establish time	Registered capital	Number of employees
FOR	1			
Year of establishment	-0.118	1		
Registered capital	0.080	-0.153	1	
Number of employees	0.206 ^b	-0.123	0.434 ^a	1

^a Correlation is significant at $P < 0.01$ (2-tailed);

^b Correlation is significant at $P < 0.05$ (2-tailed);

Table 8 Regional differences of the current FRM and CSR situation

	Region	Mean	t-test for equality of means		
			t	df	Sig. (2-tailed)
<i>FSM</i>					
Level of support that managers give to FRM	Henan	4.33	-0.072	159	0.9423
	Hubei	4.34			
Changing trend of the level support that managers give to FRM in the past 5 years	Henan	4.10	1.089	158	0.278
	Hubei	3.94			
Actual budget for FRM	Henan	6.82	0.901	74	0.371
	Hubei	5.95			
Expected budget for FRM	Henan	7.76	-0.380	132	0.705
	Hubei	8.32			
Status of the early warning system	Henan	3.56	0.730	157	0.466
	Hubei	3.41			
How alert are people to food safety issues (by learning from previous incidents in the industry)	Henan	3.64	0.216	152	0.829
	Hubei	3.61			
Training managers received regarding risk communication	Henan	3.50	-0.062	156	0.951
	Hubei	3.51			
Training managers received regarding risk management	Henan	3.46	-0.166	156	0.869
	Hubei	3.48			
Attitude to risks	Henan	3.55	0.279	159	0.780
	Hubei	3.51			
<i>Implementation of international standards</i>					
ISO9000	Henan	3.21	0.542	139	0.589
	Hubei	3.11			
ISO14000	Henan	2.64	-0.189	132	0.850
	Hubei	2.68			
SA8000	Henan	1.93	-1.007	114	0.316
	Hubei	2.12			
HACCP	Henan	2.73	-1.598	46	0.117
	Hubei	3.04			
GMP	Henan	2.09	-0.844	120	0.401
	Hubei	2.23			
SGS	Henan	1.92	-1.402	114	0.164
	Hubei	2.16			
Effectiveness of FSM (FOR)	Henan	4.36	1.044	154	0.298
	Hubei	3.34			
<i>CSR</i>					
Attitude to CSR	Henan	2.43	0.237	153	0.813
	Hubei	2.39			
CSR performance	Henan	4.21	0.189	152	0.851
	Hubei	4.18			

Figure 1 Analytical framework

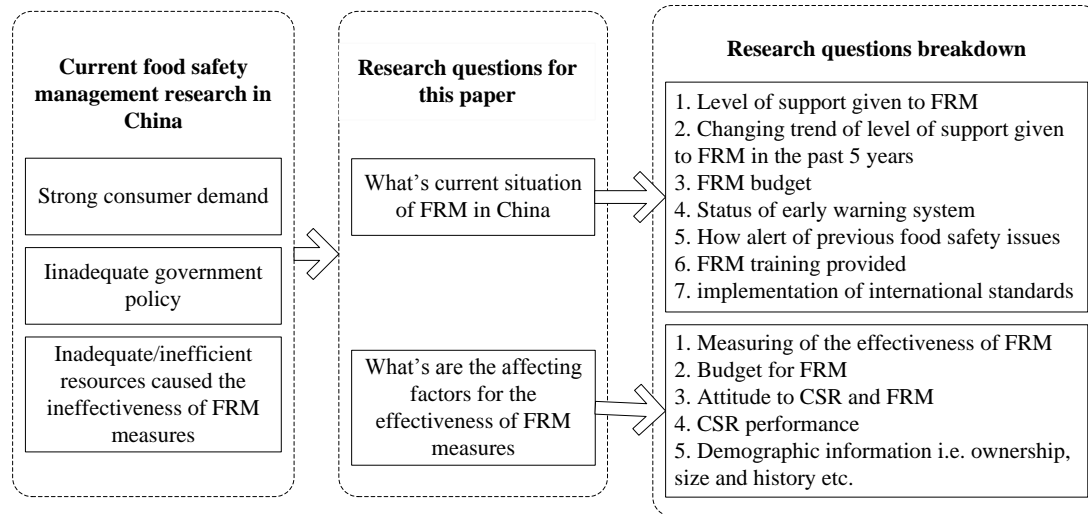
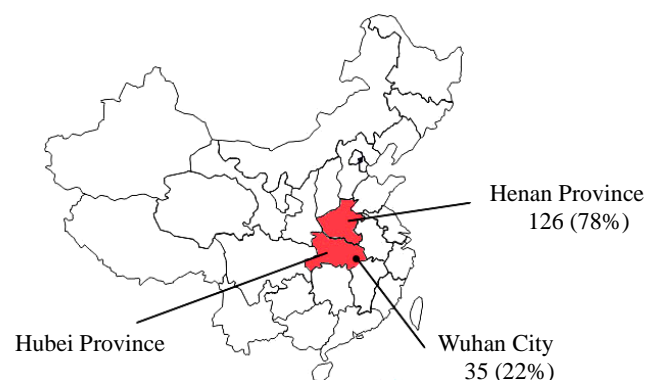


Figure 2 Location and attributes of the 161 surveyed companies employed in the research.



	Number of surveyed companies: 161				Number of replies
	1989 and before	1990-1999	2000-2005	2006-2010	
Year of establishment	23 (14%)	68 (42%)	49 (31%)	20 (13%)	160
Ownership	Private	Sino-foreign joint venture	Public-listed	State-owned	Others
	83 (52%)	35 (22%)	19 (12%)	17 (10%)	7 (4%)
Registered capital (Million Yuan RMB)	0.5 and less	0.5-1 (inc.1)	1-5 (inc.5)	5-10 (inc.10)	Above 10
	28 (18%)	27 (17%)	39 (25%)	22 (14%)	40 (26%)
Number of employees (person)	50 and less	51-100	101-500	501-1000	Above 1000
	40 (26%)	21 (13%)	51 (33%)	25 (16%)	19 (12%)