"Cross-Regional Equivalence of Consumer confidence in the Safety of Food"

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Abstract

A thorough understanding of consumer confidence in the safety of food and the factors by which influences is necessary for the development of adequate and effective risk management and communication regarding food safety issues. As food chains become increased in India, risk management and communication are also in an increase at an alarming rate. As a consequence, cross-culturally valid theoretical models are needed to investigate consumer confidence in the safety of food, in this study; consumer confidence in the safety of food in southern India and the northern India was systematically compared. On the basis of two regionally representative samples, it was examined to what extent differences in consumer confidence between the two regions resulted from differences in the relative importance of the determinants of confidence, and differences in the means of the constructs. No differences between southern India and the northern India were found regarding the relative importance of the determinants, which provides support for the generalizability of the frame- work. However, results indicated that north Indians had a higher level of optimism and a lower level of pessimism regarding the safety of food, which appeared to be mainly related to the north Indians lower level of concern about factors related to production, and the results also indicated cross-regional differences in consumer recall of food safety issues in the media.

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1. Introduction

In the recent past, consumers have been confronted with various food safety incidents, which have been associated with increased media attention focused on food safety issues, for adequate and effective risk management and communication in the light of food safety issues, a thorough understanding of consumer confidence in the safety of food and the factors by which this is influenced is needed. Insights into how consumer confidence in the safety of food changes over time in concordance with external food safety events can be used to evaluate the effectiveness of regulatory activities - including risk communication - which are designed to promote food safety, optimize consumer protection, and enhance consumer confidence in the safety of food. In addition, greater understanding of the factors that influence consumer confidence in the safety of food can be used to account actual consumer

concerns in communicating about food safety issues therefore, cross-regional differences in consumer perceptions of risk, and confidence in food safety practices is considered.

So, it is important to consider general consumer confidence in the safety of food, hence, a framework of consumer confidence in the safety of food was developed in which several factors related to general consumer confidence in the safety of food have been brought together. The concept of general consumer confidence in the safety of food, and the factors by which this might be influenced are outlined below.

General consumer confidence in the safety of food-General consumer confidence in the safety of food can be defined as the extent to which consumers perceive that food is generally safe and it is not a one-dimensional construct, but can rather be conceptualized as consisting of two dimensions; optimism and pessimism. Optimism about the safety of food indicates the extent to which consumers are satisfied about the safety of food, and think that food is generally safe, pessimism, on the other hand, indicates the extent to which consumers worry and are suspicious about the safety of food however, in consumer perception, optimism and pessimism about the safety of food are not mutually exclusive: in other words, feelings of optimism and pessimism can coexist. However, optimism and pessimism should be considered as two related, but distinct; concepts that are not opposing dimensions of the same construct, in the framework of consumer confidence in the safety of food, optimism and pessimism are, therefore, included as two separate dependent variables.

Factors that may influence general consumer confidence-Confidence is typically lost when a consumer's expectations are disappointed, particularly when there is also a perception of mismanagement on the part of the authorities or industries with responsibility for consumer protection therefore, consumer recall of specific food safety typically do not involve the entire food production system, and pertain to potential risks associated with one or several particular product groups, specific concerns at the product group level might negatively affect consumers' overall level of confidence in the safety of food. Therefore, consumer safety perceptions of particular product groups should be taken into account while investigating consumer confidence in the safety of food in general.

However, long term consumer concerns about current food production practices are also responsible for low consumer confidence in the safety of food in general and it is expected that the extent to which consumers are concerned about food production practices and the healthiness of food products available in the retail environment might influence their confidence in the safety of food in general. Consumer trust in institutions that have a responsibility for guaranteeing food safety, such as farmers, retailers, manufacturers, and regulators has been identified as a factor that enhances consumer confidence in the safety of food, wherein Competence, honesty, and care for public well-being are considered to be important aspects of trust. Approaching to individual differences, such as socio-demographic and personality characteristics, in particular, the extent to which people tend to worry about things in general, a personality characteristic referred to as trait worry, might provide insight into individual differences in consumer confidence in food safety.

2. Need for the study

The present study indicates the framework of consumer confidence is applicable to a national and international context and the measurement constructs can be conceptualized in the same way across countries, and the structural relationships between the constructs show equivalence, to focus on other regions and countries, relatively similar in terms of the dimensions like power distance, uncertainty avoidance, individualism-collectivism, and masculinity-femininity, this study is applicable in order to obtain more insight into whether risk communication and management practices can be standardized across regions.

3. Objective of the study

This study provides an interesting background against which to assess the cross-regional equivalence of the framework of consumer confidence in the safety of food regarding two distinct sources of differences:

1.   Source of the differences lies in the relative importance of the determinants of confidence, that is, the pattern of significant effects, and/or the strength of the relationships between the determinants and general consumer confidence might differ between regions.

2.   Differences in the mean ratings on the constructs might be observed and this study will examines the generalisability of the framework of consumer confidence in the safety of food to an extent to which consumer perceptions about the safety of food differ between south India and the north India and to which source potential observed differences can be a attributed.

4. Review of literature

Socio-demographic variables have been taken into account in this study that examined individual differences in risk perceptions and food safety concerns (Brown, T. A. (2003) [2]; Bouyer et al., 2001; De Jonge, J., Van Trijp, H., Renes, R. J., & Frewer, L. (2007a) [7] ; De Liver, Y., Van der Pligt, J., & Wigboldus, D. (2007) [10] Laros, F. J. M., & Steenkamp, J.-B. E. M. (2005) [15] . With regard to general perceptions of food safety, it has been reported that confidence about the safety of food in general was high (De Jonge, J., Van Trijp, J. C. M., Vander Lans, I. A., Renes, R. J., & Frewer, L. J. (2008b) [9] . In addition, risk perceptions of different kinds of hazards, including food hazards, were higher in comparison with other risk perceptions (Bredahl, L. (2001) [1]; Peters, R. G., Covello, V. T., & McCallum, D. B. (1997) [17] . Research on gender and race differences in risk perceptions indicated that socio-political factors, such as predominant views, accounted in part for the observed differences (Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1997) [3]. Although several studies indicated that young people perceive risks to be lower in comparison with elderly people (De Jonge, J., Van Trijp, J. C. M., Vander Lans, I. A., Renes, R. J., & Frewer, L. J. (2008b) [9] this relationship was often not univocal (Bredahl, L. (2001) [1]; Carver, C. S., & White, T. L. (1994) [4]. Other socio-demographic variables that have been examined, such as income, education level, and number of children in the household, were often found to be unrelated to risk perceptions and concerns (Cvetkovich, G., Siegrist, M., Murray, R., & Tragesser, S. (2002) [5] Fishbein, M., & Ajzen, I. (1975) [12].

In addition to socio-demographic variables, several studies have investigated how personality characteristics are related to consumer perceptions of risk and concern about food safety (Dawar, N., & Pillutla, M. M. (2000) [6] Green, J. M., Draper, A. K., & Dowler, E. A. (2003) [13]. A personality characteristic of particular relevance in the context of food safety is the extent to which consumers have a tendency to worry excessively in general, which is referred to as trait worry (De Jonge, J., Van Trijp, H. C. M., Vander Lans, I. A., Renes, R. J., & Frewer, L. J. (2007b) [8] Miles, S., & Frewer, L. J. (2001) [16]. Consumer confidence in the safety of food may also depend on individuals' perceived personal control over food risks. In fact, perceived personal control appeared to be one of the most important justifications for not worrying about potential hazards (Fischho , B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978) [11]). It might be expected that consumers who perceive that they themselves are able to control food risks will show a higher confidence in the safety of food.

5. Limitations of the study

1. No inferences can be made regarding causal processes underlying more specific (e.g., trust in institutions and the perceived safety of product groups) and general consumer perceptions of food safety (i.e., optimism and pessimism).

2. General consumer optimism and pessimism about the safety of food are influenced by more specific consumer perceptions about food safety-related issues, such as their level of trust in different actors, rather than the other way around.

6. Methodology

A cross-sectional survey was conducted in two regions by a professional students of management, in both regions the target population was residents of south India and north India especially urban area is chosen and of 16 years of age or older, quota sampling was performed on the basis of gender, age,   education level, household size, and area of residence. In total, 936 respondents completed the questionnaire, of which 458 were south Indians and 478 were north Indians (see Table 1). The response rate in respectively south India and in north India was 53% and 49%.

The items that were used to measure consumer confidence in the safety of food and its determinants was operationalized by two distinct dimensions, i.e. optimism (4 items) and pessimism (3 items), regarding consumer recall of food safety incidents and messages in the media about food safety, a distinction was made between respondents who recalled an incident (1), and respondents who did not recall either food safety incidents (0). In addition, respondents who indicated to recall news messages were asked what the recalled message was about, consumer confidence in the safety of a broad range of 18 different product groups, was assessed. Exploratory factor analysis was performed on the data sets of both regions separately to examine the underlying dimensional structure of the range of product groups.

Table 1

Sample characteristic

Characteristic	South India N=458		North India N=478	
	Percentage	Number	Percentage	Number
Gender				
Male	47.3	217	54.3	259
Female	52.7	241	45.7	219
Age				
15-19	7.4	34	7.6	36
20-24	8.1	37	6.4	31
25-29	8.5	39	10.0	48
30-39	16.7	76	21.1	101
40-49	20.1	92	18.8	88
50-64	22.3	102	20.7	99
65+	16.9	78	15.5	75
Education level				
Low	32.6	149	25.2	120
Average	34.7	159	37.3	178
High	32.8	150	37.5	180
Number of children				
0	68.6	314	64.3	307
1	17.0	78	16.1	76
2	9.7	44	14.1	69
3	4.7	22	5.4	26
Allergic				
Yes	25.4	116	18.8	89
No	74.6	342	81.3	389

The cross-regional validation of the framework of consumer confidence in the safety of food was performed through structural equation modeling, using LISREL 8.72., Model t was assessed on the basis of the χ2, the Root Mean Square Error of Approximation (RMSEA), and the Comparative Fit Index (CFI), (Values of RMSEA should ideally be below 0.05 (good t), but values up till 0.08 are considered acceptable and regarding CFI, which ranges from 0 to 1, values ≥ 0.97 indicate a good model t) are considered.

In addition, the Consistent Akaike Information Criterion (CAIC) was used to compare alternative models (lower values of CAIC indicate better model t), maximum likelihood was used for model estimation using covariance's as input for the analysis. To identify the model, the factor loading of one item per construct was set to one, and the intercept of the same item was fixed to zero, these items are referred to as marker items and the same items for each construct were used as marker items in both regions, the cross-regional validity of the framework of consumer confidence in the safety of food was established in four steps.

First, the model was estimated for each region separately, these baseline models provide insight into the t of the model to the data, as well as the validity of the measures, within a particular region. Second, it was assessed whether the measures of the constructs had the same content and item structure in both regions (i.e., measurement equivalence). In the third step, it was established whether the structural model was identical between the two regions as evidenced by the relative importance of the determinants in explaining general consumer confidence in the safety of food. In addition, cross-regional differences regarding the strength of the relationships were investigated. In the fourth step it was identified whether the mean scores on the constructs differed between the regions and to what extent between-region differences existed in consumer perceptions of the safety of food and its determinants. Each of these steps will be discussed in more detail below.

7. Results

7.1 Measurement model-For both regions all multi-item measures performed well, with the exception of the six-item measure of trust, results indicated that for each of four different actors the two competence items did not perform well on the trust measure for the south Indian data and the competence items in the south Indian dataset showed relatively low correlations with the other trust items, and these items had very low explained variance. Consequently, the competence items were separated from the other trust items for each actor, and included in the model as separate constructs, where two constructs were included for each actor: the extent to which the actor was believed to be competent, and the degree to which the actor was considered open and concerned about public welfare, was done within both regions, as further model comparisons can only be performed when the underlying measurement model is similar for both regions. Including perceived competence in the measurement model as a separate construct (for each actor), resulted in good t statistics for both regions, although the Chi-squared test was significant, $\chi 2$ (1649) = 3137.2 (North Indian data) and 3011.5 (South Indian data), other goodness-of- t measures were all satisfactory (RMSEA = 0.0481/0.0542; CFI = 0.983/0.971 for respectively the North and the South Indian model).

In addition, all factor loadings were significant, and the composite reliabilities of each construct exceeded 0.70., the AVE of the constructs exceeded 0.50 for both regions, which shows convergent validity, further, with two exceptions regarding the North India data, the AVE of each construct exceeded the squared correlation between that particular construct and each of the other constructs, which is an indication of discriminant validity. All correlations were significantly smaller than 1 for both regions, providing further support for discriminant validity, for the North India data, however, the decoupled constructs of competence and trust were highly correlated, particularly for the government and retailers and the squared correlations were respectively equal to, and larger than, the AVE of these constructs. In sum, the results from the baseline models indicate that the framework of consumer confidence in the safety of food is applicable to both regions, however, in order to be able to make cross-national comparisons regarding the relationships between the constructs and the construct mean scores, a more rigid test of the equivalence of the measures has to be established.

Table 2

Assessment of Measurement Equivalence

	$\chi2$	Df	RMSEA	CFI	CAIC	$\Delta\chi2$	Δdf	p
Configural invariance	6148.7	3298	0.051	0.979	11042.2			
Full metric invariance	6243.1	3343	0.051	0.979	10798.8	94.4	45	<0.01
Final partial metric Invariance	6205.6	3340	0.051	0.979	10784.6	56.9	42	0.062
Initial scalar invariance	6777.7	3398	0.055	0.975	10995.8	572.1	58	<0.01
Final partial scalar Invariance	6592.7	3394	0.053	0.977	10763.0	387.1	54	<0.01
Full factor variance Invariance	6639.9	3410	0.053	0.976	10710.4	47.2	16	<0.01
Final partial factor Variance invariance	6624.5	3409	0.053	0.976	10694.1	31.8	15	<0.01

7.2 Measurement equivalence- The results of the sequential constraints that were imposed on the measurement model are shown in Table 2, some of the factor loadings and item intercepts were not invariant across the two regions, relaxing the invariance constraints on three loadings and seven item intercepts resulted in partial scalar invariance and it should be noted that one of the unconstrained loadings was part of a two-item measure (competence manufacturers). Although the lack of invariance of this factor loading was modest (MI = 11.8), given that at least one item besides the marker item has to have invariant factor loadings and intercepts in order to meaningfully compare construct means, the perceived competence of manufacturers should not be compared cross-nationally and finally, constraints were imposed on the factor variances. CAIC of the partial factor variance invariance model was the lowest CAIC of all models, indicating that this model showed good t to the data. It can be concluded that the subsequent models of invariance fitted the data well, therefore, there is reasonable evidence to support measurement equivalence for the South Indian and the North Indian data, which means that the same underlying constructs are present in the two regions and that regional differences regarding the relationships constructs can meaningfully be compared.

7.3 Structural model: The relative importance of the determinants- Imputation of the missing values resulted in a sample size of 478 for the North Indian sample (94%) and 458 for the South Indian sample (91%), the structural model was first estimated without any invariance constraints imposed on the structural parameters and the decoupling of the competence aspect from the openness and care aspect of trust resulted in multi-collinearity problems for the North India data as in the North India competence was strongly related to perceptions of honesty and care and the one-dimensional operationalisation of trust did not fit the South Indian data (see Measurement model), and the decoupled approach where competence was included as a separate construct did not suit the North India data, perceived competence was excluded from the structural model.

Table 3
Standardized regression coefficients
(N = 936, of which 458 South India and 478 North India.)

	Optimism		Pessimism	
	Beta	t-value[a]	Beta	t-value[a]
Trust in government	0.15	4.35	-0.02	-0.64
Trust in farmers	0.11	3.82	0.00	0.08
Trust in retailers	0.13	3.83	-0.01	-0.19
Trust in food manufacturers	0.22	5.51	-0.18	-4.08
Perceived safety meat and fish	0.14	3.05	-0.18	-3.58
Perceived safety fresh	0.08	1.75	0.03	0.61
Perceived safety preserved and processed	0.11	2.49	-0.10	-2.03
Production related concerns	-0.18	-4.07	0.39	7.72
Health related concerns	0.05	1.13	-0.06	-1.12
Recall (RI)	-0.07	-2.87	0.07	2.71
Trait worry	-0.06	-2.18	0.21	7.14
Age	0.02	0.83	0.00	0.15
Gender	-0.01	-0.31	-0.01	-0.37
Kids	0.00	0.07	0.01	0.34
Education	0.01	0.41	-0.08	-2.87
Allergic	-0.01	-0.41	0.03	0.99

Note: Based on two-tailed tests: for t-values > 1.96, $p < 0.05$; for t-values > 2.58, $p < 0.01$. Significant coefficients are in bold.

The model where the structural parameters were freely estimated across the two regions yielded a good overall t: χ^2 (3186) = 6629.8 ($p < 0.01$), RMSEA =0.05, CFI = 0.98, CAIC = 9927.0, subsequently, all structural coefficients were constrained to be equal across the two regions, as well as the covariance between optimism and pessimism resulted in a significant deterioration of the model ($\Delta\chi^2$ (33) = 53.9, p = 0.0123). The largest modification index (10.2) indicated that the covariance between optimism and pessimism was not invariant for the North India and South India, relaxing this constraint yielded a significant improvement in t compared to the constrained model ($\Delta\chi2$ (1) = 13.8, $p < 0.001$).

In addition, the t of this model was not significantly worse than the t of the model with unconstrained structural coefficients ($\Delta\chi2$ (32) = 40.1, p = 0.15), and had a lower CAIC (9713.2), where optimism and pessimism were more strongly correlated in the North India (-0.71), in comparison to South India (-0.59). The modification indices did not indicate that substantial model improvements could be obtained by relaxing any of the structural coefficients which means that the relative importance of the determinants is the same for South India and the North India and the standardized regression coefficients are displayed in Table 3.

In total, the independent variables explained 61% of the variance in optimism, and 51% of the variance in pessimism; trust in actors which have shared responsibility for the safety of food was strongly related to general consumer confidence in the safety of food, in particular to general optimism. In addition, consumer confidence in the safety of specific product groups was related to their general level of confidence in the safety of food, although

this was not the case for confidence in the safety of fresh products and consumer concerns about production method related issues were significantly related to both optimism and pessimism about the safety of food.

Although the effect was relatively modest, consumer recall of food safety incidents, were significantly related to both optimism and pessimism about the safety of food and the personality characteristic trait worry was also significantly related to optimism and pessimism, indicating that the more people tend to worry in general, the less optimistic and the more pessimistic they are about the safety of food. With respect to the background variables only a significant effect for education on pessimism was found where more highly educated consumers tended to be less pessimistic about the safety of food compared to less educated consumers.

Table 4

Comparison of the Construct Means (SE)

Construct	South India N=458	North India N=478	P
Optimism	3.34 (0.04)	3.50 (0.03)	<0.01
Pessimism	3.10 (0.05)	2.72 (0.04)	<0.01
Competence government	3.84 (0.04)	3.48 (0.04)	<0.01
Competence farmers	3.66 (0.04)	3.65 (0.03)	NS
Competence retailers	3.40 (0.04)	3.20 (0.04)	<0.01
Competence manufacturers [a]	3.94 (0.04)	3.93 (0.03)	NS
Trust in the government	3.20 (0.05)	3.13 (0.04)	NS
Trust in farmers	3.41 (0.04)	3.17 (0.03)	<0.01
Trust in retailers	2.94 (0.04)	2.89 (0.03)	NS
Trust in manufacturers	3.08 (0.04)	3.08 (0.03)	NS
Perceived safety meat and fish	3.48 (0.05)	3.58 (0.04)	NS
Perceived safety fresh	3.97 (0.03)	4.04 (0.03)	NS
Perceived safety preserves and processed	3.71 (0.04)	3.80 (0.04)	NS
Production-related concerns	4.04 (0.05)	3.45 (0.05)	<0.01
Health-related concerns	3.81 (0.05)	2.95 (0.05)	<0.01
Trait worry	2.21 (0.05)	1.94 (0.04)	<0.01

Note: a Construct mean comparisons should be made with caution, because one of the items of this two-item construct was not metric and scalar invariant.

7.4 Comparing construct means-A comparison of the construct means across South India and the North India indicated some significant differences (see Table 4), South Indian consumers seemed to be less confident about the safety of food in general than North Indian consumers, which means they were less optimistic and more pessimistic than their North Indian counterparts. The lower level of general confidence was not reflected by South Indian consumers' confidence in the safety of product groups, but the results did indicate that South Indians seemed to be more concerned about production and health related issues (p < 0.01) compared to North Indian consumers, with respect to trust in the four food-chain actors, trust in farmers was significantly higher in South India than in the North India (p < 0.01). The perceived competence of the government and retailers was also higher in South India (p < 0.01) and finally, South Indian consumers reported a significantly higher level of trait worry (p < 0.01).

8. Findings

- The study was to cross-validate the framework of consumer confidence in the safety of food and the results provide support for the generalisability of the framework, where the analytical framework is suitable for the investigation of consumer perceptions of food safety.

- With respect to the relative importance of the determinants of general consumer confidence, no differences between South India and the North India were found; however, results indicated that optimism and pessimism were more strongly negatively correlated in the North India than in South India and it is possible that, if a food safety incident occurs, information processing occurs more systematically, such that optimism and pessimism become 'decoupled' which is similar to the inverse relationship between perceived risk and benefit, which is stronger when heuristic processing occurs.

- With respect to the mean scores on the constructs some significant differences between South India and the North India were observed and the results indicated that North Indian consumers had a higher level of optimism and a lower level of pessimism regarding the safety of food.

- From the model it appears that the difference in general consumer confidence in the safety of food might be related to the lower level of concern about production method related issues expressed by North Indian consumers, which raises the question of why North Indian consumers are less concerned about these issues than their South Indian counterparts.

- The mean ratings of trust and perceived competence regarding the different actors, the lower level of concerns about production method related issues does not seem to stem from a higher level of trust in food chain actors and regulators, that is, public trust in farmers, as well as the perceived competence of the government and retailers, was slightly higher in South India as compared to the North India.

9. Conclusion

This study explores and confirms the cross-regional stability of the consumer confidence in the safety of food framework, assessing the cross-national equivalence of the framework in the North India and South India shows that the relative importance of the determinants in explaining general consumer confidence in the safety of food is the same in the two regions countries, although differences exist regarding the mean scores on the constructs, wherein North Indian consumers are more optimistic and less pessimistic about the safety of food, and tend to be less concerned about food production practices. One interesting difference between South India and the North India is the conceptualization of trust, in South India, the perceived competence of a particular actor is decoupled from the perceived honesty and care attributed to the same actor, whereas in the North India these dimensions of trust are more strongly interrelated.

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