**What factors limit quality assurance program implementation in Shanghai's food manufacturing companies?**

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## Introduction

Food safety issues have plagued the Chinese food industry, causing outbreaks of food poisoning for domestic and foreign consumers. Government regulators reacted by introducing more stringent rules and severe sentences for those responsible. Although the threat of retribution can possibly prevent food fraud such as adding harmful ingredients, e.g., melamine in dairy products (Pei et al., 2011), sustained and documented efforts are more reliable in assuring quality of food products. The large and diversified industry of Chinese food manufacturers depends on management initiative in individual firms for the implementation of a quality assurance program. A formal quality assurance program, if not implemented from the onset, requires re-organization, changes in management, and employee training, among others. The created disruption generates expenses when implementation takes place and adds costs of permanently managing the program. Although the overseas companies entering China likely already are prepared to operate a quality assurance program because of the regulations in the country where they were originally established, the majority of Chinese firms have emerged relatively recently. Those firms tend to be small or medium in size, and may be very cost-conscious because of their limited resources. The objective limitations stemming from restricted resources coincide with the profit-oriented attitudes of entrepreneurs resulting in perceptions that a quality assurance program is important, but not vital.

However, with the fast growing discretionary incomes and dramatically changing demographics Alsmon and Magni, 2012; Kuo, 2017), Chinese consumers exercise the freedom of choice driven by product quality and safety. Those generic features are particularly relevant in the production, distribution, and consumption of food products. The size of China's food market and varying consumer preferences still seem to accommodate all food products, but the future

economic viability of many companies requires pro-active attitudes in the area of quality assurance. Overcoming the reluctance of companies stemming from the limited resources may require government assistance to offset some of the costs of implementing a quality assurance program, such as employee training or offsetting some of the cost of designing the quality assurance program fitting needs of a specific sector. The widespread public health benefits due to reduced risk of food-borne illness outbreaks and its societal costs justify the use of public funds.

This paper examines the perception of constraints limiting the implementation of quality assurance programs in a company using data collected from food manufacturers located in the area of Shanghai, China. The constraints were identified during meetings with company managers and reflect a business rather than consumer view. Business studies often require company cooperation leaving less time to manage the firm. Additionally, companies may be asked to share information that compromises their competitive advantage. Under such circumstances, the response rate from businesses in research surveys is frequently poor. In this study, the survey instrument probed not only for opinions about constraints to the implementation of a quality assurance program, but company and respondent characteristics in search of insights to eliminate potential barriers. By learning about company characteristics associated with the perception of a specific limiting factor, the food manufacturing industry and agencies entrusted with food safety monitoring and regulation can assist in reducing barriers and promote broad application of quality assurance programs. It is expected that having such programs in food manufacturing companies strengthens the competitive position of firms and broadly benefits the society.

The geographic scope of the survey is limited to Shanghai Province, a top-tier city in China that has been experiencing great population and income growth. The area contains highly

concentrated purchasing power represented by relatively young, well-educated, and increasingly sophisticated consumers (Hodgson, 2014). Education, income, and lifestyles that include foreign travel influence consumption patterns, which involve preferences for a variety of foods, the ability to pay for quality, and a strong desire for safety. The demand is met by a variety of small, medium, and large firms. The small and medium firms focus on the regional market, but the size of Shanghai (in terms of population and purchasing power) also attracts foreign entrants into the food manufacturing sector. The already mentioned differences in regional income levels, urbanization, and demographics dictated the focus of the survey on firms in the area of Shanghai. However, the findings are likely to be applicable to firms in other regions of China and other countries that undergo fast-paced changes.

**Quality assurance in China**

A number of studies examined the issues related to quality assurance in China, including the food manufacturing industry. Yet, the progress in adopting a formal, structured quality assurance system at a company level has been slow. The central and provincial governments have created numerous institutions responsible for monitoring and control of product quality. There have been severe penalties for quality infringement, especially if they harmed consumer health. It appears that the institutions to guard food product quality are in place. Other key players are consumers and food companies.

Studies investigated Chinese consumer preferences for quality and safety of food (Zhang and Rastegari Henneberry, 2009). Because of the vastness of the country and huge population (Holtkamp et al., 2014), most studies focused on urban consumers. A variety of methods have been applied to examine preferences for quality and safety of various food products over the last couple of decades. Empirical results identified and often quantified the influence specific factors

behind preferences, willingness to pay, and purchase decisions. The factors account for the socio-demographic characteristics of consumers, income, and location. Constructs capturing difficult to measure opinions and beliefs have been often applied to broaden the insights into consumer attitudes and the process of making consumption choices. Despite the number of studies, the number of actual companies learning and using knowledge about consumers is unknown. It is plausible that due to language barrier, studies published in English are out of reach for a typical food manufacturing company, while reports in Chinese may require investing time to locate them before getting acquainted with their content. Only large companies with dedicated personnel and adequate resources may be able to benefit from the empirical consumer studies. It is possible that a sector of consulting companies emerges to provide services in the form of information summaries simplifying academic research results if demand for such information exists. However, the need for such services must be recognized by the food manufacturing company, or it is unwilling to use a service. Under the circumstances of steady market growth and anticipated revenue increase, managers are not likely to consider additional costs of buying access to empirical studies' results.

Management leadership is essential to implement quality assurance program. Studies of company behavior with this regard are less frequent than consumer quality preferences. The paucity of data is a major reason because the systematic data collection on this topic is lacking, while the effort to collect data through a single survey is costly. Not only it may be difficult to identify the companies, but it seems that face-to-face interviews are more acceptable than mail or telephone forms of conducting a survey. But reaching the right person in the company and securing time for an interview presents a challenge. Examples of company survey efforts include using students as trained enumerators to visit food processors during the university vacation

(Han et al., 2009), but even then the total number of responses was about 10% of companies engaged in pork processing. Surveys of businesses notoriously result in low response rate because they absorb mangers' time, probe for potentially sensitive information, while lacking tangible benefits to the company.

The company's attitudes towards the issue of quality assurance would not have been an issue if they would not seem to contrast with the reported efforts of quality monitoring and control by the government to enhance the national food safety control system (Ni and Zeng, 2009; Jia and Jukes, 2013). The efforts were undertaken after a number of food poisoning outbreaks, some with international repercussions. Whether the change in the institutional environment induced change in company's behavior leaves some doubt. The enforcement of the existing regulations may be patchy for a number of reasons. Companies continue to assure quality by the traditional end-of-the-line inspection by won workers. Therefore identifying internal constraints to the implementation of quality assurance system as seen from the perspective of managers is a step in eliminating the hurdles. The hurdles could be of real economic character or reflect personal attitudes.

In this study, the quality assurance program refers to a system of monitoring, controlling, recording, and storing information throughout the production process and until the product ownership is transferred to a buyer. The latter, because of the majority of companies are SMEs in food manufacturing sector, commonly takes place during the transfer of goods.

**Survey preparation and implementation**

The study uses data collected from 199 companies located in the Shanghai area in the fall of 2016. The companies are engaged in processing and manufacturing a variety of foods such as meat and seafood, fruits and vegetables, and dairy products. Company participation in the survey

was assured by distributing the questionnaires during a workshop devoted to regulatory issues of the food manufacturing industry. Completed questionnaires were collected at the end of the workshop before the participants could leave. The questionnaire was distributed with the help of the Shanghai Minhang Quality Supervision Bureau and the Shanghai Fengxian Quality Supervision Bureau. The survey was conducted between early September and early December 2016. From a total of 244 distributed questionnaires, 199 were completed and returned, yielding an 81.6% rate of return.

The implementation of the survey at workshops bypassed the lack of control over the completion and return of the questionnaire, especially because Chinese companies are not used to respond to mail questionnaires (Han et al., 2009). Additionally, the applied approach was very cost effective and generated a very high return rate. A somewhat limiting factor is the geographical scope narrowing the surveyed area only to Shanghai in one of the largest country in the world, but the geographical focus recognizes that the attitudes and behavior of food manufacturing companies may vary across regions Hodgson, 2014; Holtkamp et al., 2014). Shanghai has been a trend setter in many aspects including the food market and represents highly concentrated population and purchasing power making it very attractive market to regional food companies. Indeed, with the growing household incomes, food companies in the area likely focus on sales in theirs and neighboring regions.

The preparation of the survey consisted of several stages. The process was initiated by meeting a small group of company managers to identify the issues related to quality assurance and motives behind adopting quality assuring procedures. Insights gained from the discussions were used to prepare the specific questions contained in the survey instrument. The specific questions pertaining to perceived constraints of implementing a quality assurance program are

constructs reflecting costs occurring over different time horizon, organizational aspects of operating a program, management resources, perception of already having an adequate quality assurance program, and uncertainty that markets reward such system. Selected constraints have been named in various studies about quality assurance in China, but they have not been named by company managers. A total of 12 constructs accounting for constraints of diverse character were included in the survey instrument (see Table 1 for list of constraints. Such a number of constraints could be expected to be differently perceived by respondents. To facilitate the response and increase its accuracy, a five-point Likert-type scale allowed choosing an option from "strongly disagree" to "strongly agree".

The survey instrument was used in a pilot study to detect potential errors or difficulties in answering questions. Two companies were involved in the pilot study before the full-scale survey was implemented. The pilot test did not lead to any changes in the survey instrument that was subsequently distributed.

*Firm characteristics*

Among firm characteristics, a measure of size such as annual revenue is an insightful descriptor. Respondents provided figures for revenues for 2015, the calendar year proceeding the year of the survey. The average revenues were nearly 87 million yuan-renimbi (or about $12.528 million at the exchange rate of $1=6.9447 recorded on January 1, 2017; (XE Currency Converter, 2017). The reported range of revenues was substantial suggesting that the majority of firms were small or medium in size.

An average firm employed about 141 individuals. Similar to the results regarding the total 2015 revenues, some firms appear to be quite small, while the largest firm reported nearly 4800 workers. Among various forms of employment, 53 firms indicated having part-time year-

round employees. An average firm had a total of about 17 year-round part-time employees with the largest number of this type of job amounting to 261 persons. Food manufacturing is affected by seasonality of available raw material for processing and some plants may adjust their employment according to the season. An average firm (of 60 firms reporting seasonal workers) employed about 63 full-time persons. Another 21 firms stated they employed part-time workers on a seasonal basis, with the average firm employing about 21 workers.

Ownership type is important because it influences a firm's objectives and motives. The survey instrument distinguished among five types of ownership ranging from privately-owned companies, to foreign-owned to firms being part of a larger company (owned by a large international firm or franchise). The most common was a privately-owned firm, 58%, followed by foreign-owned companies that accounted for 27%. Firms representing part of a larger company accounted for nearly 14%, while the remaining 1% of firms was part of a large international firm.

For 62% of firms, sales at the regional market in Shanghai accounted for more than one half of total sales (Table 2). Only 26% of firms reported sales in excess of 51% to other regional markets, while export market sales are of marginal importance despite Shanghai being a center of international commerce. Clearly, the food manufacturing firms in the area are oriented towards domestic market reflecting the large imports of various agricultural products. The domestic orientation stresses the importance of domestic and regional consumer preferences.

The majority of food manufacturing companies, 69%, expect their revenues to increase in the three years following the survey, i.e., 2017-2019 (Table 2). Only eight percent of firms expected their revenues to decline. There must be reasons for those very optimistic expectations

and they likely are associated with the growing discretionary income and rising expenditures on food among Shanghai residents.

*Respondent characteristics*

In the current survey, 45% of respondents were males (Table 3). A respondent was nearly 37 years old on average. The average education score is 2.45, suggesting that the education level fell somewhere between junior college and college undergraduate degree. The most common position occupied by a respondent in the company was classified as "middle management" (Table 3). Although the period of working for the company ranges from less than a year to 35 years (Table 3), the average respondent has been with a given company only about 6.5 years. The length of employment with the company corresponds to the average age of a respondent suggesting that many respondents were at the beginning of their professional careers. Not surprisingly, the age and education level of respondents corresponds well to the dominant group of consumers in Shanghai, who are generally not older than 35 years and college-educated.

*Quality assurance constraints*

The discussion with company managers helped to identify 12 possible constraints that prevent or obstruct the implementation of a quality assurance program (Table 1). The constraints addressed various cost aspects of a quality assurance program, lack or knowledge of expertise, and other possible limitations. Among those related to costs, the short-term and long-term costs were distinguished because short-term costs involve the disruption of routine manufacturing, while long-term costs most likely need to be passed on to buyers in the form of higher prices. Consumer studies indicated that consumers in China are willing to pay for quality and safety. Moreover, results of consumer studies have been published in research journals but are seldom

known to company managers, who would face immediate rising costs of a quality program implementation.

Responses regarding statements about 12 possible constraints to implement a quality assurance program have concentrated in the three middle categories suggesting slight disagreement, neutral stand, or agreement (Table 1). Consequently, the interesting insights are provided by the share of responses classified into two extreme categories. A substantial number of respondents, more than 10%, strongly disagreed that the cost of quality assurance program in the long or short run was an obstacle. Moreover, those who strongly agreed with the statement represented some of the smallest percentage in that category across all 12 statements, namely 1.5% and 4.6%, respectively (Table 1). Interestingly, the share of those viewing the long term costs of the program was smaller than the corresponding figures regarding the short term costs.

Size of the company was viewed as a constraint by nearly 40% of respondents (Table 1). This is one of the largest shares as compared to the distribution of responses regarding other statements. It is likely that the limiting company size implies a relatively small company, measured in terms of the 2015 revenues. That perception is important because a small company possibly is a relatively young company and quality assurance could enhance its competitive position. It may be useful to consider assistance to newly established companies by helping to implement a quality assurance program from the onset saving the potential disruption in the future.

Among the other three constraints with which respondents often agreed they constrain the quality assurance program implementation is the requirement additional staff training (Table 1). That constraint is consistent with the constraint about the size of the company, but also with the cost in terms of time, disruption of production, and expense of training. The perception of

respondents might have been also influenced by the risk of the trained employees leaving the company and a need to re-train any replacement.

Costs of permanently managing the quality assurance system were perceived as a constraint by about two out of five respondents (Table 1). The result is interesting because the share of respondents is larger than in the case of statements about short or long term costs being a limitation. Quite possibly, by naming a very specific item, respondents reacted slightly differently recognizing that there will be costs involved and that the amount is uncertain.

Finally, there was relatively large share of respondents who disagreed that the lack of time on the part of management was a constraint (Table 1). Given that the number of respondents were in managerial positions, respondents might have more or less consciously assume the stand that reduce them as a possible obstacle. It may be natural for a manager to express the opinion that he has adequate amount of time to address the quality assurance program implementation minimizing any obstinate role he may play.

**Empirical analysis**

*Spearman's rank-correlation coefficients*

The association between the constraints and four company characteristics are measured by the rank-correlation coefficient (Table 4). Among the listed coefficients, several are confirmed to be statistically significant. The negative, although small (-0.1176) correlation is confirmed between the statement about the lack of knowledge about advantages of alternative quality assurance systems and a company classified as "other", that is the company is not engaged processing major food products. Such result is plausible because a company is possibly small or relatively new and operates in a niche of the food industry.

Three significant correlations are confirmed between the expectations of strong revenue growth in the three years following the survey and the company size measure by revenues, lack of time on the part of management as the quality assurance program impediment, and lack of clear market rewards for having such a program (Table 4). The results are encouraging because they suggest that the companies that agreed with any of the statements about the three constraints were not likely to expect their revenues to increase. There is a synergy between revenue growth and recognition of the importance of having a quality assurance program, which is viewed as enhancing the competitiveness of a company.

In contrast to earlier results, the three significant and positive associations are found between deriving the majority of sales from the regional market in Shanghai area and the cost of implementing the quality assurance program in the short run, lack of clear market rewards for doing so, and the costs of permanently managing such program (Table 4). It is possible that in the very competitive environment of Shanghai food market, a company is expected to have a quality assurance program because other companies have it, while imported foods originate from countries that mandate such programs, e.g., European Union countries.

Private ownership is also positively correlated with the short term costs of implementing a quality assurance program. Possibly, the desire to generate profits weakens the motivation to assure product quality. Such firm behavior is not uncommon and led to regulations with this regard in many other countries. The profit motive behind private ownership is possibly reflected in the positive association with the statement that additional training requirement is a constraint in the implementation of a quality assurance program.

*Regression analysis*

The questions probing for opinions about specific constraints allowed respondents, who were managers or deputy managers in their respective companies, to choose from among five options: from 1=strongly disagree to 5=strongly agree. The uneven scale included the middle option reflecting the neutral opinion regarding the issue. In this study, the responses are used to create an index, which is the sum of all responses regarding the 12 constraints. The sum is a figure between 12 and 60.

The empirical relationship included several explanatory variables based on company features and information shared by respondents. Among them were: company size measured by 2015 revenues; type of ownership, number of employees; type of food processing ("other" processing); percent of sales on the Shanghai regional market, the presence of sales in other regions (a dummy), company's length of existence (in years), and a dummy indicating the expectations of future sales growth. Respondent characteristics served as the basis to create the following variables: length of working at the business (a dummy indicating the period of no more than 5 years), being a member of upper management, and respondent's age.

Results were obtained using an OLS correcting for possible presence of heteroscedasticity (Table 5). The overall fit shows that the explanatory power of the equation is limited. Among the influential variables, the percent of sales on the Shanghai regional market seems to lead an increase in index, and suggests that the larger the sales in that market, the more likely companies perceived the listed statements as constraints. It appears that for many companies there is more than a single constraint in preventing the implementation of a quality assurance program. The index is also increasing if a company sold products at other regional markets than Shanghai or (the generally marginal) export market.

## Conclusions

The paper presents the company perspective with regard to 12 constraints in the implementation of quality assurance program using survey data collected in Shanghai in 2016. The rank-correlation coefficients identified several important associations such as the negative relations between the company size or lack of market rewards for having a quality assurance program and expectations of strong sales in the foreseeable future. On the other hand, there was a positive association between private ownership of a company and the perception of short term costs of implementation and the burden to train personnel as constraints. Results of the additional analysis suggest a potential competitive character of Shanghai food market resulting in viewing multiple of the presented statements as impediments to the implementation of quality assurance program.

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Table 1. Opinions about related constraints to implement quality assurance program among managers of food manufacturing companies in Shanghai, China (in percent).

| Constraint | Strongly disagree | Disagree | Neither agree, nor disagree | Agree | Strongly agree |
|---|---|---|---|---|---|
| Cost of implementation in the short run | 11.8 | 22.1 | 36.0 | 28.2 | 1.5 |
| Cost of implementation in the long run | 10.66 | 27.9 | 34.0 | 22.3 | 4.6 |
| Size of company | 13.6 | 21.7 | 25.8 | 31.8 | 7.1 |
| Lack of time on the part of management | 15.2 | 29.4 | 25.9 | 24.4 | 5.1 |
| Lack of clear rewards in the market for having a quality assurance system | 11.7 | 23.0 | 29.1 | 29.1 | 7.2 |
| Lack of knowledge about advantages and disadvantages of alternative quality assurance systems | 13.3 | 27.6 | 26.5 | 27.6 | 5.1 |
| Unclear benefits of having a quality assurance system | 11.2 | 29.1 | 33.7 | 19.4 | 6.6 |
| Requirement of additional record keeping | 11.2 | 32.2 | 28.6 | 22.5 | 5.6 |
| Cost of managing the quality assurance system permanently | 8.2 | 19.4 | 30.6 | 32.1 | 9.7 |
| Current food safety control system is sufficient | 7.6 | 29.8 | 37.4 | 21.2 | 4.04 |
| Additional training requirements for the staff | 4.1 | 20.9 | 26.5 | 40.3 | 8.16 |
| Lack of competent consultants to advise about the implementation of a quality assurance program | 7.2 | 22.6 | 36.9 | 27.2 | 6.2 |

Table 2. Characteristics of food manufacturing firms in Shanghai, China

| Firm characteristic | Percent of firms |
|---|---|
| *Sales by market* | |
| Regional market | |
| 0 | 2 |
| 1-10 | 5 |
| 11-25 | 11 |
| 26-50 | 20 |
| 51-80 | 28 |
| 81-100 | 34 |
| Other characteristic market | |
| 0 | 21 |
| 1-10 | 13 |
| 11-25 | 15 |
| 26-50 | 26 |
| 51-80 | 20 |
| 81-100 | 6 |
| Export markets | |
| 0 | 88 |
| 1-10 | 6 |
| 11-25 | 1 |
| 26-50 | 3 |
| 51-80 | 1 |
| 81-100 | 1 |
| *Revenue expectation* | |
| Revenue increase | 69 |
| Revenue stable | 23 |
| Revenue decrease | 8 |

Table 3. Characteristics of respondents from food manufacturing companies operating in Shanghai, China.

| Characteristics of respondents | Percent of respondents |
|---|---|
| Gender | |
| Male | 45 |
| Female | 55 |
| Education | |
| High school | 13 |
| Undergraduate degree | 34 |
| Master's degree | 48 |
| Doctoral degree | 5 |
| Age | |
| >= 25 years old | 5 |
| 26-30 years old | 23 |
| 31-35 years old | 20 |
| 36-40 years old | 23 |
| 41-50 years old | 24 |
| 51 and older | 5 |
| Position in the company | |
| Upper management | 20 |
| Middle management | 51 |
| Other management | 17 |
| Administration | 5 |
| Other | 8 |
| Years of experience with the company | |
| >=1 year | 16 |
| 2-5 years | 42 |
| 6-10 years | 23 |
| 11-15 years | 10 |
| 16-20 years | 5 |
| 21 years or longer | 3 |

Table 4. Spearman's rank-correlation coefficients between constraints to implement quality assurance program and the selected characteristics of managers and their food manufacturing companies in Shanghai, China.

| Constraint | Most revenues from unspecified food manufacturing | Strong expectations of increasing revenues | Private ownership | Sells at regional Shanghai market |
|---|---|---|---|---|
| Cost of implementation in the short run | 0.0297 | -0.0974<br>0.1752 | 0.1616 | 0.1455 |
| Cost of implementation in the long run | 0.0414 | -0.0279<br>0.6964 | 0.1073 | 0.1037 |
| Size of company | 0.0258 | -0.1341[a]<br>0.0596 | 0.0714 | 0.1010 |
| Lack of time on the part of management | -0.0119 | -0.1224[a]<br>0.0866 | 0.1015 | 0.0537 |
| Lack of clear rewards in the market for having a quality assurance system | -0.0444 | -0.1542[a]<br>0.0309 | 0.0414 | 0.1825 |
| Lack of knowledge about advantages and disadvantages of alternative quality assurance systems | -0.1176 | -0.0472<br>0.5111 | 0.0973 | 0.0451 |
| Unclear benefits of having a quality assurance system | -0.0270 | 0.0499<br>0.4868 | 0.0259 | 0.0206 |
| Requirement of additional record keeping | 0.0010 | -0.0395<br>0.5822 | 0.0237 | 0.0485 |
| Cost of managing the quality assurance system permanently | -0.1113 | -0.1140<br>0.1114 | 0.0472 | 0.1168 |
| Current food safety control system is sufficient | -0.0407 | -0.0316<br>0.6582 | -0.0414 | -0.0407 |
| Additional training requirements for the staff | -0.0180 | -0.0673<br>0.3481 | 0.0543 | 0.0646 |

| | | | | |
|---|---|---|---|---|
| Lack of competent consultants to advise about the implementation of a quality assurance program | -0.0612 | -0.0337<br>0.6403 | 0.1732 | 0.1107 |

Table 5. Heteroscedasticity corrected OLS regression results of the equation modeling the measure of constraints in quality assurance program implementation by food manufacturing companies in Shanghai, China.

| Variable name | Coeff. | Std. error | t-value | p-value |
|---|---|---|---|---|
| Intercept | 30.4819 | 4.9189 | 6.20[a] | 0.00 |
| Company size | -0.0000 | 0.0000 | -0.30 | 0.76 |
| Number of employees | -0.0014 | 0.0019 | -0.75 | 0.46 |
| Percent of sales in Shanghai | 0.0487 | 0.0272 | 1.79[a] | 0.08 |
| Sell also to other regions | 3.2831 | 1.8821 | 1.74[a] | 0.08 |
| Privately owned | 0.1523 | 1.2675 | 0.12 | 0.90 |
| Expect sales increase in the next 3 years | -0.4396 | 2.0233 | -0.22 | 0.83 |
| Years respondent with the company | 0.6874 | 1.4413 | 0.48 | 0.63 |
| "Other" food industry sub-sector | -1.4089 | 3.1318 | -0.45 | 0.65 |
| Upper management | -0.6526 | 1.6178 | -0.40 | 0.69 |
| Respondent's age | -0.1239 | 0.0828 | -1.50 | 0.14 |
| Years company exists | 0.0117 | 0.0439 | 0.27 | 0.79 |

[a] Significant at $\alpha = 0.10$.