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Constraints in Implementing Duality Assurance Programs in Food Manufacturing Firms in Shanghai, China

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Abstract: This paper investigates the relationship between firm and respondent characteristics and opinions about the perception of 12 statements describing potential constraints of implementing quality assurance program by food manufacturing companies in Shanghai, China. The data were collected from 199 firms between September and December 2016. The descriptive statistical analysis includes reporting summary frequencies and the calculated Spearman's correlation coefficients. Firm size appears to be an important factor and results suggest that larger firms do not view the listed factors as constraining their implementation of quality assurance programs as compared to smaller firms. Also, younger and better educated respondents (mostly quality managers) did not view the listed factors as constraints. Small and medium size firms are most likely to benefit from assistance in designing a quality assurance program and staff training.

Key words: Survey, quality manager, training

1 Introduction

China's consumers represent the largest food market in the world. Food demand increases in response to growing household incomes, illustrated by the rising GDP per capita which between 2011 and 2015 has increased by 40% [3]. Growing incomes enable consumers to purchase food of higher quality than in the past. Annual per capita consumption expenditures increased from 15,160.89 yuan in 2011 to 19,968.10 yuan in 2014, a 31.7% increase Food expenditures account for 35.8% of urban residents' income in China in 2006 [2, 9]. The share of food expenditure is relatively large, but the average in a country of that size does not accurately reflect the changing food demand. In particular, consumers in fast growing areas such as Shanghai have larger than average incomes and expenditures. Moreover, their preferences regarding food quality and safety resemble those of areas with a comparable level of development and, while offering new opportunities for the food manufacturing sector, their expectations pose a challenge.

Should preferred foods not meet quality and safety expectations, rising incomes allow consumers to shift their purchase patterns away from inferior quality and unsafe foods. The risk of demand shift is real but the recognition of such risk varies among food manufacturing companies in China. This paper investigates the constraints that incentivize or prevent food manufacturing companies from establishing and implementing quality assurance programs. Geographically, the study is limited to a sample of companies located in Shanghai Province in China. Shanghai is a leading commercial area in China and a trendsetting region in terms of consumer demand, including food consumption. This study provides insights from the company manager perspective regarding obstacles they face in implementing quality assurance programs, including their own perceptions of limitations. Given the size of the food manufacturing sector in Shanghai and Shanghai's commercial importance, understanding gained from this study has potential application in countries and regions with similar levels of economic development. It appears that the dynamic growth of the food manufacturing companies and keen competition among Shanghai's SMEs focused on immediate economic gains prevents the full recognition of quality assurance program importance. Because of limited resources, many SMEs may be unable to initiate the design and implementation of a program leaving an opening for the government agencies to provide the necessary assistance. Additionally, potential entrants into food manufacturing in China or food exporters and marketers may adjust their decisions and exploit quality assurance programs to strengthen their competitive position. Important policy implications stem from the presented results indicating areas of possible regulatory adjustment and need for public programs alleviating some of the constraints that concern food manufacturers with regard to adoption of quality assurance procedures.

2 Changes in Consumer Preferences and Food Quality

Chinese consumer preferences regarding food are shaped by similar forces as the overall consumption in that country. Preferences change in response to changing incomes and the regional disparity in incomes as well as the income differences between rural and urban areas. Another force is changing demographics and very different attitudes towards spending between older and younger generations. Higher income, better education, and getting older are factors reflected in concerns about food safety and quality.

Regional income disparities in China are particularly pronounced between coastal urban areas and rural interior areas [4]. Shanghai is an example of a fast growing urban area, where residents enjoyed the highest per household consumer expenditure, an equivalent of $16,605, in 2013 [4], more than three times higher than expenditures in the poorest region of the country. The share of well-off Shanghai households is expected to rapidly increase by 2020 [6] and the number of well-off households is to reach 30 million in three cities alone, namely, Shanghai, Beijing, and Guangzhou. Additionally, changing demographics are a major driving force behind the 14% annual consumption expenditure growth rate of those 35 years old or younger, who are also often college-educated.

A major characteristic of the growing consumption, including of food, is the consumer's ability to choose what products to purchase given the origin of the company. In terms of product brand, international brands are well-trusted among first-time buyers as compared to domestic brands [6]. The forecasted annual growth of basic food consumption is expected to increase at a 7.2% rate through 2020 [1], while the discretionary spending, including dining out, is expected to grow 10.2% annually. The share of annual food consumption in urban households is expected to decline from 28% in 2010 to 20% in 2020.

Under the circumstances, urban consumers in the largest, fastest-growing agglomerations, including Shanghai, already consume a sufficient volume of food products and are becoming increasingly concerned about quality and safety. Health is fast becoming the primary concern for the well-educated young generation, but also for the other fast growing segment, older consumers. The emergence of this segment is relatively new and reflects the improving living conditions extending life expectancy, but also the past (only recently changed) demographic policy of the government. Among residents 55 to 65 years old in the largest commercial cities, including Shanghai, the share of food expenditure amounts to about one half [1], while those between ages of 34 and 45 years allocate 34% of expenditures to food. As time passes, the older urban consumers are expected to spend relatively less on food, but likely increase attention to its quality due to health concerns.

Despite existing regulations, food safety incidents occur although they have become less frequent in recent years. However, despite the progress, quality assurance

remains an area needing improvement. In part, food safety incidents have been related to changing consumption patterns and an increasing share of animal product consumption. Animal products are highly susceptible to microbiological contamination although this is not the only type of food contamination responsible for safety incidents and cause of concern about food quality. Zheng and Rastegari Henneberry [11] noted that grain consumption has decreased by 40%, while animal product consumption increased by 78% between 1990 and 2004. Such a shift in consumption stretched the supply chain, opening opportunities for possible contamination at various supply stages.

Food fraud and adulteration incidents in China along with imported Chinese food products in other countries have periodically brought consumer attention to the problem. Melamine addition to dairy products is one of the examples of adulterating a product [8] largely perceived as wholesome that undermined public confidence. Formaldehyde found in crawfish in Shanghai several years ago is another example of incidents causing consumer mistrust. Chinese consumers tend to purchase imported products because they have higher confidence in their safety and quality than in domestic products, aided by their increased purchasing power. China's food trade balance is negative suggesting that the imported food products are becoming more accessible to consumers. Among imported foods, an increasing share is represented by the processed, high quality products, which compete with domestic and traditional foods.

Chinese consumers have expressed willingness to pay for safe and quality foods. Earlier research suggests that food safety problems reflect under-enforcement of regulations [5, 6]. Enforcement requires resources, while responsibilities for food safety are shared by multiple agencies at the national and provincial level. The effectiveness of enforcement of existing regulations would be helped greatly by not only examining if consumers are willing to pay for a product, but by investigating what constraints food manufacturers from undertaking actions assuring quality and safety of their products. Such an approach has been hampered primarily by the lack of data and more difficulty in collecting data from firms than from consumers. Food manufacturers are difficult to reach and pose a huge challenge in obtaining their participation in a survey. Therefore this study is unique in that it examines responses from a large sample of food manufacturing companies.

3 Survey Preparation and Implementation

The geographic scope of the survey is limited to Shanghai Province, a top tier city in China that has been experiencing fast population and income growth. The area contains highly concentrated purchasing power represented by relatively young, well-educated, and increasingly sophisticated consumers. 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 as they undergo fast-paced changes.

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 prepared questionnaire was subject to a pretest involving two companies before the full-scale survey was implemented. 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. This impressive return rate was possible because the company representatives participated in workshops organized by the quality supervision bureaus and completed the questionnaire at the workshop, prior to leaving the premises.

The questionnaire included a number of questions, some focusing on quality assurance program, while some probed for opinions or indication of the company behavior with regard to quality related issues. Specifically, a set of questions asked companies to share information about measures describing the company, e.g., annual revenues, indication of main source of revenues accounting for various types of food manufacturing sectors, employment and various employment categories such as full- and part-time employment. Another set of questions probed respondents to indicate the agreement with 12 constraints regarding the implementation of quality assurance program. The constraints encompassed the costs of a program; market benefits from having a program; limitations on the part of management including the costs associated with the permanent operation of a program; and, the effort required to train personnel, while lacking knowledge of consultants able to provide the necessary expertise to implement a program. Still another group of questions asked respondents to share information about their position, education, age, and experience in working for the company. It is plausible that such measures of respondent characteristics may influence the provided responses.

3.1 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; [10]). 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, among 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 company, to foreign-owned, to a firm being a part of a larger company, a firm owned by a large international firm, or a franchise. The most common form was a privately-owned firm, 58%, followed by foreign-owned companies that accounted for 27%. Firms representing a part of a larger company accounted for nearly 14%, while the remaining one percent of firms was part of a large international firm. Franchise as a form of company ownership was absent in the sample.

3.2 Respondent Characteristics

In the current survey, 45% of respondents were males. 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". Although the period of working for the company ranges from less than a year to 35 years, 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.

4 Results

Survey data have been analyzed using descriptive statistical methods. The primary focus of the study was to investigate respondents' opinions about the limitations preventing or hampering the adoption of a quality assurance program by their company. Although the position of many respondents was classified as middle management, the respondents were most often in charge of quality control in the company, so they were familiar with company management, while having intimate insights into the various aspects of quality control and assurance.

4.1 Summary of 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. 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.

The lack of knowledge on the part of managers of consumer preferences was captured by the ignorance of "clear rewards in the market for having a quality assurance system", unclear benefits, and lack of knowledge about advantages and disadvantages of alternative quality assurance systems. Other constraints involve the need to train personnel and requirement of keeping records. The potential resistance of companies to introduce a quality assurance program was reflected in the statement that the current program was adequate. Finally, a company may have difficulties in finding competent consultants capable of advising, especially small companies, about the quality assurance program adoption.

The cost of a quality assurance program and the uncertainty of consumer reactions cannot be underestimated as impeding the decisions regarding quality assurance programs. For small companies or companies with limited resources, the expense of such a program can be relatively large. It has been suggested that there is a role for the government to possibly offset the costs of a program in part, if not in full.

Respondents indicated the degree of agreement with a statement regarding the constraint of implementing a quality assurance program along a five-step scale. The two extreme steps were "strongly disagree" and "strongly agree" with the middle step indicating a respondent's neutral opinion (neither agree nor disagree). The highest score, 3.27, was associated with a statement that the implementation of a quality assurance program required additional staff training. Training typically has

to be conducted on company time and implies that staff is not performing its assigned tasks. Consequently, training disrupts the flow of operations and training employees of one department may unsettle the smooth operation in another unit. Additionally, it is quite likely that the respondent, who often represented quality control, would have to be responsible for training. The high score regarding the statement may reflect possible concerns about the responsibility for training on the part of young, relatively inexperienced respondents as suggested by the average age and time working for the company.

The second highest score was associated with the cost of managing the quality assurance system permanently (3.16). Whereas the training can be viewed as a onetime cost, maintaining the permanent system creates a continuous obligation to monitor and update the system in response to the changes in production technology, product-mix, or customer requirements. As such, the system requires managers in charge of the quality assurance program to continually learn about all novel aspects that may affect product quality.

The third highest score among the 12 listed constraints was associated with the lack of competent consultants to advise about the implementation of quality assurance programs (3.03). This is an important result and one suggesting a need for possible assistance from public institutions. Namely, those likely expressing this opinion represent relatively small companies, which tend to be most resource-constrained, both in terms of human and financial assets. The sheer costs of searching for a suitable consultant can be substantial, while tailoring a quality assurance system to the needs of a small company can generate additional costs. A publicly funded program aimed at enhancing the adoption of a quality assurance program by a company may be an essential factor reducing the importance of that constraint.

Among the constraints assigned the lowest scores on average were: lack of time on the part of management (2.75), requirement of additional record keeping (2.79), and the long term cost of quality assurance program implementation (2.81). However, the overall range of 12 scores was somewhat narrow, from 2.75 to 3.28 and the average scores had a tendency to indicate a slight disagreement with most of the statements. Factors that could affect this pattern of responses is the desire to present the company in a good light and, possibly, attitudinal issues in adopting quality assurance programs such as simply not recognizing the need for such programs.

4.2 Correlations between Quality Assurance Constraints and Firm Characteristics

This section examines the three largest calculated Spearman's correlation coefficients between the company size as measured by the total number of employees and the constraints in implementing the quality assurance program. The three constraints are the long-term cost of a program, lack of clear benefits from

having a program, and the requirement of having to keep additional records associated with operating a program.

To calculate correlation coefficients companies were grouped into seven categories. The categories were: no more than 15 employees; 16-25; 26-40; 41-60; 61-100; 101-200; 201 or more employees. The largest share, 27% of firms, was in the first group, but 18% each were included in the third and fifth size groups.

All but two calculated (Spearman's) correlation coefficients were negatively associated with the agreement that they represented a constraint, while the remaining two were of very small size. The correlation between the firm's size and the agreement that a quality assurance program was a constraint, -0.1501, indicates that respondents from larger firms were less likely to agree that the long-term costs were a limiting factor as compared to small firms. Even more importantly, the correlation between size and the statement that "benefits of having a quality assurance program are unclear" is also negative, -0.1518. This result is further strengthened by the negative association between size and the notion that requirements of additional record keeping represent a constraint. Finally, larger firms were less likely to agree that there is a lack of competent consultants, who could advise about quality assurance program implementation; the value of correlation coefficient is -0.1083.

4.3 Correlations between Quality Assurance Constraints and Respondent Characteristics

Personal characteristics of a respondent can influence the answer about the importance of a constraint regarding the implementation of quality program and determine the choice of an option on a five-step scale. Education is a major factor because it determines formally acquired knowledge, but also shapes perception of issues. The calculation of Spearman's correlation coefficient with 12 scores reflecting the agreement with the constraints shows that the majority of associations with the level of respondent's education are negative and generally small.

However, four correlation coefficients are worth a discussion. The correlation coefficients refer to the following constraints of implementing the quality assurance programs: the short- and long-term cost of the quality assurance program, the requirement of maintaining records of the program (presumably the timing and outcomes of measuring quality of products and processes), and the lack of competent consultants to help in implementing the program.

Education of a respondent is negatively correlated with the scale of agreement regarding the short- and long-term costs of implementing the quality assurance program. Their values are -0.1741 and -0.1407, respectively. Also, the requirement of keeping records is negatively correlated with education of the respondent, -0.1225. Lastly, although the average score about the statement that there is "a lack of competent consultants to advise about the implementation of a quality assurance

program", the latter is negatively correlated with education (-0.1538). The result suggests that the perception of difficulty in finding competent consultants is tempered by education of persons responsible for quality control in a company.

The calculated correlation coefficients between age and any of the 12 constraints are negligible in size suggesting the absence of any associations. But the correlation coefficients were of much larger size between the number of years working for the company and 12 constraints. The values of two were particularly large. The value of the correlation coefficient between the number of years a respondent worked for a particular company and the requirement of additional record keeping associated with the quality assurance program is negative 0.1244. Another negative correlation was established between the years working for the company and the lack of finding a consultant capable of advising about quality assurance program (-0.1517). Interestingly, it was the number of years working for the company and not the age of a respondent that was more relevant with regard to the importance of constraints.

Concluding Remarks

Quality assurance has been viewed from the perspective of a consumer and supported by earlier studies. However, the view from the company perspective is different because of different objectives. Company management is focused on the economic viability of a company and areas where a company can exercise some control. That approach implies eliminating any unnecessary costs. Quality assurance programs can be perceived as an expense that lacks justification. But as incomes of Chinese consumers increase, they will become increasingly aware of quality differences and able to make purchases consistent with a preference for quality, safe food products.

The implementation of a quality assurance program may be imposed on the company by a regulator or voluntarily adopted to enhance the competitive position in the market place. Some companies may be reluctant to adopt a program because of their limited resources. This paper presented a summary of results from a survey of 199 food manufacturing companies in Shanghai Province, China with regard to 12 potential constraints preventing or delaying a company's implementation of a quality assurance program.

Among company characteristics, it appears that size, measured by 2015 revenues, is a major factor that influences opinions about the constraints. Specifically, the calculated correlation coefficients suggest that large companies did not consider the listed constraints as obstacles in implementing a quality assurance program. It appears that small to medium size companies could benefit from assistance in this area and small companies dominate the food manufacturing sector in Shanghai. Finding knowledgeable consultants and training of staff are among the limitations.

Characteristics of managers responsible for quality control in the surveyed firms suggest that those with more education are less likely to view any of the listed causes as constraining quality assurance program adoption. Also, those with a relatively short period of working for a company were less likely to consider the listed reasons as limiting quality assurance program adoption. It seems that as the generation of quality managers changes, some of the constraints are less likely to be perceived as truly restraining. The question remains, however, if such change will keep pace with fast-evolving changes in consumer preferences. Any mismatch between the two may eliminate a company from the market if it is unable to deliver safe and high quality products.

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References

[1] Y. Atsmon, M. Magni. 2012. Meet the Chinese consumer 2020. McKinsey & Company. Available online at http://www.mckinsey.com/global-themes/asia-pacific/meet-the-chinese-cosnumer-of-2020. Accessed April 7, 2017.

[2] FAO. 2017. Food consumption expenditure. Available online at *w*ww.fao.org/fileadmin/templates/ess/documents/food.../ShareOfFood_en.xls . *Accessed April 8, 2017.*

[3] FocusEconomics. 2017. Available online at https://www.focus-economics.com/country-indicator/china/gdp-per-capita-USD. Accessed April 7, 2017.

[4] A. Hodgson 2014. Income and expenditure in China: understanding regional disparities to unleash market potential. Available online at http://blog.euromonitor.com/author/anhodgson, February 24. Accesses April 7, 2017.

[5] N. Holtkamp, P. Liu, W. Mcguire. 2014. Regional patterns of food safety in China: What can we learn from media data? China Economic Review, 30, pp. 459-468.

[6] Y. Kuo. 2017. 3 great forces changing China's consumer market. Worl Economic Forum on Latin America 2017. Available online at https://www.weforum.org/agenda/2-16/01/3-great-forces-changing-chinas-consumer-market/. Accessed April 7, 2017.

[7] H-G. Ni, H. Zeng. 2009. Law enforcement is key to China's food safety. Environmental Pollution, 157, pp. 1990-1992.

[8] X. Pei, A. Tandon, A. Alldrick, L. Giorgi, W. Huang, R. Yang. 2011. The China melamine milk scandal and its implications for food safety regulation. Food Policy, 36, pp. 412-420.

[9] www.statista.com, 2017. Annual per capit consumption expenditure in China. Available on line at www.statista.com/statistics/278699/annual-per-capita-consumption-expenditure-in-china/. Accessed April 7, 2017.

[10] XE Currency Converter. 2017. Available online at http://www.xe.com/currencyconverter/convert/?Amount=1&From=USD&To=CNY. Accessed April 1, 2017.

[11] Z. Zheng, S. Rastegari Henneberry. 2009. An analysis of food demand in China: a case study of urban household in Jiangsu Province. Review of Agricultural Economics, 31(4):873-893.