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Locally Made Liquor(LML) Industry Status and Development Plan Using a Scale Efficiency Analysis

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Abstract

Purpose – The domestic liquor market is steadily increasing, but locally made liquor markets remain stagnant. The market opening due to the FTA and westernized eating habits are expanding the consumption of imported liquor by Koreans and the demand for beer and soju is still high. Therefore, we analyzed the scale efficiency of Korean locally made liquor companies.

Research design, data, and methodology – Based on a translog-cost function, a scale efficiency analysis was conducted using the government's information survey on the liquor industry. Data from 541 liquor companies analyzed from 2013 to 2014 were used for analysis.

Results – As a result of the scale efficiency analysis, the average sales of the mid-sized locally made liquor companies is 171 million won, but the appropriate sales amount is 1 million won. It is estimated that there is a need to increase sales.

Conclusions – The gap between the actual sales and the appropriate sales of mid-sized locally made liquor companies with 3~10 employees is larger, so it is necessary to reduce the average cost by increasing the sales of locally made liquor companies. In order to do so, it is necessary to acquire customer strategies such as product differentiation, advertising and publicity.

Keywords: Locally Made Liquor, Industry, Scale Efficiency, Drinks, Government Policy.

JEL Classifications: Q10, Q18, L10.

1. Introduction

1.1. Background and the purpose of the research

The amount of buying liquors per household increased from 7,658 won in 2005 to 11,422 won in 2015, implying an increase of 49.2% compared to 2005. The proportion of buying liquors in household economy increased from 0.28% in 2005 to 0.37% in 2015 (Statistics Korea, 2016). Increased consumption of imported liquors is also contributed by a recent increase in the single-person households, more people used to the Western pattern diet, changing consumer's preference, and more opportunities for buying imported liquors

following FTAs. In particular, the amount of imported beer increased from 38.11 million dollars in 2005 to 84.55 million dollars in 2015, and the amount of imported wine from 154,036 dollars to 413,289 dollars for the latest 10 years (Korea Agro-Fisheries & Food Trade Corporation, 2016). Also, many studies claimed that internal and external changes have influence on Korean agriculture (Kim et al., 2013; Kim et al., 2016; Park et al., 2016).

Therefore, the Korean liquor market scale shows an increase from 6 trillion 964.8 billion won in 2005 to 9 trillion 126.9 billion won in 2014, implying a growth of 31.0%. On the other hand, while the LML (Locally Made Liquor) market shows ups and downs over time, its amount is generally around 35 billion won, implying sluggish growth (National Tax Service).

The LML program was enforced since 1993 to encourage farmers to participate in the liquor making industry to enhance added values of agricultural products and thus increase farmer's income. However, the LML producers operate small-scale business, do not invest much capital in R&D for developing new products, and experience difficulty

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in distribution and marketing to be very vulnerable in terms of business growth. In particular, more than 90% of LML producers employ at most 9 people, implying their small scale to have difficulty in ensuring competitive business with other liquors.

Moreover, LML producers are limited in terms of their market unlike other large-scale liquor enterprises, and experience difficulty in marketing. Therefore, the government loosens related regulations, for example, permits for sales on the Internet to allow them to secure their market. However, LML producers still have difficulty in finding their market.

Therefore, the government enacted the 'Act on Promotion of Traditional Liquor Industry' in 2010 and established the 'Master Plan for Developing Traditional Liquor Industry' based on the Act in 2011. However, various issues have emerged in the process of enforcing the policy for promoting the traditional liquor industry including projects focusing on short-term public relations and events, inefficient promotion of the projects and post-management thereof, and delay in appropriate policy development resulting from problems in information sharing between local governments.

Because the LML industry uses agricultural products locally produced as main materials, supporting the industry is a strategy for expanding the demand for Korean agricultural products, and contributes to ensuring farmer's more income. Moreover, where supporting the LML industry is connected to other tourism resources of the concerned region to emphasize their features advantageous over other regions, it can be developed as a special local industry. Therefore, it is necessary to promote a comprehensive systematic policy on a national basis to achieve various secondary effects through promotion of the LML industry.

This study examines the current LML industry and scale analysis for LMLs. Therefore, this study aims to suggest political tasks to achieve various primary and secondary effects including an increase in consumption of Korean agricultural products and farmer's more income.

1.2. Literature Review

Jeon et al. (2006) surveyed current intellectual property rights for traditional liquor trademarks, exemplary commercialization and marketing strategies of traditional liquor producers to suggest strategies for securing rights for traditional liquors and enhancing their competitiveness. The suggested strategies for enhanced competitiveness include developing various products and brands through integration with regional natural resources or local festivals to emphasize health benefits and local features, providing more training opportunities specialized in intellectual property rights through public relations and supports for trademark registration by traditional liquor producers, enhancing product quality standardization and grading quality control, and maintaining the labeling system.

Lee (2007) suggests alternative policies for vitalizing the traditional liquor and LML industry, for example, loosening regulations for liquor production and distribution, revising the 'Alcoholic Liquor Duties Act' for levying different taxes on small-scale liquor producers, building a system for stable supply of raw materials, training and R&D for improving LML quality and finding new sales channels, securing an institutional ground for supporting the industry by enacting an act on supporting traditional liquor and LML industry. This aims to provide unified tasks for supporting the industry.

Jang (2010) conducted a survey by questionnaires for LML producers and consumers to examine the current state of the traditional liquor industry in Jeonnam, and establish a strategy for vitalizing the traditional liquor industry. As a strategy for vitalizing the industry, he suggests introducing a certification system for traditional liquor quality in Jeonnam, building a system for safety and assurance, building a comprehensive national research center (proposed) for traditional liquor (woorisool), creating a traditional liquor industry cluster or special district for the traditional liquor industry, providing a special marketing strategy and enhancing public relations capability.

Jeon and Moon (2011) divided types of consumers who have bought makgeolli to make an analysis of the reason for purchase of and satisfaction with makgeolli by each type, reliability analysis, factor analysis, cluster analysis, one-way analysis of variance, and multiple regression analysis. The result of analysis shows that the features of drinking and purchase about the reason for buying makgeolli have an effect on customer's satisfaction.

Yang and Yang (2011) surveyed consumer's preference depending on the attributes of makgeolli to analyze economic values of each attribute. The analysis of partial values for the level of each makgeolli attribute shows higher partial values about 100% of rice as raw material, the rice produced in Korea, and low-temperature sterilization.

Kim et al. (2012) analyzed the reason for consumer's purchasing makgeolli, and a correlation between attributes for selecting makgeolli. The analysis shows that there is a significant correlation between the reason for purchasing makgeolli and the attributes for selecting makgeolli, and consumers are significantly affected by taste, alcohol contents and advertisement images which belong to the attributes for selecting makgeolli.

Jeong (2013) examined the effect of various attributes affecting preference for makgeolli currently sold in Korea, and predicted market shares. The analysis shows consumers prefer PET makgeolli containers the most, prefer national brands to local brands, smaller containers to larger containers except glass bottles, and cheaper makgeolli. Prediction of market shares shows the market share of PET containers is around 50%, cans and glass bottles do not show a great difference in terms of their market share.

This study aims to suggest government's systematic policy

by examining the current overall state of LML industry and scale analysis for sales of LML industry.

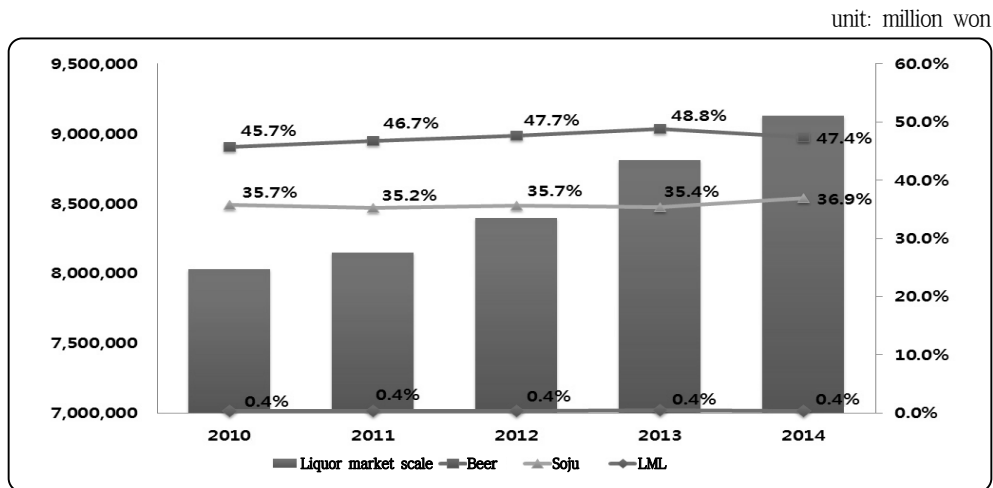
2. Current Status of Locally Made Liquor Industry

The scale of Korean liquor market has shown a steady growth by 3.3% per annum from 8 trillion 26.3 billion won in 2010 to 9 trillion 126.9 billion won in 2014. On the other hand, the scale of LML market is around 35 billion won for the same period, showing a sluggish growth.

The share of LMLs in the Korean liquor market decreased from 0.43% in 2010 to 0.39% in 2014. On the other hand, the market shares of beer and soju increased

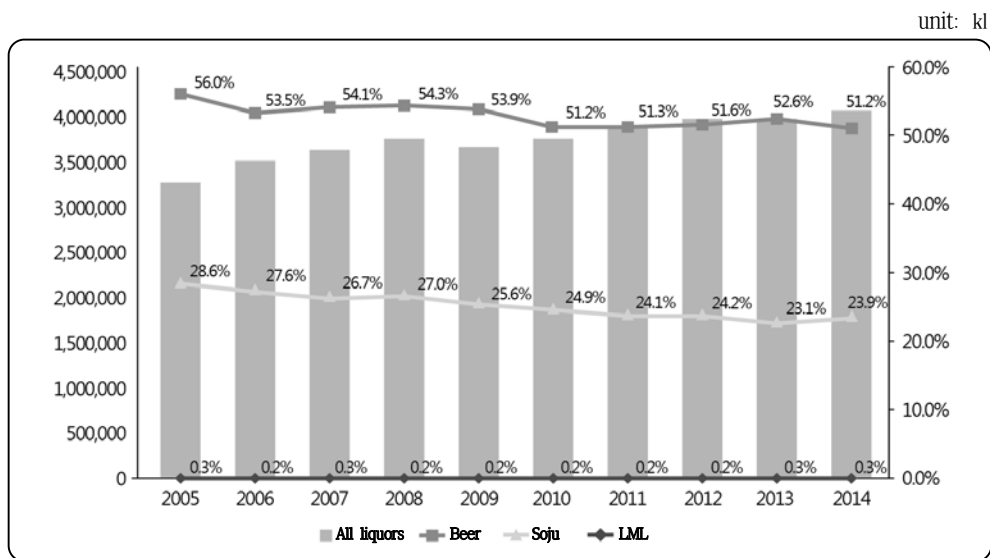
by 3.0% and 4.3%, respectively, for the recent 10 years (2005 to 2015), and from 82.2% in 2005 to 84.4% in 2014 in the whole liquor market.

The scale of marketed liquors in the Korean market (including imported liquors) increased by 2.4% on the average every year from 3,245,363kl in 2005 to 4,014,872kl in 2014, and LMLs also showed an increase of 2.3% on the average every year to show a share of 0.3% in the whole marketed liquors. The volume of marketed beer and soju shows just an increase of 1.4% and 0.3%, respectively, for the latest 10 years (2005 to 2015), and a decreased share in the marketed whole liquor volume from 84.7% in 2005 to 75.1% in 2014.



Source: National Tax Service (each year), National Tax Statistics.

<Figure 1> Scale of Korean liquor market and each liquor share



Source: National Tax Service (each year), National Tax Statistics.

<Figure 2> Volume of marketed liquors in Korean market and shares of major liquors

In the LML industry, many LML producers are small-scale enterprise owners, and tend to close their business because of difficulty in management. This implies the issue of scale efficiency of the LML industry about whether the small-scale LML producers run their business cost-effectively.

The LML industry makes efforts to enhance efficiency by increasing profits through increased sales volume and lower average costs for production. It is necessary to review whether Korean LML producers implement economies of scale. Furthermore, it is necessary to examine the reasonable sales volume and scale of the LML industry to minimize operating expenses of the LML industry.

3. Scale Efficiency Analysis Model

3.1. Data Source

The analyzed data was based on the LML producer data from the original liquor producer data in the 'Current Liquor Industry Information Survey' which is conducted every year.

'Current liquor industry info survey', which was designed to identify the liquor industries by Korea Agro-Fisheries and Food Trade Corporation(aT) and the Ministry of Agriculture, Food and Rural Affairs. In order to prepare the basic statistics for liquor industries comprehensively and systematically the survey was conducted from 2012 to 2014. In this study, Data from 541 liquor companies analyzed from 2013 to 2014 were used for the analysis.

3.2. Model

Several studies have employed a data envelopment analysis(DEA) for efficiency calculations (Kim & Yoo, 2014; Choi et al., 2016; Banna et al., 2017; Seo et al., 2017) However, in this study, the translog cost function was specified and the estimate result of cost function was used to review and examine factors affecting on the production cost of LML producers.

In the empirical analysis of this study, the translog cost function was specified with the following restriction to reflect the difference of cost function type of LML producers.

$$(1) \ln C = \alpha_0 + \sum_i \beta_i \ln p_i + \beta_y \ln y + \frac{1}{2} \sum_i \sum_j \beta_{ij} \ln p_i \ln p_j + \sum_i \beta_{iy} \ln p_i \ln y + \frac{1}{2} \beta_{yy} \ln y^2$$

$i, j = 1, 2, 3, 4$

in which C represents total costs; y represents a yield; and p_i represents the price of input i .

Applying the Shephard's lemma to equation (1) contributes to deriving s_i (the share of production cost of

each input in the entire production cost) as follows.

$$(2) s_i = \frac{\partial \ln C}{\partial \ln p_i} = \beta_i + \sum_j \beta_{ij} \ln p_j + \beta_{iy} \ln y, \quad i = 1, 2, 3, 4$$

Equation (2) is used to predict factors affecting the operating cost of LML producers by using SUR (Seemingly Unrelated Regression). Moreover, the estimate result by the translog cost function is used to measure the SE (economies of scale) index. SE is expressed with the following equation.

$$(3) SE = \frac{\partial \ln C}{\partial \ln y} = \beta_y + \sum_i \beta_{iy} \ln p_i + \beta_{yy} \ln y$$

In equation (3), SE index of 1 represents the best scale. If $SE < 1$, economies of scale exist, but if $SE > 1$, ray diseconomies of scale exist.

4. Results

4.1. Selecting LML Producers for Analysis

LML producers who obtained the LML production license were selected for analysis, and were classified into the groups of no employee (family business type), at most two employees (small scale), three to nine employees (intermediate scale) and ten employees (large scale) in terms of the number of employees.

The LML producers running their business without employees accounted for 31.1%, and the small-scale LML producers with at most two employees accounted for 46.2%, implying 77.3% by the small-scale LML producers without employees or with at most two employees. Meanwhile, the large-scale LML producers with at least ten employees accounted for 3.3%, implying a very small share.

<Table 1> Distribution of LML producers based on their scale (number of employees, 2013 to 2014)

unit: factory, %

Category	Sample	Share
No employee	168	31.1
At most two employee	250	46.2
Three to nine employees	105	19.4
At least ten employee	18	3.3
Total	541	100.0

4.2. Analysis of Elasticity of Demand of Input

The elasticity of demand of inputs was measured for LML producers. All signs of the price elasticity of demand of

respective inputs were negative (-). This implies that the demand rule is exactly established. Furthermore, the absolute value of the price elasticity of demand for all inputs was smaller than 1 which implies inelastic prices. The analysis shows that exemplary inputs of which the price elasticity is relatively high included labor, sales promotion and R&D in sequence. The sign of elasticity between inputs was positive (+) which implies the alternative relation each other. In particular, the analysis shows a high alternative relation exists between the labor cost and sales promotion cost.

<Table 2> Input costs and average cross-elasticity

Input	Raw material cost	Labor cost	R&D expenses	Sales promotion cost	Others
Raw material cost	-0.211				
Labor cost	0.130	-0.618			
R&D cost	0.020	0.105	-0.234		
Sales promotion cost	0.041	0.263	0.089	-0.415	
Others	0.020	0.120	0.020	0.022	-0.181

4.3. Analysis of Economies of Scale

The average SE (Economies of Scale) index of the LML producers was 0.876 for No employee, 0.873 for At most two employees, 0.862 for the types of Three to nine employees, and 0.884 for At least ten employees. This implies that LML producers experience a small increase in production cost in comparison with the increase in their sales on the average.

It is seen that the SE indexes of LML producers for the

types of No employee, At most two employees, Three to nine employees, and At least ten employees are positioned relatively toward the left side based on 1. This means that the LML producers whose SE index is smaller than 1 account for at least 95%; most LML producers do not earn more than their minimum average costs; and their average cost diminishes as their sales are expanded. Therefore, it is essential that most LML producers increase their sales to be more than the current values to reduce average costs.

The sales scale was subdivided to find the section of sales and operating profits where the SE index is 1. For the LML producers of family business and thus no-employee type, the reasonable scale is 200 million won for sales and 48 million won for operating profits. For the small-scale LML producers with at most two employees, the reasonable scale is 400 million won for sales and 88 million won for operating profits. For the LML producers with three to nine employees, the reasonable scale is 800 million won for sales and 160 million won for operating profits. For the large-scale LML producers with at least ten employees, the reasonable scale is 2 billion won for sales and 460 million won for operating profits.

Although the average sales amount of LML producers of family business type is 46.7 million won, the reasonable sales scale for which the SE index is 1 is about 200 million won. Therefore, it is necessary to increase the sales amount about 4.3 times more than the current sales amount to reach the minimum point of the average cost. Furthermore, while the average operating profit of the LML producers of family business type is 14.5 million won, the converted reasonable operating profit is about 48 million won. It is thus necessary to increase the operating profit about 3.3 times on the average.

<Table 3> Distribution of SE indexes for each LML category(2014)

Sales Category	SE index of LML Producers			
	Family business type (no employee)	At most two employees	Three to nine employees	At least ten employees
Smaller than 10M won	0.852	0.752	0.651	
10M but smaller than 30M won	0.871	0.743	0.712	
30M but smaller than 50M won	0.882	0.782	0.725	
50M but smaller than 80M won	0.912	0.842	0.805	0.621
80M to 100M won	0.986	0.887	0.852	0.724
100M to 200M won	1.000	0.912	0.882	0.768
200M to 300M won	1.101	0.961	0.918	0.802
300M to 500M won		1.000	0.943	0.829
500M to 800M won		1.232	0.982	0.892
800M to 1B won			1.000	0.911
1B to 1.5B won				0.952
1.5B to 2B won				1.000

*M= million, B=billion

<Table 4> Reasonable sales amount and operating profits for each type of LML producers (2014)

unit: million won, %

Category	Current average sales amount (A)	Current average operating profit (B)	Reasonable sales amount (C)	Operating profit in reasonable sales amount (D)	Reasonable operating profit (C×D/100)
No employee	46.7	14.5	200	24.0%	48
At most two employees	88.4	23.6	400	22.0%	88
Three to nine employees	171	42.0	800	20.0%	160
At least ten employees	621	112	2,000	23.0%	460

Note: The reasonable sales amount and reasonable operating profit refer to the sales amount and operating profit in which the SE index is 1.

Although the average sales amount of small-scale LML producers with at most two employees is 88.4 million won, the reasonable sales amount in which the SE index is 1 is about 400 million won. It is thus necessary to increase the sales amount about 4.5 times more than the current sales amount to reach the minimum average cost. Furthermore, while the average operating profit of the small-scale LML producers is 23.6 million won, the converted reasonable operating profit is about 88 million won. It is thus necessary to increase the operating profit about 3.7 times more than the current operating profit on the average.

Although the average sales amount of intermediate-scale LML producers is 171 million won, the reasonable sales amount in which the SE index is 1 is about 800 million won. It is thus necessary to increase the sales amount about 4.7 times more than the current sales amount to reach the minimum average cost. Furthermore, while the average operating profit of the intermediate-scale LML producers is 42 million won, the converted reasonable operating profit is about 160 million won. It is thus necessary to increase the operating profit by about 3.8 times on the average.

Although the average sales amount of large-scale LML producers is 621 million won, the reasonable sales amount in which the SE index is 1 is about 2 billion won. It is thus necessary to increase the sales amount about 3.2 times more than the current sales amount to reach the minimum average cost. Furthermore, while the average operating profit of the large-scale LML producers is 112 million won, the converted reasonable operating profit is about 460 million won. It is thus necessary to increase the operating profit by about 4.1 times on the average.

Summarizing the analysis result, the gap between the actual sales amount and the reasonable sales amount for the intermediate-scale LML producers with three to nine employees is bigger. Therefore, it is necessary to reduce average costs by increasing the sales amount of LML producers focusing on the intermediate-scale LML producers. It is shown that increasing the sales amount requires a customer attraction strategy, for example, producing better products, advertisement and public relations.

5. Discussions and Conclusions

5.1. Discussions

Most LMLs are sold in offline stores (customers visiting producer's factory or their own store), and or through mail orders. Although the share of offline-store sales is greater, the share depends highly on the liquor type.

Among the direct sales methods, online sale through the producer's homepage which is the easiest way accounts for the greatest share (52%), and the share of selling through post offices or Narajangteo operated by the National Tax Service accounts just for 10 to 20%.

The small-scale LML producers have difficulty in collecting information about changing markets and this is an issue involved in expanding their sales. At present, it is necessary to provide information about consumer preference and markets, marketing consulting and training to small-scale LML producers. The current government support project focuses on providing support for building facilities, and does not take enough consideration into management consulting, public relations and marketing support.

At present, an exemplary effective project enforced by the Ministry of Agriculture, Food and Rural Affairs is the Project for Expanding Traditional Food and Liquor Sales Channels. This project is more effective than the Project for Providing Financial Support for Repairing and Renovating Facilities. In addition, although there are more projects, they are not recognized or considered to be less effective.

Although the share of LML producers who conduct public relations accounts for about 50%, the share of public relations accounts for about 12% of the sales amount, implying a pretty high portion. Exemplary public relations include participation in events, for example, exhibitions or local festivals. The public relations strategy described above is not enough to expand sales channels. The first reason that LML producers do not conduct public relations is the involved cost, and the sales contributed by public relations through events account for about 18% in total sales.

Therefore, it is necessary to consider application of joint public relations for which local producers based on the

same region and similar product features conduct joint public relations. Evaluation of the efforts made for public relations and sales promotion shows the LML producers make the least efforts for ensuring specialized human resources, for example, employment of human resources specialized in marketing, although they make positive efforts for quality control and brand improvement. This also results from the small scale of LML producers, and it is thus necessary to encourage the LML producers to secure human resources specialized in marketing.

The scale of marketed LMLs in each region between 2010 and 2014 decreased in Gangwon, Jeonbuk, Gyeongnam, and Jeju-do. In terms of the marketed LML sales, Jeju and Gangwon regions show a great decrease of annual average -28.0% and -18.0%, respectively, for the same period.

On the other hand, while the share of marketed LMLs sales in 2010 was just 2.7% and 5.7% in Chungnam and Jeonnam, they showed an increase of 219.9% and 81.8%, respectively, in 2014 in comparison with 2010 thanks to the Traditional Liquor Support Policy by the local governments.

5.2. Conclusions

The LML industry was developed to encourage farmers with small capital to participate easily in the liquor industry to increase their income. Most LML producers are small-scale producers, and experience difficulty in product development, advertisement and public relations because of their small capital.

The scale efficiency analysis shows that it is necessary to increase their sales amount about 4 to 5 times more than the current sales for each type to realize the reasonable

operating profit of the small-scale LML producers. This means continuous efforts for increasing their sales amount are required. For more sales amounts, multidimensional efforts are required because many factors affect on implementing more sales, for example, producing better products through R&D, and conducting advertisement and public relations for better recognition.

As described above, the role of local governments for providing support for the LML industry is important, and it is essential to continue to develop LMLs agreeable to regional features to continue and provide more support.

In the liquor distribution system, liquor sellers are classified into liquor producers, wholesalers and retailers. Producers generally sell the liquors they produce to wholesalers who sell liquors to retailers in turn. The retail system is crucial for marketing, so it needs to be relaxed (Park et al., 2014; Baskin et al., 2016; Cho et al., 2017).

As indicated above, specific liquor producers including LML producers do not have their own distribution network because of their small scale. Under these circumstances, the government introduced the specific liquor wholesale license in 1998 to allow the producers to sell their liquors directly to consumers. Nonetheless, most producers sell their liquors to specific liquor wholesalers except direct sales to consumers. Although it is currently allowed that LMLs are sold by relatively large-scale liquor wholesalers, it is not actually applicable. This results from small-scale business operation of the LML producers and specific liquor wholesalers.

The first priority is to have a contact with consumers to vitalize sales, and the small scale of LML producers is a barrier to have the contact. Therefore, it is urgent to form a LML producer union to build a joint sales network, rather than waiting until general liquor wholesalers expand sales.

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Appendix: Estimates of LML Producers' Cost Function

Appendix 1. Estimates of LML producers' cost function

Variable	No employee	At most two employees	At most nine employees	At least ten employees
ln_ingredient	.5241***	.946245***	.7484854***	.7821107***
ln_labor		.3779094***	.1045799***	.4274257***
ln_rnd	.1557***	.5542399***	.4352147***	.1326382***
ln_marketing	-1.5686**	-2.338816**	-1.47086***	-1.491493***
ln_sales	1.0981***	1.100355***	1.025815***	1.098566***
ln_ingre^2	.0517***	.0414245***	.037335***	.0601544***
ln_ingre*ln_labor		.1337474***	.1652385***	.1181449***
ln_ingre*ln_rnd	-.1036***	-.060999***	-.1036477**	-.1164291**
ln_ingre*ln_marketing	-.0866***	-.1136805**	-.0841418**	-.0733868**
ln_ingre*ln_sales	-.0527***	-.072369***	-.654752***	-.0676173***
ln_labor^2		-.010823***	-.0393303**	-.0337219***
ln_labor*ln_rnd		-.0612035**	-.0104431**	-.0312*
ln_labor*ln_marketing		-.147148***	-.1568416**	-.1491781**
ln_labor*ln_sales		-.0380957**	-.0198347**	-.0342853*
ln_rnd^2	.083431**	.081772***	.0649681***	.0996693**
ln_rnd*ln_marketing	.0834261**	.064579***	.0501733***	.0572651***
ln_rnd*ln_sales	.0156674**	-.005404***	-.0041798**	.0197782***
ln_marketing^2	.0880575**	.0829399***	-.0687965**	.0571462**
ln_marketing*ln_sales	.112337**	.1450129***	.099101***	.0968867**
constant	-1.159274***	-1.3636***	.0986277***	-1.290160*

Appendix 2. Share function for each input of LML producers's cost function

(cost function for raw material purchase)

	No employee	At most two employees	At most nine employees	At least ten employees
ln_ingredient	.0318812***	.0317001***	.032077***	.0321045***
ln_labor	-	-.0239956***	-.0242113***	-.023234***
ln_rnd	-.0032245*	-.0021417**	-.0029777**	-.0025827**
ln_marketing	-.041022***	-.0006857*	-.0022429**	-.0013189*
ln_sales	.0037483*	.002687***	.0032891***	.0026511***
constant	.9263343***	.8788068***	.8645716***	.8766958***

Appendix 3. Share function for each input of LML producers's cost function

(labor cost function)

	At most two employees	At most nine employees	At least ten employees
ln_ingredient	-.0222807***	-.0213483***	-.0216522***
ln_labor	.0297286***	.0290162***	.0301021***
ln_rnd	-.0025286**	-.0034171***	-.0029553***
ln_marketing	-.0000616*	-.0016323*	-.0005569*
ln_sales	.0031976***	.0036378***	.0031594***
constant	.8706174***	.8592232***	.868881***

Appendix 4. Share function for each input of LML producers's cost function

(R&D cost function)

	No employee	At most two employees	At most nine employees	At least ten employees
lIn_ingredient	-.02123583***	-.0208746***	-.0195657***	-.0202113***
lIn_labor	-	-.021616***	-.0221883***	-.0206064***
lIn_rnd	.06213582***	.0464612***	.0450052***	.0457084***
lIn_marketing	.03453252***	.000499*	-.001042*	-.0002605*
ln_sales	.00523581***	.0072845***	.006747***	.0073053***
constant	.90245628***	.785529***	.7916387***	.7809432***

Appendix 5. Share function for each input of LML producers's cost function

(sales promotion cost function)

	No employee	At most two employees	At most nine employees	At least ten employees
lIn_ingredient	-.04032425***	-.0205537***	-.0196555***	-.0200828***
lIn_labor		-.0212174***	-.0217744***	-.0201278***
lIn_rnd	.00250215*	-.0017401*	-.0032029***	-.0024415**
lIn_marketing	.05820255***	.0485245***	.0471548***	.047775***
ln_sales	.00682452***	.0069496***	.0064735***	.0068953***
constant	.8753215***	.7897685***	.7956442***	.7869681***

Note 1) $lIn_ingredient = \ln(\text{raw material cost})$ $lIn_labor = \ln(\text{labor cost})$ $lIn_rnd = \ln(\text{R\&D cost})$
 $lIn_marketing = \ln(\text{sales promotion cost})$ $lIn_others = \ln(\text{other cost})$ $ln_sales = \ln(\text{sales amount})$
 $lIn_ingredient = lIn_ingredient - lIn_others$
 $lIn_labor = lIn_labor - lIn_others$
 $lIn_rnd = lIn_rnd - lIn_others$
 $lIn_marketing = lIn_marketing - lIn_others$

Note 2) * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

Note 3) The other cost share function is not included for estimation.