

RESEARCH ARTICLE

Performance of dairy processing firms in India- An empirical analysis across size and experience categories

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Received: 23 September 2022 / Accepted: 19 January 2023 / Published online: 23 June 2023

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Abstract: The Indian dairy processing sector is characterized by the co-existence of organized and un-organized sectors, while the latter is predominant. For the progressive development of the dairy processing industry, the participation of the organized sector needs to be encouraged. In order to make this industry attractive for investing, its productivity, efficiency, and profitability need to be higher. Keeping these facts in view, this study investigated the profitability of the organized dairy processing sector in India using firm-level secondary data for 1991-2017. Comparative performance analysis was done across different categories of firms according to size and experience. There was a significant increase in profit margin over the period, while it varied significantly across different size categories of firms but not across firms having different years of experience.

Keywords: Capital Intensity, Dairy Industry, Labor Productivity, Profitability, Size

Introduction

The dairy sector in India has shown impressive growth over the years due to the successful implementation of various dairy development programs, including Operation Flood. This has made India the world's largest milk producer, with an annual production of 187.7 million tonnes, and per capita availability of 394 grams per day during 2018-19 (Economic survey, 2019-20). Additionally, dairying plays an essential role in the country's socio-economic

development as a source of livelihood, food, and nutrition for millions of people. The development of the dairy sector in India is inclusive as the 80 million households engaged in milk production consist primarily of small and marginal farmers and landless. Besides, the dairy sector has solid forward linkages with industries and backward linkage with rural people, which promotes the balanced development of the economy. Despite these facts, the Indian dairy sector lacks on the processing front.

In India, both organized and unorganized sectors are involved in milk processing. The organized dairy industry comprises cooperatives and private dairy plants, including multinationals. The unorganized sector consists of milkmen, dairies (small processing units), and small vendors who collect milk from local producers and sell it in urban and peri-urban areas either as liquid milk or milk products. Out of the total milk production, 52 per cent is the marketable surplus available for sale to consumers in the urban centers after meeting the consumption needs of producers and non-producers in the rural area. From the available market surplus, 40 per cent is handled by the organized sector namely, dairy co-operatives (20%), private dairies (19%), and producer companies (1%), and the unorganized sector handles the remaining 60 per cent. Despite the use of low-level technology and low benchmark quality control measures by the unorganized sector, value addition from this sector is of great economic significance (Singh and Datta, 2010). It is expected that this trend in milk handled by private players, co-operatives, producer companies and the unorganized sector may change to 30, 20, 2 and 8 per cent, respectively in 2023-24 (GoI, 2018).

In the recent past, the share of the organized sector in dairy processing has been increasing because of liberalization and policy changes in the Milk and Milk Products Order (MMPO) that encourage private investment and demand-driven growth of the sector. The growth rate in the number of units and growth in gross value added of the dairy processing sector was higher (5.87 % and 14.35 %, respectively) compared to the food industry as a whole (1.58 % and 10.51 %, respectively) during 1980-2001 (Ali et al. 2007). This sector's growth is driven mainly by three factors, such as growth in population, urbanization, and an increase in per capita income. The growth in processing provides farmers with broader market access and remunerative price. To

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meet the increasing demand and compete with the global players, India needs to focus on manufacturing value-added products with enhanced shelf-life, improved packaging, and prescribed quality standards. The high profitability of investment in this sector is going to attract investment from private players. In this context, the present study attempts to find out the past trends in the profitability of dairy firms and the factors determining the profitability.

Data and Methods

Description of data

The study is based on secondary data from the Prowess database of Centre for Monitoring Indian Economy Private Limited, Mumbai (CMIE). It is a query-based database that contains firm-level calendar year financial data of active business entities, including registered companies. For the present study, data of 138 dairy processing firms was filtered from the abovementioned database for 27 years (1991-2017). Data availability on a particular variable varies across firms for different years, resulting in unbalanced panel data formation. The information on total income, expenses, assets, sales, production, and unit prices were collected along with general characteristics of firms like size and experience. As some cases were missing, information was generated from aggregates. For example, 'the number of employees' information was given, but sufficient observations were unavailable to conduct any analysis. Hence, number of employees' information (termed as efficient units of labor) was calculated by dividing the total salary expense of the firm (from the prowess database) by the average wage rate of the industry (obtained from the Annual Survey of Industries database) as in Balakrishnan et al (2000).

A firm's performance may be affected by its size and experience. A study conducted by Majumdar (1997) using firm-level data revealed that larger firms were more productive and less profitable, whereas older firms were more profitable and less productive, which is attributed to the institutional framework of the Indian economy and industrial policy instruments, such as inter-alia, restrictive entry policies. Hence, a comparison of performance indicators across size and experience categories over the years was made to understand if there is a significant difference across distinct categories. According to size, firms were classified into large, medium, and small size categories based on the decile classification of firms given in the database. This classification was based on the last three-year averages (TE 2018) of the total income and assets. Accordingly, there were 31.88 per cent large firms, 44.93 per cent medium firms and 23.19 per cent small firms. The experience is calculated by taking the difference between the year of study (2018) and the year of incorporation of the firm. Based on years of experience, the firms were classified into three groups, viz., firms established less than 20 years ago were termed as low experience firms, 21-40 years ago as moderate experience firms, and more than 40 years ago as high experience

firms. The database consists of firms established as early as 1940 to the latest 2018. The firms with low experience were more than one-third of the total firms (37.68%). The share of moderate and high-experience firms was about 54 per cent and 8 per cent, respectively.

Estimation of trends in profitability

For the present study, the profit margin was considered as an indicator of profitability. It is nothing but the profit over sales. Different studies have estimated profit margins according to data availability (Kambhampati and Parikh 2003; Kalirajan and Bhide 2005). The present study calculated profit margin as the ratio of PAT and sales, as in Kalirajan and Bhide (2005).

$$\text{Profit Margin} = \text{Profit after tax (PAT)/Sales}$$

PAT and sales are values in monetary terms (rupees in million). The performance indicators of the firms were taken as PAT, labour productivity, capital-output ratio and cost per unit sale. The whole study period was divided into sub-periods with equal intervals of 9 years, viz., 1991-99, 2000-2008 and 2009-2017 to know if there was any shift in trend or fluctuations during different sub-periods which may be attributed to changes in the policy environment and other external factors. To find out the growth rate of each indicator compound annual growth rate was worked out by fitting the exponential function ($Y=ab^t e^t$) where the compound annual growth rate can be calculated as $[(\text{Antilog of } b)-1]*100$. The data series was deflated before estimating the growth rate using respective indices to reflect real change.

Determinants of profitability at the firm level

To find the factors affecting profit margin, a panel data regression was carried out. Panel data has the advantage of having two dimensions, i.e., across firms and over time. Thus, it adds more variability by having more observations and considering heterogeneity across firms. Extreme observations that affect the sample statistics as well as data of firms which were facing loss for the entire period of study were removed to avoid any bias arising due to them. Hence, the final dataset for panel data analysis consisted of unbalanced data of firms for the period 1991-2017.

To determine factors affecting profit margin following factors were included as explanatory variables as in Kambhampati and Parikh (2003 and 2005):

$$\text{Profit Margin} = f(\text{Share of Sales, Labor productivity, Capital-output ratio, cost per unit sale, time trend})$$

Where, share of sales indicates the market power of a firm which was calculated by taking the ratio of firms' sale to industry sales for a particular year. The labour productivity was calculated as sales per efficient unit of labour as in Balakrishnan et al. (2000). The Capital- output ratio was estimated as Gross Fixed Assets

(GFA) per rupee of sales. The sales series was deflated using the wholesale price index for dairy products at 2004-05 prices, and the GFA series was deflated with an implicit deflator at 2004-05 prices. The cost per unit sale is an indicator of cost efficiency, and it was calculated by taking the ratio of operational cost per rupee of sales. The time trend was included to consider the effect on profitability due to improvement in knowledge, experience, and technology over the years.

A linear panel data regression was run with fixed (FE) and random effects (RE). FE model control individual heterogeneity or time-invariant individual-specific characteristics that may or may not influence the predictors/outcome variables and hence, reduce the possible bias by estimating the net effect of predictors on the outcome variable. FE is appropriate when the individual-specific intercept may correlate with one or more regressors. At the same time, in RE model, it is assumed that the intercept of an individual unit is a random drawing from a much larger population with a constant mean value. It is appropriate when the intercept of each cross-sectional unit is uncorrelated with the regressors (Gujarati, 2004). The choice between two models was made using the Hausman test, which tests if the unique error term is correlated with the regressors with the null hypothesis that they are not correlated.

Results and Discussion

The trend in performance indicators over time

The values of different performance indicators over time for the Indian dairy industry are given in Table 1. All values are in ratio form in rupees per annum. The overall profit margin (1991-2017)

Fig. 1 Trend in Profit margin, 1991-2017

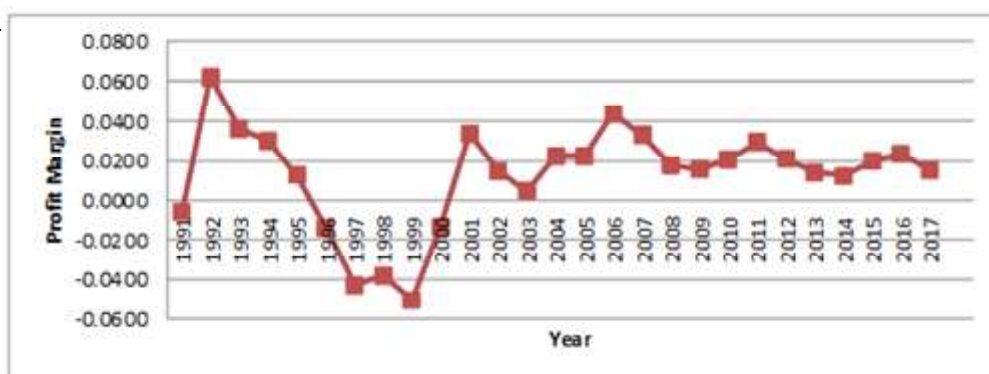


Table 1. Trend in performance indicators of Indian dairy industry (1991-2017)

Sub-periods	Profit margin (Ratio in Rs)	Labour Productivity (Rs. Million/ EU)	Capital Output ratio (Ratio in Rs)	Cost per unit sale (Ratio in Rs)
1991-99	-0.005	5.16	0.52	0.966
2000-08	0.016	7.34	0.71	0.954
2009-17	0.020	8.23	0.53	0.954
Overall	0.015	7.42	0.59	0.956
CGR (%)	0.164**	2.36***	0.59	-0.081

CGR is calculated for the period 1991-2017;***, **, *indicates significance at 1% level,5% level and 10% level of probability

was 1.5 per cent of the sale value, and it increased significantly at a compound growth rate of 0.164 per cent exhibiting improvement in the profitability of the dairy industry in India. The profit margin, during 1991-99 was negative, i.e., for per unit sale there was 0.5 per cent loss. In the following sub-periods, there was an increase in profit margin to the extent of 0.016 in 2000-08 and 0.020 in 2009-17.

Annual changes in profit margin can be seen from Figure 1, which shows that the profit margin has improved over time. During the first decade, the profit margin was continuously declining. The possible reason for the same may be significant trade policy reforms in the early 1990s that favored privatization and liberalization of all sectors, including the dairy industry. Delicensing of the dairy industry attracted a large number of domestic and private players, including multinational companies, to make investments in the sector. The increase in competition due to the rise in the number of plants might have squeezed the profit margin. Further, the establishment of WTO and reductions in quantitative restrictions on imports might have increased competition from other countries also.

The next indicator studied was labor productivity. As shown in Table 1, the overall average labour productivity in the dairy industry was observed as Rs 7.42 million per efficient units of labour in a year which has increased significantly at a compound growth rate of 2.36 per cent per annum during 1991-2017. During 1991-99, annual average labour productivity was 5.16 million rupees per labour and it increased in subsequent sub-periods to the tune of Rs 7.34 and Rs 8.23 million during 2000-08 and 2009-17, respectively. There was a steady growth in labour productivity due to the automation of dairy processing that

subsequently reduced the number of labor required to handle per unit of milk, but at the same time, the quality, as well as the value of product, increased. The analysis of aggregate data from the Annual Survey of Industries (ASI) indicates that, during 1991-2017, the number of persons engaged per factory decreased at a compound growth rate (CGR) of 2.18 per cent. Ohlan (2014) also reported that the number of employees per factory has shown a sharp decline with a CGR of -4.03 per cent during 1980-2008, exhibiting the labor substitution by capital.

Another performance indicator that reveals capital intensity is the capital-output ratio. It is the extent of capital used per unit output. It can be seen from the table that the overall capital-output ratio was 0.59 in the Indian dairy industry, which means the value of capital used was 59 per cent of the value of output. During the last 27 years (1991-2017), this ratio has not increased significantly and, at the same time, fluctuated too much. The capital-output ratio has shown a fluctuating trend, and it increased from 0.52 in 1991-99 to 0.71 in 2000-08, then declined in 2009-17 to 0.53. Non-significant growth in the capital-output ratio indicates that capital used per unit of output has remained the same since capital intensity increased in proportion to the increase in output.

Besides, the overall cost per unit sale ratio was 0.96, which denotes that for producing one-rupee-worth output, the operational cost accrued to the firm was 0.96 Rupees. If we compare the performance of Indian dairy industry in terms of cost reduction there was not much improvement as indicated by the growth rate, i.e., during the study period cost per unit sale was reduced by only 0.08 per cent and it was statistically non-significant. It might be because a major share of operation cost is constituted by raw material expenses that cannot be reduced without affecting production. Besides, due to increased competition, firms might be allocating more money for advertising, research, and development, improved and attractive packaging etc.

Table 2: Performance Indicators across size and experience categories

Classification	Parameters	Profit margin	Labour productivity	Capital-output ratio	Cost per unit sale
Large	Mean	0.018	8.16	0.39	0.955
	CGR	0.005	2.13***	1.63**	-0.039
Medium	Mean	0.016	6.76	0.67	0.957
	CGR	0.138	2.55***	0.86	0.017
Small	Mean	-0.006	6.11	1.17	0.955
	CGR	0.988***	2.37	2.2	-0.360***
Experience category					
Low Experience(< 20 years)	Mean	0.012	9.23	0.58	0.957
	CGR	0.125	4.40***	2.05	-0.105
Moderate Experience (21-40 years)	Mean	0.013	6.63	0.6	0.957
	CGR	0.1	0.97***	2.21	-0.052
High Experience(>40 years)	Mean	0.03	5.29	0.54	0.949
	CGR	0.492***	1.475	0.33	-0.059

*** and ** indicates significance at 1% level and 5% level of probability

Trends in performance indicators across categories according to size and experience

The changes in performance indicators over time across sizes and experience categories can be seen from Table 2. Large firms were found to have the highest profit margin (0.018) followed by medium (0.016), while the small firms were in loss intermittently with an overall profit margin of -0.006 during 1991-2017. It might be because, as firm size increases, firms might benefit from economies of scale, leading to a decrease in average cost.

If we examine the growth in profit margin, small firms grew at a faster rate (0.99 % per annum), while growth in profit margin was statistically non-significant in the case of medium (0.14 %) and large (0.01 %) firms. This may be because small firms were operating with much loss when compared to the other two categories of firms; hence they might have tried to make the firms profitable. However, the other two categories were already in a comparatively better position in terms of PAT, and their focus might be to sustain profitability rather than increase profits. A similar trend was observed in the case of labor productivity also. It was found highest in the case of large firms (8.16), followed by medium (6.76) and small (6.11) firms. The higher labor productivity of larger firms might be attributed to the higher capital intensity so that they might employ less labor. Labor productivity improved over time, implying that the labour is being replaced by capital irrespective of firm size. Examination of trend growth in labour productivity revealed that it was growing significantly in the case of large (2.13%) and medium (2.55%) firms. It may be because these two categories of firms might be replacing labour with capital at a faster rate when compared to small category firms for which the growth was found non-significant.

However, capital-output ratio was highest in the case of small firms (1.17) followed by medium (0.67) and large firms (0.39). The capital intensity declines as the size increases. It might be because large firms may be utilizing capital more productively than smaller firms, or the capacity utilization of large firms might be higher than smaller firms. Calculation of the growth rate in the capital-output ratio indicated that it had grown significantly in the case of large firms (1.63%). In contrast, it was not statistically significant for small and medium firms. Hence it could be understood that large firms accumulated a substantial amount of capital over the years.

Lastly, the cost per unit sale was almost the same across different size categories (0.955, 0.957, and 0.955, respectively, for large, medium, and small firms). This reveals that firms incur almost the same operational cost per unit sale irrespective of size. The reason might be that the raw material expense constitutes the major expense share in operational costs, and for per unit production of output, the requirement of raw material (milk) might be the same for all firm sizes. But there is a chance of difference in total cost per unit production, which may be least in the case of larger firms due to economies of scale. Other than that rate of growth in cost per unit sale per annum was negative and significant in the case of small firms (-0.36 %) while growth was insignificant in the case of large (-0.04 %) and medium (0.01 %) firms. So we can conclude that small firms significantly reduced operational costs over the years. This might have attributed to significant improvement in profit margin in the case of small firms, as mentioned earlier.

Further, it is assumed that firms established recently may be using capital-intensive technologies compared to those established much before; hence, there are chances of differences in performance in terms of profit margin and other economic indicators for firms established in different time periods. Therefore, tabular analysis was undertaken for three experience categories, and the results are presented in Table 2. It could be observed that profitability increases as the experience of the firm increases (0.012, 0.013, and 0.030 respectively for low, medium, and high Experience firms). The reason may be apparent if we check the trend in other indicators. If we see the trend in labor productivity, we can find a reversible trend to profit margin, which means labour productivity decreases with an increase in experience (9.23, 6.63, and 5.29 respectively for low, moderate, and high experience firms). It may be due to the use of comparatively capital- intensive

technologies by firms with low experience, which are new that require a smaller number of employees; hence per unit output of employees may be high. At the same time comparison of capital-output ratio across different experience categories revealed that moderate experience firms (0.60) had comparatively high capital per unit output than low (0.58) and high experience (0.54) firms. Hence, we can conclude that relatively low-experience firms use more capital per unit output than high-experience firms. Similarly, cost per unit sale was found to be lowest in the case of high-experience firms (0.949) and similar in the case of low and moderate-experience firms. From the table, we can find that firms belonging to low and moderate experience categories are more or less similar for all indicators except labor productivity. After analyzing the trend of all factors, we can conclude that the higher profit margin of high-experience firms may be due to use of low capital per unit output and low cost per unit sale compared to less experienced firms.

Analysis of the growth rate of profit margin revealed that high-experience firms registered high and significant (0.492) growth while other two categories reported almost the same growth rate (0.125 % and 0.100 % respectively for firms upto 20 years and 21-40 years), but insignificant. Labour productivity has shown an increasing trend over the years irrespective of categories. At the same time growth in labor productivity was found highest in the case of low-experience firms (4.4%) while moderate-experience firms also reported significant growth of 0.967 per cent. It may be because of the adoption of more capital-intensive technologies by these firms over the years. In the case of high-experience firms, the growth was insignificant. The capital-output ratio fluctuated over the years. It has shown an increasing trend between the first and second sub-period, then decreased in the third sub-period for all categories. The growth rate in capital-output ratio was found insignificant for all the categories. In general, cost per unit sale has shown a declining trend across all experience categories which may be due to the cost reduction strategies adopted by the firms through experience and learning over the years. It has decreased from 0.974 to 0.956 in the case of low experience, 0.968 to 0.954 in the case of moderate experience, and 0.952 to 0.947 in the case of high experience firms between 1991-99 and 2009-17. The growth rate in cost per unit sale was found to be negative in all cases but insignificant. So it can be concluded that operational cost per unit sale remained constant over the period for all experience categories.

Table 3. Summary statistics of variables

Size	Profit Margin	Share of sales	Labour Productivity	Capital Intensity	Cost per unit sale
Large	0.018 (0.052)	0.043 (0.077)	8.158 (8.085)	0.389 (0.629)	0.955 (0.070)
Medium	0.005 (0.131)	0.050 (0.059)	7.688 (13.349)	0.898 (3.676)	0.954 (0.116)
Small	-0.006 (0.100)	0.002 (0.004)	6.111 (8.736)	1.172 (1.688)	0.955 (0.124)

Factors affecting profit margin across firm size categories

Having discussed the trends in selected performance indicators across size and experience of firms, to know the determinants of profit margin at firm level, panel data regression was undertaken as per size. The summary statistics of different size categories of firms are provided in Table 3.

To examine size-wise variation in determinants, analysis for each size category was undertaken for the time period, 1991-2017. From Table 4, it can be seen that numbers of firms in large, medium and small category were 44, 59 and 17 respectively. Further investigation of co-efficients across size categories indicates that in the case of Large firms, capital-output ratio, cost per unit sale and trend were found to affect profitability significantly. It is evident from the co-efficient of capital –output ratio that use of more capital per unit output reduces profit margin. The extent of reduction in profit margin for unit increase in the ratio was 0.091 units. As expected cost per unit sale negatively affects profit margin which means unit increase in cost per unit sale decreases the profit margin by -0.244 units, while profit margin increases by 0.001 units per year due to technological progress. In the case of medium firms, cost per unit sale and trend were the two variables that were found to be significant. A unit increase in cost per unit sale decreases the profit margin by -0.249 units while the trend affects the profit margin positively. Profit margin increases by 0.004 units per year in the case of medium firms due to technological progress. In the case of small firms, labor productivity and cost per unit sale were the two variables that affected the profit margin significantly. As the cost per unit sale increased by one-unit profit margin decreased by 0.63 units which were comparatively higher to the other two category firms, while labour productivity contributes positively to profit margin. That

means as labor productivity improves by one-unit profit margin increase by 0.004 units. Hence, we can conclude that cost per unit sale was the most important variable that found to affect profit margin of all size categories as well as overall dairy industry. Therefore, any strategies adopt by the firms to reduce the cost may improve profit margins. The improvement in profit margin due to trend was observed to be significant only in the case of large and medium firms.

Finally, the co-efficients of random effects model for the overall industry showed that cost per unit sale and trend were the two variables that affected profit margin as in the case of fixed effects model but the magnitudes were different. We also mentioned that fixed effects model was appropriate for overall dairy industry but to introduce dummy variables random effects model was analysed thus it may suffer from bias due to omission of the individual effect. Large firm category was considered as the benchmark category, and the co-efficients of both medium and small dummies were significant. It indicates that the profit margins of medium and small-sized firms were significantly less than large firms by 0.015 units and 0.045 units. A study conducted by Kumar (2003) to analyze the economic performance of 30 dairy firms including the 5 MNC firms for the period 1991-92 to 2000-01 revealed that sales and value of the output of dairy processing firms increased during the period, and about 5.5 per cent of profit margin was due to a handful of well-performing large farms. So we can conclude that profit margin across different sizes of firms in dairy industry differed significantly and it increases with the size of the firm which may be due to economies of scale.

Factors affecting profit margin across firms having different years of experience

Table 4. Co-efficients of size wise panel data regression

Independent Variables	Size			Overall with size dummy
	Large	Medium	Small	
Share of Sales	-0.06422(0.136)	0.10788(0.094)	0.086(7.043)	0.08021(0.063)
Labour Productivity	0.00003(0.000)	-0.00003(0.000)	0.004**(0.002)	0.00001(0.000)
Capital output ratio	-0.09104*** (0.026)	0.00087(0.001)	-0.012(0.014)	-0.00002(0.003)
Cost per unit sale	-0.24360*** (0.086)		-0.24985*** (0.090)	-0.631*** (0.197)
Trend	0.00102* (0.001)	0.00367** (0.002)	0.003(0.004)	0.00139** (0.001)
Constant	0.26682*** (0.083)	0.16633* (0.088)	0.502* (0.259)	0.33027*** (0.070)
Medium dummy	—	—	—	-0.01506* (0.009)
Small dummy	—	—	—	-0.04486*** (0.016)
No. of groups	44	59	17	120
No. of observations	532	506	106	1150
Model	FE	FE	FE	RE
Hausman test statistic	Chi2= 61.94; Prob>chi2=0.0	Chi2=13; Prob>chi2=0.0234	Chi2=10.47; Prob>chi2=0.033	—
F statistic	F(5,43)=2.73 Prob>F=0.032	F(5,58)=2.41 Prob>F=0.047	F(5,16)=35.26 Prob>F=0.000	Wald chi2=43.36; Prob>chi2=0.000

Figures in parentheses are robust standard errors; *, **, *** indicates significance at 1% , 5% and 10% levels of probability

Table 5. Summary statistics of variables according to experience

Experience	Profit Margin	Share of sales	Labour Productivity	Capital Output ratio	Cost per unit sale
Upto 20(Low Experience)	0.011 (0.072)	0.022 (0.039)	9.32 (9.11)	0.58 (0.99)	0.957 (0.100)
21-40(Moderate experience)	0.014 (0.090)	0.023 (0.069)	6.69 (6.63)	0.60 (1.15)	0.957 (0.095)
>40(High experience)	0.016 (0.066)	0.211 (0.224)	5.94 (6.19)	0.56 (0.64)	0.945 (0.076)

Figures in parentheses indicates the standard deviation

Table 6. Co-efficients of experience wise panel data regression

Independent Variables	Experience category			Overall with experience dummy
	Low	Moderate	High	
Share of sales	-0.2616(0.368)	0.460939(0.297)	-0.0136(0.045)	0.14307*(0.076)
Labour Productivity	0.0034***(0.001)	0.000002(0.000)	-0.0002(0.000)	0.00002(0.000)
Capital output ratio	-0.0002(0.011)	0.001037(0.001)	-0.0286(0.043)	-0.00022(0.003)
Cost per unit sale	-0.2777**(0.126)	-0.291118*** (0.094)	-0.3377**(0.136)	-0.35033*** (0.071)
Trend	0.0017**(0.001)	0.002247*(0.001)	0.0010(0.001)	0.00166**(0.016)
Constant	0.2104*(0.123)	0.231960*** (0.096)	0.3404**(0.137)	0.30435*** (0.000)
Upto 20	—	—	—	-0.00449(0.010)
>40	—	—	—	0.01516(0.009)
No. of observations	395	631	123	1150
No. of groups	42	69	9	120
Model	FE	FE	FE	RE
HausmanStatistic	Chi2=95.56; Prob>chi2=0.000	Chi2= 29.63; Prob>chi2=0.000	Chi2=12.42; Prob>chi2=0.0294	—
F statistic	F(5,41)=26.62; Prob>F=0.000	F(5,68)=3.31; Prob>F=0.0098	F(5,8)=2.13; Prob>F=0.163	Waldchi2=36.17; Prob>chi2=0.000

Figures in parentheses are robust standard errors;***, **, *indicates significance at 1% level, 5% level and 10% level of probability

Studies revealed that there was a difference in performance in terms of the use of technology and inputs for firms established during different time periods that in turn have an effect on output and profits. Therefore, to find out the difference in determinants according to the year of incorporation of the firm, panel data regression was undertaken. The Hausman test indicated that the fixed effects model was appropriate. The summary statistics of the variables are presented in Table 5, and the analysis results are presented in Table 6.

It can be observed from Table 6 that the profitability of firms with low experience was affected mainly by labour productivity, cost per unit sale and trend. All other coefficients were found to be insignificant. Labour productivity found to affect profit margin positively, which means that as labour productivity increases by one-unit, profit margin may improve by 0.003 units. Cost per unit sale, on the other hand, affects profit margin negatively. As the cost per unit sale increases by one unit, the profit margin may decrease by 0.27 units. Trend, a proxy for technological progress, affects profit margin positively by 0.002 units per year. Cost per unit sale and trend were found to be significant for moderate experience firms also. As the cost per unit increases by one unit,

the profit margin decreases by 0.29 units. Profit margin improved by 0.002 units per year due to technological progress. The model fitted was non-significant in case of high experience category, so the results cannot be interpreted. The coefficients obtained from the random effects model with dummies show no significant difference in profit margin between experience categories, even though we can observe a similar profit margin trend as in the tabular analysis case. That means compared to the moderate experience category, the profit margin of high-experience firms was higher by 0.016 units, for younger firms, it was less by 0.004 units, as observed from the co-efficients.

Conclusions

The demand for dairy products has been increasing over the years due to population increase, improvement in per-capita income, urbanization, etc. The dairy processing industry should be equipped to meet this rising demand for diversified dairy products. The profitability of this sector should be sufficient to attract new investment. In this context, this study examined the performance of the dairy processing industry in India using firm-level data obtained from CMIE. The study found that the profit

margin and labor productivity have increased significantly over the study period, while the growth in other performance indicators was not significant. The profit margin was found to be increasing with the increase in size and experience of the firms, while labour productivity was directly related to size but inversely related to experience. The lower profit margin among small firms and firms with low experience requires policy intervention to enhance their efficiency and productive capacity. The cost per unit of sale was the most determining factor that adversely affected the profit margin. At present, it is very high in all cases. Hence, any measures to reduce operational costs, including improving efficiency, will help to improve the profit margin.

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