

Growth & Productivity Of Food Processing Industries In All-India

Dr. R. K. Goyal and Mr. Rohin Malhotra

Department of Management, Asra Institute of Advanced Studies, Channo

Abstract: *Green revolution of 60s ultimately after four decades led the beneficiary states like Punjab witness slow growth in productivity of agriculture, depleting water table as well as increasing soil salinity and micro-nutrient deficiencies accompanied by rising costs of production. It led to the stagnating incomes and high indebtedness amongst the farmers. However, to circumvent this problem, policymakers are putting emphasis on shifting the direction of agriculture towards high value agricultural commodities such as fruits and vegetables, milk and milk products, meat, eggs, fish and processed food products from the stereotyped wheat and rice monoculture. The solution seems more viable too when seen in light of the consumers demand for better, safer and convenient food products for which they are even willing to pay a higher price. The present study is taken up to assess the growth and productivity of different food processing industries in India since 1980-81. The results indicate that the momentum gained by the food processing industries in terms of its share in overall manufacturing sector from 1990-91 to 2000-01 lost its steam in the next decade and picked up later from 2010-11 to 2015-16. Also, the growth of food processing industries remained less than what was realized in the pre-liberalization regime with total output and profitability experiencing a negative growth. Further, total factor productivity change experienced a decline owing to decrease in both the technical as well as scale efficiencies and labour divergence in the post-2000 period.*

Keywords: Food Processing, Growth, Productivity, Data Envelopment Analysis and Convergence.

**GROWTH & PRODUCTIVITY OF FOOD PROCESSING INDUSTRIES IN ALL-
INDIA
SECTION I****INTRODUCTION**

Indian economy has been growing consistently at an annual rate of over 6 per cent. This growth has come from services and manufacturing sectors, but the performance of agriculture sector has been lack luster. Food processing industry in India is a sunrise sector that has gained prominence over the recent years. Availability of raw materials, changing lifestyles, appropriate fiscal policies, huge scientific and research talent pool, well developed distribution network, rapid urbanization and increased literacy has given a considerable push to the industry's growth. This sector serves as a vital link between the agriculture and industrial segments of the economy. Adequate focus on this sector could greatly alleviate our concerns on food security and food inflation. Strengthening this link is of critical importance to reduce waste of agricultural raw materials, improve the value of agricultural produce by increasing shelf-life as well as by fortifying the nutritive capacity of the food products; ensure remunerative prices to farmers as well as affordable prices to consumers. India already is a leading exporter of several food products the continuing food inflation in the country has brought in sharp focus "supply side" constraints, especially in case of perishables. There is thus an increasing realization about the need to increase agricultural production in the country and a strategy to usher in second green revolution is under preparation. At the same time, it needs to be understood that it will not be enough only to produce more, but it is equally important to save each grain produced by reducing wastages. This would improve farmers' income and economic viability of agricultural operations. Such a strategy would also be essential to meet the twin national objectives of "inclusive growth" and "food security".

Food processing industry comprises all enterprises dealing with the processing of fresh agricultural produce. This industry refers to the items pertaining to the two processes viz. (a) Manufactured Processes: If any raw product of agriculture, animal husbandry or fisheries is transformed through a process [involving employees, power, machines or money] in such a way that its original physical properties undergo a change and if the transformed product is edible and has commercial value, then it comes within the domain of Food Processing Industries and (b) Other Value-Added Processes: Hence, if there is significant

value addition (increased shelf life, shelled and ready for consumption etc.) such produce also comes under food processing, even if it does not undergo manufacturing processes. India presents itself a lot of advantages. India is one of the largest food producers in the world. The diverse agro-climatic conditions and the raw material base suitable for food producing companies are available in abundance. The North-the country's granary, north hilly area country's fruits & vegetables-have prepared plans for the food processing industry. The region processes about a fourth of fruit, vegetables and milk against the national average of around 10 per cent.

The growth of food processing sector would need to be a significant component of this strategy, considering its possible role in achieving increased agricultural production by ensuring better remuneration for farmer. The food processing sector makes it possible by not only ensuring better market access to farmers but also by reducing high level of wastages. A developed food processing industry will reduce wastages, ensure value addition, generate additional employment opportunities as well as export earnings and thus lead to better socio-economic condition of millions of farm families.

The deceleration in agriculture growth if not arrested, will have serious consequences for the livelihood of over 52 per cent of the country's population that depends on agriculture and for the growth of other economic sector particularly manufacturing sector that has strong backward and forward linkages with agriculture. The food and agricultural sectors in developing countries have been enormously transformed in the way food is produced, processed, marketed and consumed. Consumers have also been responding to changes in quality of food intake and are becoming more conscious regarding nutrition, health, and food safety issues. Historically, Indian consumers have preferred fresh and unprocessed food over processed and packaged food; however, the recent changes in consumption patterns, particularly in middle and high – income groups, show ample opportunity for processed food segments in the country. Rising income, increased urbanization, changing lifestyle, greater willingness to experiment with new products and flavours, desire for convenience and an increase in the number of working women have led to a strong growth in consumption of packaged and processed food products.

The process of economic liberalization in India has been on its way since the late 1970s and early 1980s, but at a slow and halting pace. The first comprehensive economic reform policy

statement was formulated for India in July 1991 in the form of industrial and trade sector liberalization. The economic reforms of the 1990s, which strengthened the process of liberalization, privatization and globalization in the country, have brought new opportunities and challenges before food processors through a competitive market environment. To meet the emerging demand for processed food products, both national and multinational food processing organizations have been trying to capture the huge and exponentially growing food market by adopting sophisticated technologies to facilitate innovations in food product development and packaging for competitive success and survival within the consumer market across the world. The capital investment in the food processing sector has significantly increased after the economic reforms of 1991 in the country. The government accorded it a higher priority, with a number of fiscal reliefs and incentives, automatic approval of foreign investment and technologies transfer and imports to strengthen the manufacturing sector, including food processing. Therefore, analysing productivity and efficiency changes across the manufacturing sector during pre and post reform periods becomes essential for providing strategic inputs to the producers, the government and other stakeholders.

Market liberalization is expected to have a favourable impact on productivity growth in the manufacturing sector due to several reasons. Krishina and Mitra (1998) argue that trade can spur innovation by enhancing industrial learning, exchange of technical information, sharing of global research and elimination of duplication in research and development. Goldar and Kumari (2003) have listed several expected impacts of import liberalization on productivity and efficiency of manufacturing sector: (i) import liberalization will provide the industrial firms with greater and cheaper access to imported capital goods and intermediate goods; (ii) greater availability of imported capital and intermediate goods will enable the firms to enhance the productivity and efficiency in a better way; (iii) the increased competition among manufacturing units will enforce better utilization of resources; (iv) the increased competitive pressure coupled with expanded opportunities for importing technology and capital goods will bring greater technological dynamism in industrial firms; (v) since competitive business environment forces inefficient firms to close down, the average level of efficiency of various industries should improve; and (vi) greater access to imported inputs and a more realistic exchange rate associated with a liberalized trade regime would enable manufacturing firms to compete more effectively in export markets. Similarly, other researchers propound the fact that trade reforms lead to increased international competition which brings about a reduction in input slacks and greater access to a variety of

specialised inputs for enhancing production efficiency (Chand and Sen 2002; Horn, Lang, and Lundgren 1996). Pattanayak and Thangavelu (2005) indicate that key elements of the New Industrial Policy (NIP) of 1991 aim at enhancing productivity and efficiency in the Indian manufacturing sector by increasing competition, creating a level playing field among public, private and foreign businesses, and generating a conducive environment for technological growth through abolition of licensing, reducing the reserved list for public sector undertakings, increasing foreign equity ownership and investment, promoting private investment in infrastructure, allowing free import of capital goods, reducing tariffs for consumer goods and deregulating small scale units. However, there are contrasting views as well on the linkage of market liberalization with productivity and efficiency growth. The traditional infant industry argument, which has greater relevance to the Indian food processing sector, emphasizes that the removal of protection through market liberalization may force the majority of small and medium firms to close down their business. The food processing sector in India covers a wide range of food items such as meat and meat products, fish and fish products, fruits and vegetables, vegetable oils and fats, milk and milk products, grain milling, animal feed, confectionery products, bakery products, sugar processing, among others. The level and structure of the Indian food processing industry reflects that food production is mainly constrained due to lack of productivity augmenting technologies. To meet the emerging challenges, there is an urgent need to bring efficiency to the production process, either through maximizing the output or minimizing the cost. Therefore, technology is the key to improvement in the growth and efficiency of the food processing sector.

The recently liberalized food manufacturing sector, as well as other forms of agribusiness could play an important role in stimulating agriculture growth and transforming rural economy. Amongst various agro industries, food manufacturing is more material intensive (Sarcar and Karan, 2005; kumar *et al*, 2011) and this possess a greater potential to revitalize agriculture growth by strengthening forward and backward linkages with farmers and speed up the process of commercialization and diversification of agriculture production.

Food processing industries, to reduce their own transaction cost often tend to be located nearer to the source of raw material, and thus can create income opportunity for the rural people. Hence accelerating agriculture growth through diversification and development of agro processing is a major policy challenge.

Significant changes are taking place in the food basket of Indian consumer. Sustained income growth, increasing urbanization, a fast growing middle income class, increasing entry

of women in workforce, nuclearization of families, improvements in literacy and exposure to western food are leading to a rapid growth in demand for processed foods. With an increase in the number of working couples, there is paucity of time to prepare the meals by married females which has necessitated the requirement of ready-to-cook foods. Thus, high value agricultural crops are assuming increasing weightage day by day. Moreover, due to improvement in technology, physical input of the people has decreased because of which their lifestyle has become sedentary which has deteriorated the quality of life. (Harold, 2018). Therefore, people are becoming more diet conscious and relying on healthy foods with lower carbohydrates and cholesterol contents like zero-percent transfat snacks and biscuits, slim milk, whole wheat products, oats, soybean products, cornflakes etc. Consumers are aggressively demanding better, safer and convenient food products for which they are even willing to pay a higher price. Demand for processed foods is more responsive to income and price changes and will grow faster than any other food item (Ravi and Roy, 2006) by 2020 processed food products and beverages are expected to account for about 15 per cent share in the food basket. The Indian food processing industry accounts for 32 per cent of the country's total food market. Estimated to be worth USD 121 billion, it is one the largest industries in India, and is ranked fifth in terms of production, consumption and exports. The industry employs 13 million people directly and 35 million people indirectly. It accounts for 14 per cent of manufacturing GDP, nearly 13 per cent of India's exports and 6 per cent of total industrial investments. Rising demand together with improvements in transportation, logistics, communication, technological innovations, adequate legal and regulatory arrangements, and other favourable economic policies in food processing offer an immense scope for the growth of food processing industry.

This has given an added stimulus to the food processing industry in recent times (Thorton, 2017). Further, a strong and dynamic food processing sector provides vital linkages and synergies between agricultural and industrial sectors thereby providing a potential for the growth of the economy (Murthy and Himachalam, 2011). Taking leap in this direction, the present study attempts to find out the growth and productivity of food processing industries in India. Specifically, objectives of the study are:

1. To find out the dominant and fastest growing food processing industries in India since 1980-81
2. To analyse the pattern of labour and total factor productivity growth in manufacturing sector in India

Briefly, the study is divided into five sections. Section I is introductory in nature wherein the relevance of food processing industries is highlighted. In section II, database and methodology is discussed. Analysis pertaining to the dominance and growth of Punjab's food-processing industries is presented in section III. Productivity of food-processing industries of Punjab is discussed in section IV. Concluding remarks follow section V.

SECTION II

DATA BASE AND METHODOLOGY

For the purpose of study, secondary data from various issues of Annual Survey of Industries (ASI) published by the Central Statistical Organization, Ministry of Planning, Department of Statistics, Government of India for the years 1980-81, 1990-91, 2001-02, 2010-11 and 2015-16 is used. Broad classification of industries listed in the group of food-processing have undergone drastic reclassification from 1980-81 to 2015-16. In order to arrive at comparable and meaningful results a concordance is developed by clubbing the similar industries classified under different codes in National Industrial Classification - 2008 (Annexure I). To examine the dominance of different food-processing industries in the state, we have assessed the share of food processing industries in total food processing group and overall manufacturing sector in Punjab over a period of time. The comparison is undertaken in terms of six variables i.e. number of factories, number of workers, invested capital, total output, net value added and profits. Further, to study the growth of food-processing industries, compound growth rate of each of the selected indicators have been calculated for different time periods. Trends in growth are studied by computing the compound growth rate through principle of least squares, using following formula

$$\text{Log } Y = \text{Log } a + (\text{Log } b)t$$

The data given in ASI reports is on current prices but for proper comparison, values are deflated with the help of suitable deflator (1993-94 = 100).

For finding out the productivity, we have used the non-parametric method of Data Envelopment Analysis (DEA) primarily on the assumption that all food processing industries in Punjab share common production practice. We have taken gross value added as output and labour and capital as two inputs in the production function. The Malmquist indices are computed on the basis of annual time series data for the time-period 1980-81 to 2015-16. Using DEA, Malmquist indices of productivity change is decomposed into components of change in pure technical

efficiency, technical progress, and scale efficiency. It helps to identify the sources of productivity growth to make efforts to transform the lagging industries into the leading ones. We assumed that all the industries are operating at an optimal scale. The Malmquist input oriented Total Factor productivity (TFP) change index between the base period t & the following period $t+1$ is defined as:

$$M(y_t, x_t, y_{t+1}, x_{t+1}) = \left[\frac{d_{t+1}(Y_{t+1}, X_{t+1})}{d_t(Y_t, X_t)} \times \frac{d_t(Y_{t+1}, X_{t+1})}{d_{t+1}(Y_{t+1}, X_{t+1})} \right]^{1/2}$$

A value of M greater than unity implies a positive TFP growth from period t to period $t+1$ whereas a value of M less than one indicates a TFP decline. Equation above is the geometric mean of two TFP indices. The first index is calculated with respect to period t technology, while the second index is evaluated with respect to period $t+1$ technology. The advantage of the Malmquist index is that it allows us to distinguish between shifts in the production frontier i.e. Technological Change (TC) and movement of firms towards the frontier Technical Efficiency Change (TEC). The measure of technical efficiency must be between 0 and 1.

$$\text{Total Factor Productivity Change Index} = \frac{D^t(y^t, x^t)}{D^{t+1}(y^{t+1}, x^{t+1})} \times \left[\frac{D^{t+1}(y_{t+1}, x_{t+1})}{D^t(y^{t+1}, x^{t+1})} \times \frac{D^{t+1}(y^t, x^t)}{D^t(y^t, x^t)} \right]^{1/2}$$

$$\text{Technological Change Index} = \left[\frac{D^{t+1}(y_{t+1}, x_{t+1})}{D^t(y^{t+1}, x^{t+1})} \times \frac{D^{t+1}(y^t, x^t)}{D^t(y^t, x^t)} \right]^{1/2}$$

$$\text{Technical Efficiency Change Index} = \left[\frac{D^{t+1}(CRS)(y_{t+1}, x_{t+1})}{D^t(CRS)(y^t, x^t)} \right]$$

$$\text{Pure Technical Efficiency Change Index} = \left[\frac{D^{t+1}(VRS)(y_{t+1}, x_{t+1})}{D^t(VRS)(y^t, x^t)} \right]$$

$$\text{Scale Efficiency Change Index} = \left[\frac{D^{t+1}(CRS)(y_{t+1}, x_{t+1})}{D^t(CRS)(y^t, x^t)} \right] / \left[\frac{D^{t+1}(VRS)(y_{t+1}, x_{t+1})}{D^t(VRS)(y^t, x^t)} \right]$$

The use of Malmquist Index gives a fair idea about the total factor productivity growth and the components ushering in that growth. However, in order to understand the role of labour in food processing industries in different time periods, we have tested the labour productivity convergence. Estimates are carried out for four sub-periods i.e. 1980-81-1990-

91, 1991-92-2000-01, 2001-02 to 2010-11 and 2011-12 to 2015-16. We have made use of Barro-regressions (1991) wherein the model is estimated as

$$\frac{1}{T} \ln \left(\frac{\bar{y}_i T}{\bar{y}_{i0}} \right) = \alpha + \beta \ln \bar{y}_{i0} + \varepsilon_i$$

Average labour productivity growth over a time period is the dependent variable and logarithm of initial labour productivity is the independent variable or regressor. Left hand side of the equation shows average labour productivity growth rate, α and β highlight the parameters to be estimated, and ε_i is an error term. The results so arrived are discussed in the following sections.

SECTION – III

DOMINANCE AND GROWTH OF FOOD PROCESSING INDUSTRIES IN ALL-INDIA

Table 1 clearly shows that Manufacture of grain mill products, starches and starch products, and prepared animal feeds industry has independently dominated the food processing industries in almost all the time periods as well as all the variables considered for this study. However, slow movement of grain towards the processing industries, drilage losses due to space shortage (to stock the grains), high cost of power and rising wage rates etc. seems to be the most plausible reasons for recent losses in this industry. Similarly, for the slaughtering, preparation and preservation of meat industry, number of workers, value addition and profitability have seen an upward trend in the recent years (although factories, invested capital and output has moved down) possibly due to better machines to process the non-vegetarian products like chicken, fish, and meat, increase in spending capacities and lesser availability of time with the working couples. On the whole, symmetric oscillations can be found in context of the fluctuating share of different food processing industries in the overall manufacturing sector in India. From 1990-91 to 2000-01 (except slaughtering, preparation and meat industry and other food products) all other food processing industries witnessed an increase in their share in total manufacturing industries in India. Similarly, all food processing industries (except manufacture of beverages and dairy) saw a dip in their share in the overall manufacturing in India during the time span 2000-01 to 2015-16. Also, the overall share of food processing industries in total manufacturing industries in All - India has gone down from 16.17 percent to 14.36 percent in the same time period.

Table 1
Dominance of food processing industries in All-India

(in percent)

Industry	Year	Number of Factories	Number of Workers	Invested Capital	Total Output	Gross Value Added	Profit	Share of the industry in manufacturing in All - India
Slaughtering, preparation and preservation of Meat	1980 – 81	16.29	18.09	24.84	35.82	31.25	56.86	4.69
	1990 – 91	12.64	9.59	14.41	24.69	14.03	17.53	3.81
	2000 – 01	13.71	10.56	13.91	23.39	6.38	14.96	3.78
	2015 – 16	11.64	6.40	13.98	22.75	15.37	19.62	3.27
Manufacture of dairy product	1980 – 81	0.99	1.71	6.32	8.17	8.02	2.10	1.07
	1990 – 91	1.51	2.67	5.15	8.20	6.12	2.58	1.27
	2000 – 01	2.71	5.79	4.72	11.52	5.30	16.02	1.86
	2015 – 16	4.50	13.09	8.51	14.21	8.89	6.71	2.04
Manufacture of grain mill products, starches and starch products, and prepared animal feeds	1980 – 81	28.72	10.78	11.76	21.30	10.28	7.74	2.79
	1990 – 91	33.63	13.55	13.18	18.82	9.95	7.37	2.90
	2000 – 01	47.43	21.99	12.53	22.21	6.23	12.81	3.59
	2015 – 16	48.05	24.73	20.79	26.29	14.60	7.71	3.78
Manufacture of other food products	1980 – 81	19.51	43.27	43.68	22.75	36.13	1.06	2.98
	1990 – 91	21.22	41.07	54.54	35.59	46.72	46.00	5.49
	2000 – 01	21.94	42.35	54.50	29.82	68.46	8.37	4.82
	2015 – 16	21.80	37.65	43.72	24.74	30.91	15.82	3.55
Manufacture of beverages	1980 – 81	1.66	1.86	5.28	3.86	5.49	14.95	0.50
	1990 – 91	2.97	3.00	6.15	4.43	8.37	2.11	0.68
	2000 – 01	3.88	4.15	9.50	6.24	5.20	8.03	1.01
	2015 – 16	5.15	4.44	9.72	7.20	14.65	18.84	1.03
Manufacture of tobacco	1980 – 81	32.83	24.30	8.13	8.10	8.84	17.29	8.10
	1990 – 91	28.02	30.12	6.57	8.27	14.80	24.41	8.27
	2000 – 01	10.32	15.16	4.84	6.82	8.43	39.81	6.82
	2015 – 16	8.87	13.68	3.27	4.81	15.58	31.30	4.81
Share of all Food Processing Industries	1980 – 81							13.09
	1990 – 91							15.43
	2000 – 01							16.17
	2015 – 16							14.36

Source: Supplement to Annual Survey of Industries, various years

Table 2
Growth of food processing industries in different time periods

(in percent)

Characteristics / Year	Growth from 1980 – 81 to 1990 – 91							Growth from 1990 – 91 to 2000 – 01							Growth from 2000-01 to 2015 – 16						
Industry Group	G-I	G-II	G-III	G-IV	G-V	G-VI	FPI as a whole	G-I	G-II	G-III	G-IV	G-V	G-VI	FPI as a whole	G-I	G-II	G-III	G-IV	G-V	G-VI	FPI as a whole
Number of Factories	-1.31	5.62	2.84	2.08	7.27	-0.36	2.69	-0.25	4.89	2.40	-0.73	1.62	-10.47	-0.42	2.35	6.73	3.49	3.361	5.24	2.43	3.93
Number of Workers	-4.62	6.23	3.97	1.09	6.63	3.83	2.86	1.13	8.23	5.13	0.47	3.47	-6.48	1.99	-0.90	7.60	3.00	1.501	2.67	1.59	2.58
Invested Capital	12.25	16.13	19.89	21.19	20.35	16.03	17.64	15.56	14.97	15.39	15.96	21.12	12.49	15.92	11.65	15.80	15.20	10.088	11.78	8.91	12.24
Total Output	13.62	17.97	16.47	23.33	19.56	18.17	18.19	13.02	17.56	15.54	11.65	17.60	11.46	14.47	12.30	13.98	13.68	11.187	13.51	10.06	12.45
Profit	12.54	29.22	25.97	84.51	4.08	31.04	31.23	8.74	32.61	19.79	-4.22	8.05	16.01	13.50	17.20	9.13	11.64	19.912	21.54	13.51	15.49

Source: Supplement to Annual Survey of Industries, various years

Note

G- I is Slaughtering, preparation and preservation of meat; G- II is Manufacture of dairy product; G- III is Manufacture of grain mill products, starches and prepared animal feeds; G- IV is Manufacture of other food products; G- V is Manufacture of beverages, G- VI is Manufacture of tobacco and other tobacco products

Growth of food processing industries is shown in table 2. It is evident from the table that the food processing industry of India has failed to meet the test of liberalization. Specifically, in the post liberalization period the growth of food processing industries in all the selected variables remained less than what was realized in the pre-liberalization regime. Major change has taken place in context of total output and profitability which have experienced a negative growth. The same is true for almost every food-processing industry individually. Except slaughtering, preparation and preservation of meat industry every industry has witnessed a negative growth in profits during the post-liberalization period. However, in the last few years, even the growth of number of workers has gone positive which indicates that the industry is now becomes attractive to offer employment to the people and wherever the profits are being generated they are because of the use of capital-oriented techniques. Statistical trends highlighted do match with the ongoing catastrophic conditions in the state of Punjab.

Skilled workers have stopped coming to work in the food processing industries. Hence, the onus to increase production falls on the existing workers who have to work for longer hours under inhospitable conditions. Under such circumstances only the untrained labourers are coming forward to work in food processing industries. Resultantly, there is a fall in quality of production and profits arising there from. Consequently, the food processing industries fail to meet the test offered by liberalization. Of course, other factors like high cost of power and tax rates (both are now reduced under the new industrial policy of the state and the applicability of GST) and tax sops offered by the various states are equally responsible for the dismal show of food processing industries.

Thus, from the above discussion it can be inferred that there is momentum gained by the food processing industries in terms of its share in overall manufacturing sector in 2000-01 to 2015 – 16 from the previous decade. Further, the growth of food processing industries remained less than what was realized in the pre-liberalization regime with total output and profitability experiencing a negative growth. Since the growth of labour remained slightly positive in past few years, hence, the profits are being generated by using the labour and capital-oriented techniques. In order to further understand the sources of growth and their relation with trends in productivity across food processing industries along with the potential to gain from the reforms (if any), in accelerating productivity growth, the total factor productivity analysis is carried out in the next section.

SECTION IV**PRODUCTIVITY ANALYSIS OF FOOD PROCESSING INDUSTRIES**

Malmquist Productivity Index (MPI) is used to estimate the Total Factor Productivity Growth by means of DEA method as it does not require the exact specifications of any functional form for the underlying production function. The results of mean estimates (geometric means) of Malmquist indices and their decomposition into technical change and efficiency change for different food processing industries of India in the pre (1980-81 to 1990-91) and post-liberalization regime (1990-91 to 2015-16) are highlighted in table 3. It is evident from the table that in the pre-liberalization period, mean total factor productivity growth in the food processing industries remained 5.1 percent. Total factor productivity change can further be explained by the positive changes in both the technology (technical progress) as well as scale efficiencies (managed costs). However, the operational and management predicaments reflected by pure technical efficiency change remained unmanageable. Pertinently, technological progress played a vital role in bringing up the total factor productivity change in at least three out of six (scale efficiency spoiled the show in remaining three food processing industries) food processing industries in the pre-liberalization period. In contrast, during the post liberalization period, total factor productivity change has experienced an upward growth owing to increase in the technical change. Precisely, mean total factor productivity showed high growth in the food processing industries during post – liberalization period. Further, some of the industries could manage to capitalize on the technical or scale efficiencies individually. It is worth mentioning that mean technical change in the post liberalization period remained greater than one indicating better operational and management activities.

Table 3
Efficiency change across different food processing industries

ALL – INDIA	Pre-Liberalization Period (1980-81 to 1990-91)					Post-Liberalization Period (1990-91 to 2015-16)				
Industry	TEC	TC	PTEC	SEC	TFPCh	TEC	TC	PTEC	SEC	TFPCh
Slaughtering, preparation and preservation of meat	0.701	0.578	0.939	0.747	0.406	1.023	3.452	1.024	1	3.533
Manufacture of dairy products	0.869	0.568	1	0.869	0.493	0.7	2.87	0.731	0.957	2.009
Manufacture of grain mill products, starches and prepared animal feeds	0.741	0.501	0.952	0.778	0.371	0.8	2.441	0.998	0.802	1.954
Manufacture of other food products	0.926	0.582	1	0.926	0.539	0.793	2.585	1	0.793	2.051
Manufacture of beverages	1.22	0.599	1	1.22	0.731	1	4.115	1	1	4.115
Manufacture of tobacco and other tobacco products	1.166	0.567	1.164	1.002	0.661	1	2.147	1	1	2.147
Mean	0.917	0.565	1.007	0.911	0.518	0.877	2.865	0.953	0.921	2.512

Source: Authors' computations from supplement to Annual Survey of Industries for various years

Note: TEC is Technical Efficiency Change; TC is Technical Change; PTEC is Pure Technical Efficiency Change; SEC is Scale Efficiency Change, TFPCh is Total Factor Productivity Change

Convergence of labour productivity

The protagonists of liberalization and increasing privatization advocated that investment climate in the country in the post liberalization regime will improve automatically when all the states of the union will try to woo investment to catch up with the developed countries of the world. Once the economy was liberalized in the year 1990-91, buzzword labour market reforms started picking up. Scholars like Ray (2002), Kar and Sakthivel, (2004) Ark *et al* (2009) tried to measure the labour productivity convergence and found that across Indian states, labour productivity has not shown any inclination towards convergence. However, very few scholars have attempted to find out the labour productivity

convergence in the food processing industries in India. We tested for the labour productivity convergence across food processing industries in figures 1, 2, 3 and 4.

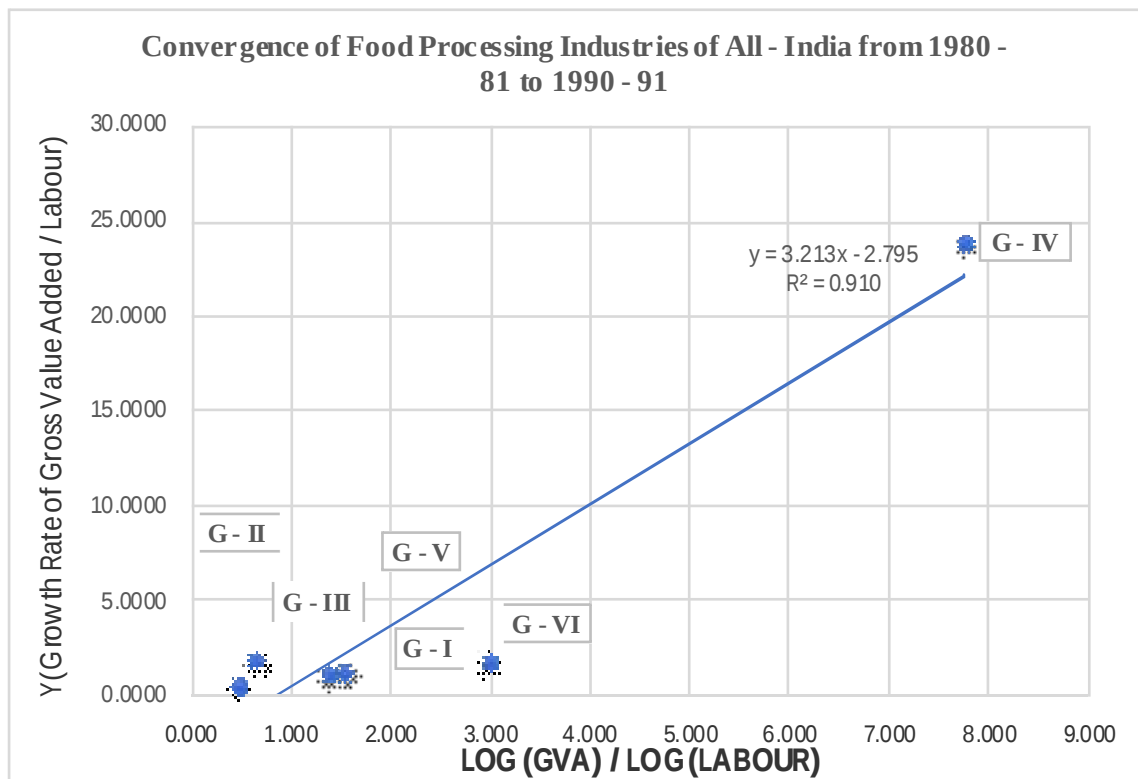


Figure 1
Convergence of Food Processing Industries of All - India from 1980 - 81 to 1990 - 91

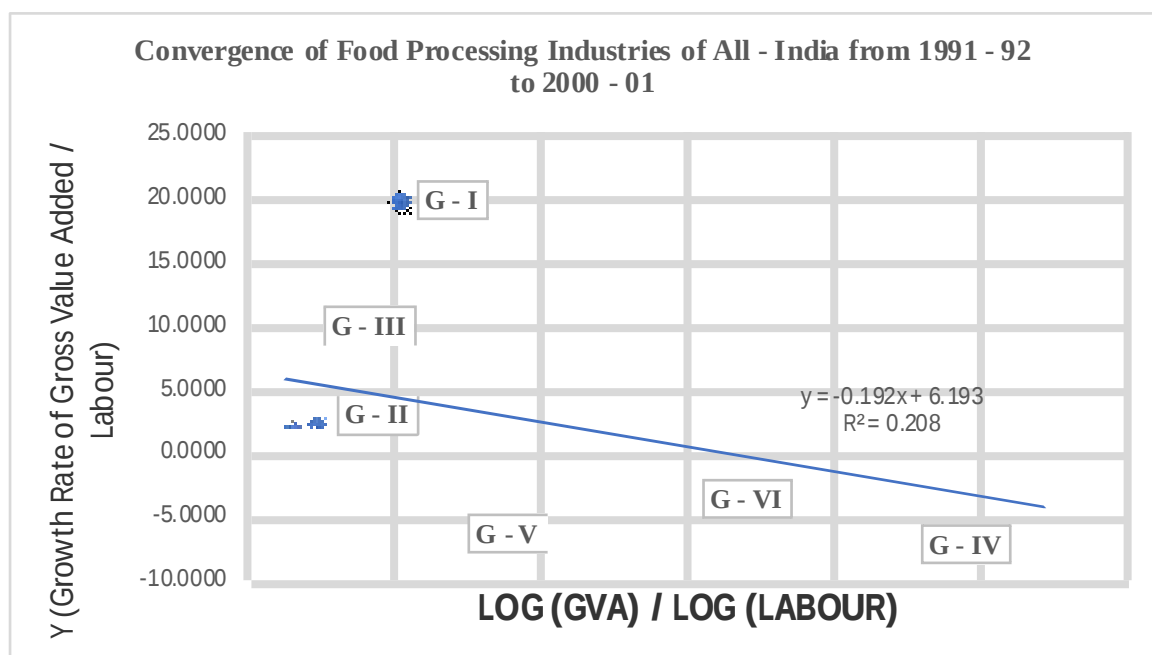


Figure 2

Convergence of Food Processing Industries of All - India from 1991 - 92 to 2000 - 01

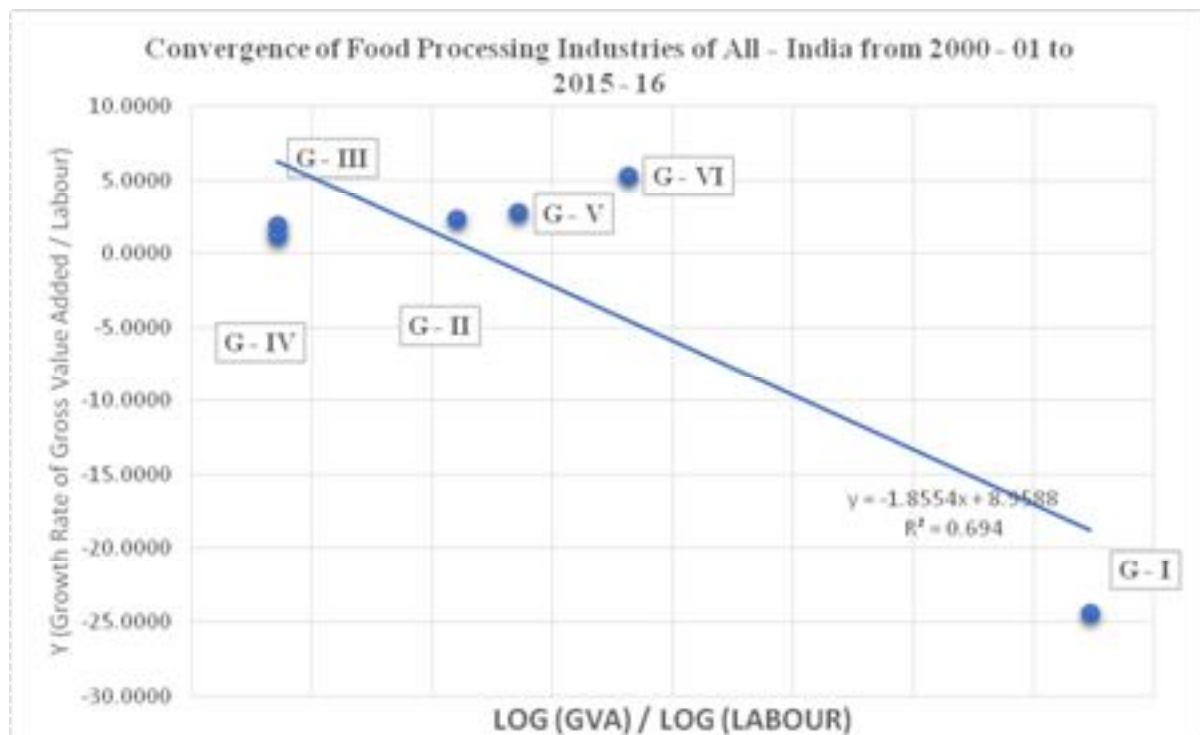


Figure 3

Convergence of Food Processing Industries of All - India from 2001 - 02 to 2015 - 16

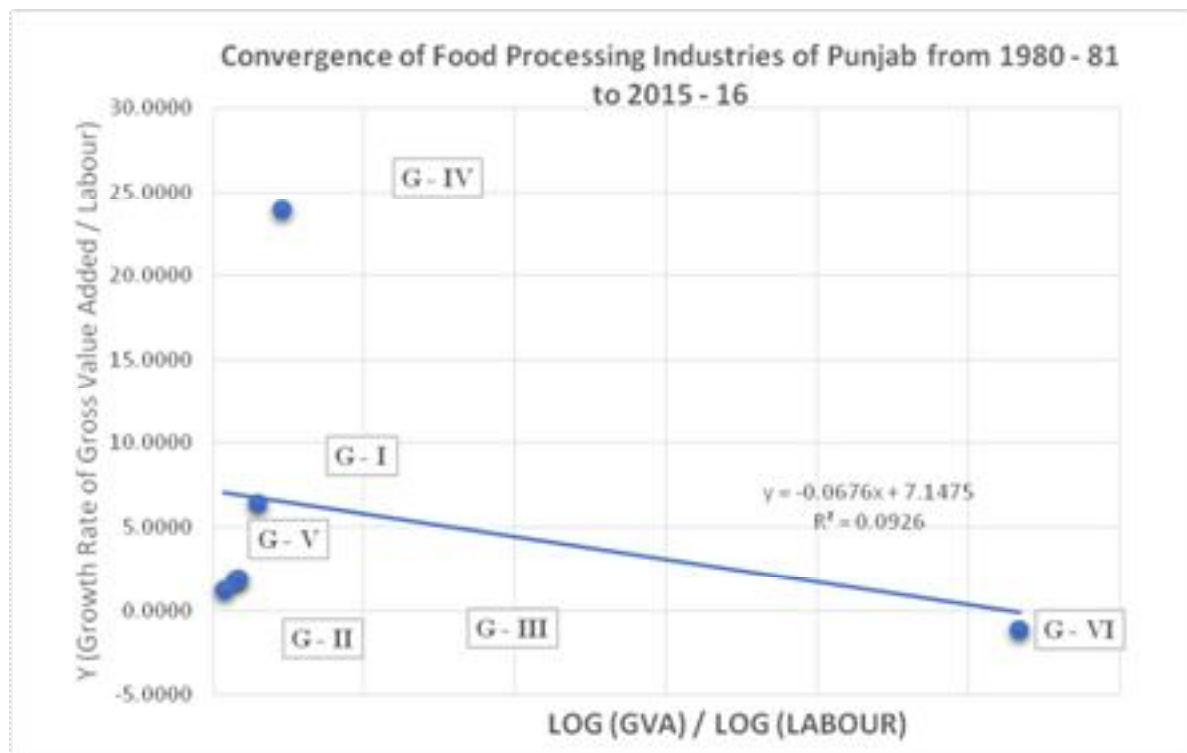


Figure 4

Convergence of Food Processing Industries of Punjab from 1980 - 81 to 2015 – 16

The results indicate that in the pre-liberalization era labour productivity across food processing industries had a tendency to converge and variation in labour productivity was not registered very high. However, the post-liberalization period has witnessed a tendency towards divergence of labour productivity across regions which further accentuated in the post-2000 period. If we discuss the case of Slaughtering, preparation and preservation of meat and Manufacture of grain mill products, starches and prepared animal feeds industries and tobacco industries, it becomes clear that fast growth in these industries has not led to any convergence. When the results are compared with the growth of output, invested capital and number of workers identified above, it can be seen that there is no sizeable increase in invested capital, rather in case of slaughtering, preparation and preservation of meat industry and tobacco growth in invested capital is negative. It connotes that increase in output is being achieved by decreasing the number of workers. The route to labour market reforms in this fashion needs a fresh relook particularly when we know that there is mass unemployment in the economy.

SECTION V**CONCLUSIONS**

Green revolution of 60s started showing its ill effects subsequently wherein the beneficiary states started witnessing slow growth in productivity of agriculture due to depleting water table as well as increasing soil salinity and micro-nutrient deficiencies accompanied by rising costs of production thereby leading to stagnating income of the farmers. Farmers borrowed money year after year, yet they were not able to clear their loans because the proceeds from agricultural produce failed to commensurate with the amount to be returned. Accordingly, the indebtedness among the farmers and suicides in the farm sector started increasing. In order to circumvent this stigma, policymakers are putting emphasis on shifting the direction of agriculture towards high value agricultural commodities such as fruits and vegetables, milk and milk products, meat, eggs, fish and processed food products from the stereotyped wheat and rice monoculture. Also, consumers are demanding better, safer and convenient food products for which they are even willing to pay a higher price. It calls for giving stimulus to the food processing industries. Since Punjab's agriculture is plagued by inherent problems economists are strongly advocating the case for developing food processing industries in the state on war footing basis. This study has tried to find out the growth and productivity of food processing industries in the state. Secondary data taken

from various issues of Annual Survey of Industries (ASI) published by the Central Statistical Organization, Ministry of Planning, Department of Statistics, Government of India for different years remained the basis for analysis. The results indicate that the momentum gained by the food processing industries in terms of its share in overall manufacturing sector 1980–81 to 1990–91 lost its steam in the next decade and picked up later. Further, the growth of food processing industries remained less than what was realized in the pre-liberalization regime with total output and profitability experiencing a negative growth. Malmquist Productivity Index (MPI) is used to estimate the Total Factor Productivity Growth by means of DEA method. Results indicate that in the pre-liberalization period, mean total factor productivity growth in the food processing industries attained a positive growth owing to technical progress as well as managed costs. However, during the post liberalization period, total factor productivity change experienced a decline owing to decrease in both the technical as well as scale efficiencies. Results further express that labour productivity across food processing industries has not shown much inclination towards convergence in the post–2000 period. It implicitly connotes that increase in output is being achieved by decreasing the number of workers which is not in the interest of the economy that is facing huge unemployment.

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ANNEXURE – I

	NIC 1987	NIC 1998	NIC 2004	NIC 2008
Group I	200+202+203+210+211+212	200+202+203+210+211+212	151	101+102+103+104
Group II	201	201	152	105
Group III	204+217	204+217	153	106+108
Group IV	205+206+207+208+209+213+214+ 215+218+219	205+206+207+208+209+213+214+215 +218+219	154	107
Group V	216+220+221+222+223+224	216+220+221+222+223+224	155	110
Group VI	225+226+227+228+229	225+226+227+228+229	160	120