

## Productivity in Private and Public Food Industries of Iran

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**Abstract:** One of Iran's most important industries is food industries that has a large effect on Iranian economy. The number of public food industries has decreased from 246 units in 1995 to 127 units in 2006. On the other hand the number of private food industries has increased from 1636 units in 1995 to 2077 units in 2006. Due to these changes in ownership this paper examined the labor productivity and total productivity in private and public food industries of Iran in 1995-2006 period. The results show that, unlike the normal theory where the private sector is always better, labor productivity and total factor productivity in public sectors of food industries were higher than private sectors industries over the period. The main responses for this inconsistency are due to higher wages, higher capital per worker and lower women employees in public sector against private sectors of food industries.

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### 1. Introduction

Food processing plays an important role in economic development. It can provide new outlets for agricultural output, raising the income of farmers, who tend to be poorer than non-farmers. The sector is sometimes involved in providing credit, seed, and technical assistance to producers in order to obtain higher-value crops. Furthermore, food processing generates employment, more so than many other manufacturing sectors because it is relatively labor-intensive. Since food processing plants are often located in rural areas, they create jobs for rural households, where poverty is often concentrated. Finally, the food processing sector can play a role in improving nutrition through fortification and the supply of foods with longer shelf-life (2002). As a result, this industry is one of the largest industries in Iran. Based on the 2006 reports by the Statistical Centre of Iran (SCI), the sector is ranked first in terms of employment (18 percent). Moreover, in terms of value-added, it is ranked third (16 percent).

In addition, the development of these industries would increase the demand for agricultural products in food processing and reduce the level of waste. The importance equally lies in identifying the strength and the weakness of the food industry in presenting scientific solutions to researchers. It will also assist economic policymakers to reach their program goals quickly. Briefly, the importance of food industries is due to three important factors; 1) Priority of the Non-oil Exports in Foreign Trade, 2) Respond to Nutrition of population, 3) Prevention of Wastage. Over the last two decades the government has encouraged the expansion of agro-industries and food industries. One of the ways that has been chosen

by the government is industries' privatization. The policies emphasized on decreasing the public ownership in industries and encourage more private sectors ownership. According to these policies in recent years the number of public industries has decreased from 1101 in 1995 to 508 in 2006<sup>1</sup> and the number of public food industries has decreased from 246 units in 1995 to 127 units in 2006. Also the number of private food industries has increased from 1636 units in 1995 to 2077 units in 2006 (SCI, 2007/2008). In theory, one of the aims for privatizations is to maximize the profit of firms. The increment of productivity is one of the ways that can increase the firms' profit. Now the question is, what are the differences between public and private food industries of Iran in terms of productivity? In other words, does the privatization lead to high productivity? This paper studied the labor productivity and total productivity in private and public food industries of Iran in 1995-2006 periods.

### 2. Literature review

The economic theory of productivity measurement goes back to the work of Jan Tinbergen (1942) and independently, to Robert Solow (1957). These studies formulated productivity measures in a production function context and linked them to the analysis of economic growth:

$$Y(t) = A(t) \cdot F[K(t), L(t)]$$

Where  $Y(t)$  stands for aggregate production (or aggregate income),  $K(t)$  is the stock of physical capital used in production,  $L(t)$  is the amount of labor inputs and  $A(t)$  is the total factor productivity.

<sup>1</sup> Manufacturing with more 10 workers

International organizations of productivity (APO & OECD)<sup>2</sup> have attempted to present a practical guide for the measurement of productivity. Their attempt has been to compare economies in terms of productivity.

In recent years several attempts have been made to investigate and compare the productivity between private and public sectors of economic. However according to the neoclassic theory, the private sectors are more efficient than public sectors but empirical studies often find that the effect of ownership on firm productivity to be ambiguous. Studies done by Atkinson and Halvorsen (1986), Boardman and Vining (1989), Martin and Parker (1997, chapter 5), Krishnan (2000, 1986) and Yarrow (1986) suggest that there are cases that exist where private ownership does not lead to productivity gains or is even detrimental to productivity. On the other hand studies like Ram (1996), Corneoa and Robb (2003) and Schmitz Jr. and Teixeira (2008) showed that that privatization has increased productivity.

Due to the importance of food industries of Iran, this paper at first investigates the total productivity and labor productivity in private and public sectors of food industries and then analyzes the difference productivity in these two sectors.

### 3. Methodology

The objective of this paper is to investigate and compare the labor and total productivity in public and private food industries of Iran.

In the first stage of productivity measuring is to compute labor productivity in both private and public sectors of food industries based on the index below;

$$LP_V = \frac{V}{L} \quad (1)$$

Where:

$LP_V$  : is labor productivity based on added value.

V: is added value in fixed price<sup>3</sup>

L: is number of workforce

In the second stage, Kendrick's index will be applied to measure the total productivity levels in both private and public sectors (Kendrick, 1984).

#### Total factor productivity and Kendrick Index

The production function expresses an output as a function of the stock capital, employment, and a shift factor (t), time, where the latter proxies the effects of

productivity and technical progress. The subscript t also represents time.

$$Q_t = F(K_t, L_t, t) \quad (2)$$

Assume that the argument "t" is separable from K and L;

$$Q_t = A_t F(K_t, L_t) \quad (3)$$

This way,  $A_t$  is referred to as exogenous, disembodied, and Hicks-neutral technical progress and was measured by how output changes and time elapses with the input bundle held constant. Therefore, the notion of overall productivity can be reinterpreted as an index of all those factors other than labor and capital not explicitly accounted for but contributed to the generation of output.

$$A_t = \frac{Q_t}{F(K_t, L_t)} \quad (4)$$

### 3.1 Kendrick Index

Kendrick's index of total factor productivity for the case of value added as output, and two inputs can be written as:

$$A_t = \frac{V_t}{F(rK_t, wL_t)} \quad (5)$$

Where;

$A_t$  is the value of index in a given year,

$V_t$  is the added value;  $w$  and  $r$  denote the factor rewards of labor and capital respectively in the base year.

### 4. Data sources

Annual data on output, value added, capital and labor for the private and public sectors of food industries were compiled for the periods 1995–2006 from the *Annual Survey of Manufacturing Industries* published by the Statistical Centre of Iran. The variables were deflated by using price index of each group on the base year 1997 that was published by the Central Bank of Iran.

### 5. Empirical results

The levels of labor productivity between private and public sectors of food industries were obtained by using index (1) in the equations below;

$$LP_t^{private} = \frac{V_t^{private}}{L_t^{private}} \quad (6)$$

$$LP_t^{public} = \frac{V_t^{public}}{L_t^{public}} \quad (7)$$

The levels of total productivity between private and public sectors of food industries were obtained by using Kendrick Index in the equations below:

<sup>2</sup> Asian Productivity Organization (APO).

Organization for Economic Co-Operation and Development(OECD)

<sup>3</sup> Added value deflated by using price index related to industries that have been presented by central bank of Iran (CBI).

$$TFP_t^{private} = \frac{V_t^{private}}{INPUT_t^{private}} \quad (8)$$

$$TFP_t^{public} = \frac{V_t^{public}}{INPUT_t^{public}} \quad (9)$$

Where,  $TFP_t^{private}$  and  $TFP_t^{public}$  are total productivity,  $LP_t^{private}$  and  $LP_t^{public}$  are labor productivity,  $V_t^{private}$  and  $V_t^{public}$  are added value in terms of fix price (1997),  $L_t^{private}$  and  $L_t^{public}$  are number of workers and  $INPUT_t^{private}$  and  $INPUT_t^{public}$  are value which used input in the private and public food industry respectively. The levels of labor productivity and total productivity between private food industries and public food industries are summarized in Table (1).

Table (1) Labor and total productivity in private and public food industries

YEAR	TOTAL PRODUCTIVITY		LABOR PRODUCTIVITY	
	PRIVATE	PUBLIC	PRIVATE	PUBLIC
1995	0.493544	0.490416	26.60409	31.86285
1996	0.502194	0.476469	27.86451	33.04318
1997	0.556328	0.451104	34.27209	37.28131
1998	0.509412	0.466037	37.03178	40.95548
1999	0.523245	0.485313	34.69558	42.60307
2000	0.473541	0.466206	33.00469	38.89739
2001	0.468717	0.465687	30.85966	40.30671
2002	0.439507	0.56302	36.59408	52.32396
2003	0.423613	0.419512	34.28353	43.6104
2004	0.353915	0.501445	32.58854	49.69858
2005	0.416714	0.506108	38.12508	55.17463
2006	0.432194	0.505013	43.82133	49.67505

The results of this study indicate that the level of labor productivity in private sector of food industry

have been less than public sector in the overall periods of 1995-2006, see Table (1) and Figures (1).

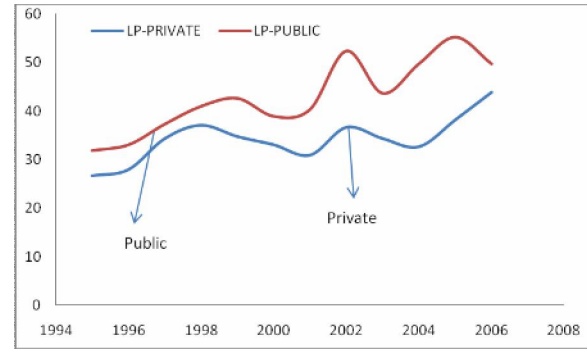


Figure (1) Labor productivity in private and public sectors of food industries

Also the total productivity in the private sector of food industry has been less than public sector at the latest years; see Table (1) and Figure (2).

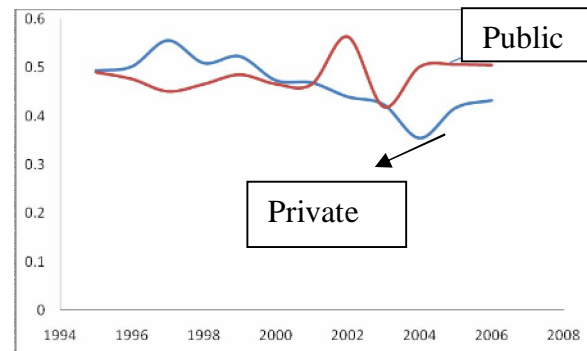


Figure (2) Total productivity in private and public sectors of food industries

This study aimed to research on the reasons for this inconsistency in the privatization in food industries. Several reasons have been found for this problem; one of the findings was that the average wages in public sectors were more than private sectors in food industries, Table (2) and Figure (3) show that it is existent in the target periods. According to empirical evidences related to *efficiency wage models*<sup>4</sup> for example Stiglitz (1986), Levine (1992) and Abbas and Zaman (2005) found that the wages are related to labor productivity. In other words when there is an increase in the workers' wage then it will lead to an

<sup>4</sup> In the efficiency wage model, a firm may be willing to pay its workers a real wage that is higher than the wage that would be competitively determined, because this induces the firms employees to work harder .

increase in their productivity. Therefore this model (efficiency wage model; a worker's effort increases with the wage he or she receives) may be consistent with food industries of Iran that the researchers need to study it.

Table (2) The average real wages in private and public food industries

YEAR	AVRAGE REAL WAGE-FOOD	
	PRIVATE	PUBLIC
1995	6.430424	9.640199
1996	6.794909	10.51704
1997	8.449847	12.56129
1998	9.421533	13.97087
1999	8.311943	13.16719
2000	8.409587	13.78154
2001	9.408525	12.79492
2002	9.715624	15.71631
2003	9.676681	14.40667
2004	10.2673	16.30848
2005	10.98688	15.63313
2006	12.19288	17.26739

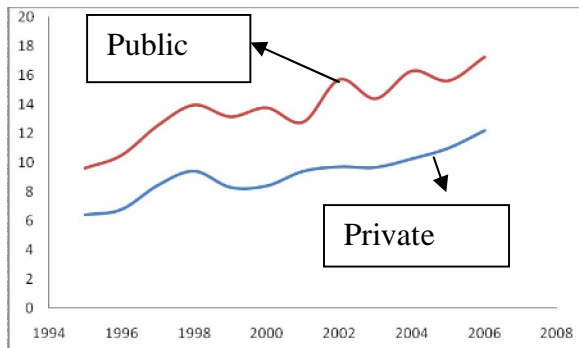


Figure (3) The average real wages in private and public food industries

Another reason for the existence of low productivity in private sector against public sector is low capital per worker in private sector vs public sector. Also the ratio of women to total workers in private sector is more than the ratio of women to total workers in public sector; see Table (3) and Figures (4 & 5). As Table (3) and Figures (4 & 5) show in the earlier period the ratio of capital per worker in private sector was more than public sector but the trend of ratio of capital per worker in private sector went downwards and in the later years it has been less than public

sector. This matter can be the reason for low total productivity in the later years.

Table (3) The ratio of women to total workers and the capital per worker in private and public food industries.

Table (4) The ratio of women to total workers in private and public food industries

YEAR	Ratio of Women to Total Workers		Ratio of Capital Per Worker	
	PRIVATE	PUBLIC	PRIVATE	PUBLIC
1995	0.119861	0.035395	84.22441	113.7704
1996	0.11459	0.035366	71.6858	103.1611
1997	0.104823	0.032807	64.57103	102.8042
1998	0.109117	0.037839	63.10074	96.51353
1999	0.116535	0.045166	50.43221	79.75551
2000	0.119787	0.030641	42.71445	74.62309
2001	0.118715	0.048281	38.86416	69.62781
2002	0.117817	0.022032	31.73403	78.59828
2003	0.13316	0.037139	29.24891	81.7485
2004	0.145418	0.027629	30.70274	97.22351
2005	0.145674	0.029516	31.51425	110.7223
2006	0.151645	0.028544	35.05036	160.9383

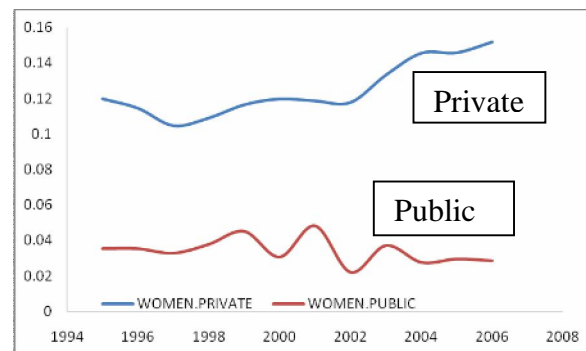
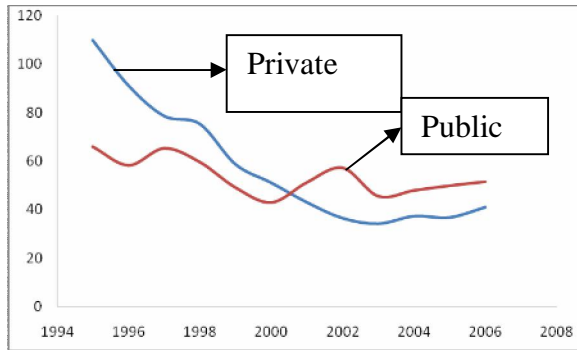


Table (5) The ratio of capital per worker in private and public food industries



Lastly, another reason for having low productivity in private sector of food industries is that the ratio of women workers in private sector was higher than public sector. According to empirical evidences female employees 'productivity are generally less than male employees' (Verner, 2000), (Crepon, Deniau, & Perez-Duarte, 2002), (Kawaguchi, 2003) and (Liqin & Xiao, 2006)

### Conclusion

The government has over the last two decades encouraged the expansion of agro-industries and food industries. One of the ways that has been chosen by the government to expand agro-industries and food-industries is through industries' privatization. The policies emphasized a decrease in public ownership in the industries and encouraged a proliferation of private sectors. According to these policies in recent years the number of public industries has decreased from 1101 in 1995 to 508 in 2006 (sic)<sup>5</sup> and the number of public food industries has decreased from 246 units in 1995 to 127 units in 2006. Also the number of private food industries has increased from 1636 units in 1995 to 2077 units in 2006. Regarding these changes in ownership this paper examined the labor productivity and total productivity in private and public food industries of Iran in 1995-2006 periods. Unlike the classic theory, the results showed that labor productivity and total factor productivity in public sectors of food industries were higher than private sectors of food industries over the target period. The main reasons for this inconsistency have been higher wage, higher capital per worker and low women employees in public sector against private sectors of food industries.

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<sup>5</sup> Manufacturing with more than 10 workers

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