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EXPORT-LED VERSUS IMPORT SUBSTITUTION INDUSTRIES: THE FOOD INDUSTRY IN JORDAN

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Working Paper 0128

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Abstract

Many analysts believe that export-led policies improve technical efficiency. This is the main focus of export-oriented economists, who argue that participation in export markets brings industries into contact with international best practice and fosters learning and productivity growth. In support of this argument, many empirical studies have concluded that export-oriented industries (EXOI) are more efficient than import substitution industries (IS). The rationale for this is the fact that under the IS strategy, firms are normally protected by tariffs and quotas, and tend to be inefficient because of the lack of competition and economies of scale. However, very few studies have answered the question of whether exporting brings about efficiency gains. Plausible arguments can be made for causality to flow in the opposite direction: relatively more efficient plants are self -selected into export markets because the returns brought about by doing so are relatively high, depending on the exchange rate, and hence the degree of protection overall. In this study we investigate the impact of trade orientation on the productivity level by focusing on the case of the food industries in Jordan. We base our analysis on fieldwork conducted for the purpose of this study. Our main conclusion is that the economic process in export-oriented and import-substitution industries is similar when we divide our data according to trade orientation into two groups. We observe some differences in the structure, the size and the factor intensity, and even in the estimated TFP between the EXOFs and the ISFs. However, we cannot formally confirm that the two groups of industries are significantly different.

1.1 Introduction

Many analysts believe that export-led policies improve technical efficiency. This is the main focus of export-oriented economists, who argue that participation in export markets brings industries into contact with international best practice and fosters learning and productivity growth. In support of this argument, many empirical studies have concluded that export-oriented industries (EXOI) are more efficient than import substitution industries (IS). The rationale for this is the fact that under the IS strategy, firms are normally protected by tariffs and quotas, and tend to be inefficient because of the lack of competition and economies of scale.

However, very few studies have answered the question of whether exporting brings about efficiency gains. Plausible arguments can be made for causality to flow in the opposite direction: relatively more efficient plants are self -selected into export markets because the returns brought about by doing so are relatively high, depending on the exchange rate and hence the degree of protection in general.

Studies that attempt to distinguish between EXOI and IS industries within countries may be classified into two main groups. Those of the first group, based either on time series or cross-section data, tend to estimate a frontier production based on Farrel's (1957) definition of productivity. According to this methodology, researchers normally estimate a stochastic production frontier as a first step. Then an analysis is carried out to measure the deviation of different firms' or industries' production function from the best practice[1]. Examples of such studies include (Abdulai et al. (2000), Chen et al. (1987), Haddad (1993), Pack (1984) and Pitt (1981)).

The second group of studies employs different versions of the C-D production function - standard or translog- in order to estimate the elasticity of output with respect to the different inputs. The estimated coefficients are then used to approximate economies of scale and TFP. Normally coefficients are estimated for different groups of industries according to their trade orientation before being compared with each other in order to determine differences in productivity and economies of scale (Bahrdan 1973, Banerji 1974, B.Y.Aw et al.1995, Sjöholm 1999). This study follows the second group of studies, and its objective is to test the hypothesis that export-oriented firms are exhibiting higher productive efficiency than IS firms. Under this methodology the C-D production function is specified in a flexible functional form so that there are no restrictions on returns to scale, or elasticities of substitution pre-imposed. The C-D production function, with its implicit assumptions will allow us to quantify the role of input level differences and returns to scale coefficients, as distinguished from differences in the productivity of the input and technical efficiency. In addition, some attributes of a firm that might affect its technical efficiency or returns to scale, notably size and age, can also be incorporated into the analysis without affecting its functional form.

The organization of this study will be as follows; in the next section we will review the main features of the trade policies pertaining to the food industry in Jordan. In section three we will present the empirical model and the main arguments that link between exports and efficiency. Section four will present our data along with some descriptive analysis. In section five and six we will discuss the empirical findings and their interpretation. Section seven deals with factor share and marginal productivity of labor and capital from a neo-classical perspective followed in section seven by concluding remarks.

1.2 Trade Policies and the Food Industries

Until early 1984, Jordan had very few Quantitative Restrictions (QRs) on its imports. Those that existed consisted mainly of restrictions on imports of major agricultural commodities such as wheat, sugar and other similar products which are major inputs for many firms in the food processing sector. In addition, there were market sharing arrangements for some products, whereby their producers were required to obtain 50 percent of their intermediate requirements from the domestic market and a market share of 30 percent was reserved for those products (WB 1988: 17).

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[1] In this context Tybout (1998: 16) argues that 'frontier' production technology is defined as the maximum amount of output, y*, attainable from a given input bundle, x: $Y^*=f(x)$. Then for observed combinations of output and inputs at the i^{th} plant (yi, xi), the ratio yi/ f(x) is interpreted either as an efficiency index itself, or as an efficiency index estimated by measurement error and transitory shocks beyond the control of plant managers. These two approaches are known as the 'deterministic frontier' and "stochastic frontier" approach, respectively.

From the year 1985, in response to an adverse economic recession in the region, the government employed more QRs. Thirty two manufactured goods were protected by introducing QRs, of which 15 could be classified as food commodities. A comparison of the list of these commodities and the type of firms surveyed in our fieldwork implies that more than 50 percent of the food processing industries were highly protected during some stage, either by QRs or other measures ranging from tariffs to import licensing to bureaucratic measures such as health inspection and safety checks[2]. The effective rate of protection in the food, beverage and tobacco industries was estimated at 10, 153 and 206 percent respectively by 1987.

In 1988, the year when Jordan started its first adjustment program, 93 percent of gross output of food was sold in the domestic market with only 7 percent being exported, compared to an average of 18 percent for the manufacturing sector. By 1996, the ratio of food exports had increased to a level of nearly 18 percent with the remainder consumed domestically, compared to a ratio of 27 percent for the manufacturing sector. Apparently there was reasonable growth in the export share, especially in vegetables, animal oils and fats, and in processed and preserved meat. Exports, measured as a share of gross output, averaged nearly 10 percent over the period 1987-96. This ratio will be used to divide our sample between export-oriented and import-substitution firms later in this study.

1.3 The Empirical Model and the Main Hypotheses

The study will estimate a C-D form of the production function. Through this function, one can estimate returns to scale as well as differences in TFP between EXOI and IS firms. Banerji (1974: 215) argues that estimating the coefficient and determining returns to scale in a typical C-D production function is not quite accurate. Increasing returns to scale means that a proportional expansion of all inputs leads to an expansion of output by a greater proportion. This relationship holds at an instant of time and applies only to a situation in which the character of inputs does not change. This is very different from the conditions that prevail when the analysis is conducted at the aggregate level of time series data. Both of these criticisms are remote in our case because we are dealing with data at the firm level, not at the aggregate level. In addition, we are dealing with a cross-section sample, i.e. the characters of inputs do not change over time though they might vary across firms[3].

The aggregate C-D production function that will be used is:

$Y_i=A_i K^{\alpha}_i L^{\beta}_i$

where the variables Y, K and L denote value added, capital stock and labor respectively. The parameters α and ß denote the output elasticities with respect to capital and labor respectively, and the subscript i represents each individual firm.

For the purpose of the estimation we take the log of the C-D production function, hence we have:

$\text{Log } Y_i=\text{Log } A_i+ \alpha \text{ Log } K_i +ß\text{Log } L_i$

This form will allow us to add some additional explanatory variables which are assumed to be affecting TFP only, such as size or age or any other relevant dummy variable without affecting the functional form. In our estimation we will start by estimating the model with only labor and capital. We will then incorporate some additional explanatory variables to minimize the error term, *A*, in our case. *A* is assumed to capture efficiency differences between firms. The reason for this is that two firms could have the same input bundle or probably the same α and ß for a given industry (food in our case) and therefore use the same techniques, but the firm with the higher value of *A* would produce more than the other firm, for every combination of inputs. So *A* expresses the relative efficiency of combining the given inputs.

[2] Food commodities that were under QRs in 1986 were: milk and cream, cut flowers and buds, palm oil, macaroni and spaghetti, tomato paste, fruit juice, natural yeast, non-alcoholic preparations, ice *cont.* cream, mineral waters, flavored beverages, beers in containers, prepared forge, cigarettes and tobacco and salt. (WB 1988: 70)

[3] Limitations and the assumptions underlying the C-D production function have been extensively covered in the literature, see for example Nelson (1981) and more recently Felipe (1999).

The efficiency term is assumed to have two components[4]: $A_i = \mu_i + e_i$. The first component (μ_i) is a firm-specific effect pertaining to a firm's efficiency and management skills, fluctuations in capacity utilization, and returns to scale. The second component is a random disturbance reflecting the remaining noise across firms such as weather conditions, unpredicted political incidents, or any other variation in machine or labor performance. The two components are supposed to capture the TFP effect (Haddad 1993: 3).

According to Haddad (ibid.: 5), all errors (efficiency measures, in our case) are not observable to the econometrician. However, the first source of error may be observable to the managers. In this case, they will be correlated with the exogenous variables. It is from this source of bias that the OLS might produce biased coefficients.

In order to overcome the simultaneity problem, there is a need for a complete production and input decision model. However, it has been proposed that the single equation estimates can be legitimized by arguing that firms do not maximize profit by choosing the input level with a view to current output, but by the anticipated output with respect to inputs. That is, firms do not know the impact of the disturbance term when they select the level of inputs. Hebden (1983: 144) argues that this may be the case for instance where production function residuals may refer to the effect of variables such as weather; or (as in agricultural studies) the demand for inputs may depend on maximizing expected output and not actual output, so that the production function residuals affect actual output (the dependent variable in the production function) but not the level of inputs, since the latter depends on expected output. However, Tybout (1992) argues that factor demand equations are difficult to specify properly and are likely to introduce significant biases.

The simultaneity bias in labor will overestimate the coefficient of labor. If labor is endogenous, then an increase in the disturbance of the production function will increase value added. This in turn increases labor and hence will result in the overstatement of the estimated coefficients. Thus the disturbance of the production function and the regressor are positively correlated as argued by Haddad (1993: 26)[5].

The main focus of our empirical section is to test the hypothesis about the links between efficiency and trade orientation. It has been argued that EXOFs are more efficient than ISFs in developing countries. The arguments linking export-orientation positively with productivity are related to increasing returns to scale, or increasing returns to entrepreneurial effort with exposure to foreign competition. However, formal analysis of these arguments has shown that this positive relationship between export-orientation and productivity is far from being an obvious one.

The mechanism that underlies the hypothesized link between export-orientation and productivity is that export markets are more competitive and therefore afford firms less opportunity for the inefficient operation. (Nishimizu et al. 1984: 191).

EXOI are expected to generate higher productivity growth than IS as a result of greater capacity utilization in industries in which the minimum efficient size is large relative to domestic markets; greater horizontal specialization as each firm concentrates on a narrower range of products: increasing familiarity with and absorption of new technologies; greater learning by doing as this is a function of cumulative output and exports permit greater output in an industry; and the simulative effects of the need to achieve internationally competitive prices and quality. Krueger (1980: 291) has argued that exporters receive feedback from the external markets and thus they should be in a better position to adjust more quickly to external shocks or changes in tastes. However, one should note that these arguments are partial in nature since they treat export- and import-oriented firms as completely separate. If we combine both export-oriented and import-substitution firms, different possible scenarios will emerge on how trade liberalization influences productivity, as argued by Ocampo et al. (1998: 1538-40).

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[4] Normally it has been assumed that the 'error' (efficiency) term has three components. In addition to the two mentioned above, a time effect is normally included. This has been excluded in our model because we are dealing with cross-section data.

[5] We employed several methodologies that have been used in the literature to deal with this problem (endogeneity of labor). The findings suggest that we can proceed with the OLS estimation with some careful interpretation of the estimated coefficients. We have assumed throughout the analysis that capital is exogenous. For the economy of space results are not reported.

Tybout (1998) has noted that after nearly three decades of empirical work on exports and productivity, the basic question concerning whether exporters are more efficient because of the process of 'self selection' or whether they have become more efficient since they became involved in the foreign markets is still a valid one without a firm answer. In other words, the controversy surrounding the causality between exports and productivity has never been resolved. In general, results have pointed to a positive but not a robust relationship between export performance and economic growth.

1.4 The Data[6]:

The data was obtained from fieldwork conducted for the purpose of this study. The survey covered nearly 70 firms, of which 50 firms operate in the food, beverage and tobacco industries. We excluded 10 of the 50 firms because of incomplete observation on capital and cost structure, leaving us with 40 firms to be investigated.

Firms were classified into two main groups: the first one comprises export-oriented firms, and the second comprises import-substitution firms. The first group consists of all the firms involved in the export market with at least 10 percent or more of their products being sold in external markets[7]. The second group comprises firms that exclusively serve domestic markets and have never been involved in export markets.

1.4.1 Factor Inputs

Capital is available at book value. Our survey contains information on the utilization rate of machines by firms. Therefore we are able to get a more accurate estimate of each firm's level of capital stock by accounting for capacity utilization rate, which is defined as the ratio of realized output to feasible output, the latter being defined as the maximum output that can be produced given that there is enough demand, i.e. no demand constraints on production[8]. Gross capital comprises land, machinery and transport equipment plus other assets such as furniture.

[6] Table A.1 contains the main variables that have been used in our estimation.

[7] Firms that were involved in exporting and did not make any exports during the year when the survey was conducted have been classified as export-oriented with their average exports to gross sales over the last three years, rather than the current year's exports, considered as their export share.

The use of gross capital versus net capital has been justified in developing countries because capital stock is more often used at approximately constant levels of efficiency for periods far beyond the accounting life measured by normal depreciation until it is eventually discarded or scrapped (Banerji 1974: 214).

The labor factor was estimated to capture the level of skills embodied in this factor in the following way. First, the number of hours worked in each firm was multiplied by the number of employees. Second, the monthly wage level for each labor group (skilled, unskilled and management) was multiplied by the number of employees in each firm for each category in order to estimate the total wage bill incurred by each firm. Finally, the figures obtained in the first step were multiplied by the share of each labor group of each firm's wage bill which had been obtained in the second step[9]. The outcome of this was considered in our estimation to represent labor inputs, which is a weighted sum of labor type with different skills or training.

Overall the data we are using is undoubtedly imperfect since both labor and capital are measured in terms of stock and not the service provided as argued by Chen et al. (1987: 282).

1.4.2 Descriptive Tables

Table 7.3 below provides a summary of the average characteristics of the food industry in Jordan as outlined in our survey for export oriented firms (EXOFs) and import substitution firms (ISFs).

[8] This definition has been adopted since all the surveyed firms reported that they are not working at full capacity utilization. They claimed that they are not doing so due to inadequate demand and not because of technical problems or any other reasons.

[9] The three steps described above correspond to the following equation:

L=(Number of Hours*Number of Employees)*$((W_s/W_i+W_{un})/(W_i+W_m/W_i))$. Where, L denotes labor factor, W_s, W_{un} and W_m are total wage paid for skilled, unskilled and management respectively. W_i is the total wage bill incurred by each firm which is equal to $(W_s+W_{un}+W_m)$* Number of employees in each firm.

By all measures of size (VA or employment), the EXOFs are larger than ISFs and the difference was statistically significant. Exporting firms are also more capital-intensive and younger than ISFs. The average capital/labor ratio among exporters is approximately 1.7 times higher than that among ISFs and the difference is significant at the 90 percent level (10 percent level of significance but 90 percent confidence interval???). Given the relatively more capital-intensive nature of the export-oriented firms, labor productivity (LP) in this group was found to be higher on average than in the ISFs industries. LP in EXOFs averaged about JD 12850, compared with JD 9568 for ISFs; that is equivalent to 1.34 times higher. However this difference was not statistically different and therefore cannot be considered as an indicator of productivity difference.

Exporting firms seem to be larger, and more capital intensive. These characteristics are consistent with what prevails in many developing countries. Berry et al. (1992) have argued that in a typical developing country, there is evidence that manufactured exports come mainly from firms that are both large and capital intensive by the standard of the country. Apparently this does not conform to the basic comparative advantage. Conventional Hecksher-Ohlin comparative advantage theory associates the ability to compete in world markets with the interaction between commodity production characteristics, i.e. the technical requirements of production as represented by factor combinations, and national attributes. A country is expected to have a comparative advantage and be competitive in the production of goods which intensively utilize its relatively abundant resources or productive factors. (National attributes include skills, technology and technological sophistication).

1.5 Empirical Findings [10]:

In this section we will report the results of the regression analysis obtained based on the OLS method.[11] In cross-section analysis, productivity difference between the two groups of firms is reflected in both the intercept and slope coefficients of the production functions. The former (intercept) is conventionally referred to in the literature as differences in TFP. If exporters are more productive than non-exporting firms then their estimated production technology should show a higher intercept term, or higher average slope coefficients, which also represent the returns to scale, as argued by B-Y (1995).

Table 1.2 depicts the first round of estimation with all the firms included. The elasticity of output with respect to labor at 0.54, is greater than that for capital, which is estimated at 0.43.

High coefficients for labor could be explained by the fact that labor is easier to adjust relative to the output level than is capital, which once installed, is difficult to remove or be re-adjusted at no cost. There will be a sunk cost associated with any reduction of the capital level. In addition, the accuracy with which capital is estimated in the developing countries normally casts doubt on the results obtained from such analysis.

However, OLS might involve an upward bias in the estimated coefficients due to the simultaneity problem. In order to determine how significant this problem is, we ran several regressions under different assumptions. First, we assumed that firms are operating at full capacity and accordingly re-estimated labor, capital and output to reflect a full-capacity scenario. This was done in order to determine how output and the other explanatory variables correlated under this hypothetical scenario. The estimated coefficients were as follows:

log Y= 4.03+ 0.45logK + 0.57logL, Adjusted R^2 = 0.90, Num. of observation=40

4.6 (0.87) 6.09 (0.079) 7.7 (0.084), T-ratios followed by the SE.

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[10] Due to the problem of heteroscedasticity associated normally with cross-section data, the ‘Park Test’ as described in Gujarati (1995: 369-371) was carried out on the data to make sure that the data does not suffer from this problem.

[11] In estimating the production function many studies have opted to employ a translog production function, which represents an extended form of the standard C-D production function. However, it should be noted that since the translog production function is a quadratic form of the C-D function, one has to a posteriori ensure that it is well behaved, i.e. that the output function is convex in relation to the different inputs. A scatter plot between the dependent and each one of the independent variables suggests that the relationship between the variables is a linear one. In order to confirm this further, we estimated the translog production coefficients. The estimated coefficients were insignificant, suggesting further that all the independent variables in the estimation are linearly correlated with the dependent variable.

Furthermore, following Haddad (1993: 29) we employed instrumental variables techniques by employing average wage rate[12] as an instrument for the labor variable, and we ran a regression using two stage least squares (2SLS), which is one of the most common methodologies to deal with the endogeneity problem. The results of the estimation suggest that we can proceed in our analysis using OLS with some careful interpretation of the estimated elasticities, because it was noticed that the coefficients of both labor and capital appear to be sensitive to the methodology used in the estimation.

1.5.1 Export-led Versus Import Substitution Industries

In order to account for the export variable in our regression we included a dummy variable which takes the value of 1 for exporting firms and 0 otherwise, to capture the impact of trade orientation. The estimated coefficient of the dummy variable was found to be insignificant, suggesting that efficiency is not significantly associated with the level of exports.

It should be noted that dummy variables help us determine if participation in international trade increases productivity growth. It is obviously a restrictive assumption that any involvement in international trade brings about the same influence on productivity growth regardless of the size of involvement and the characteristics of the served markets, i.e. competitive or non-competitive export destination.

Furthermore, in order to determine if there are structural differences between EXOFs and ISFs we included in our regression slope dummies for both capital and labor based on the firms' trade orientation. The following form of C-D production function was estimated:

$$\log Y_i = \text{Log } A_i + \alpha 1 \text{ Log}K_i + ß_1 \text{ Log } L_i + \lambda D_i + \alpha 2 \, D_i \text{Log}K_i + ß_2 D_i \text{Log}L_i$$

Y, K, L, α , and ß are the same as defined previously. λD_i denotes the intercept dummy and D_iK_i and D_iL_i denote the slope dummies for capital and labor respectively. The subscript i represents each firm in our fieldwork. Gujarati (1995: 513) summarizes the advantages of using slope dummies to test for parameters' stability. He argues that under this methodology, we can test for both the intercept and the slope differential for groups under investigation.

The estimated coefficients for slope dummies, as table 1.2 below depicts, were insignificant. This indicates that neither the intercepts nor the slopes of the two groups are statistically different. This finding suggests that there is no structural difference between EXOFs and the ISFs.

A similar conclusion was reached when we estimated a separate production function for each group and ran the 'Chow test'. We found that the estimated coefficients for both group are not statistically different, implying that within a well defined production function the operation of the two groups is not statistically different.

Overall, our findings suggest that the estimated coefficients of determination (R^2) are very high, explaining more than 87 percent of the changes in the dependent variable (value added). The estimated elasticities for both labor and capital were not very sensitive to the inclusion of some other variables in the regression.

An important factor that may explain the similarities in the coefficients of the two groups and has not been included in the analysis so far is the level of import penetration and its possible influence on productivity. Haddad (1993: 20) has argued that import penetration may be successful in enhancing productivity, as sheltered markets permit exploitation of economies of scale, or capacity utilization, or both. It is equally possible that if import penetration is overwhelming, then import substitution industries may not be able to face competition and therefore may quit the market. This implies that the remaining IS firms are the most efficient, and it is expected that they possess the same level of productivity as the export-oriented industries.

When Jordanian exporting firms lost their external markets, most of them did not penetrate into new markets. Instead, they turned back to the domestic market. The permissive nature of the domestic market which offers an outlet for these industries whenever they are faced with adversities in their 'secured' export markets might help us to understand this behavior. Unlike some East Asian countries, Jordan has never adopted restricted

[12] The Spearman correlation coefficient between our labor variable and average wage was estimated at 0.56 and found to be significant at 95 percent. Hence we proceeded by using wage rate as an instrumental variable.

policies that determined a minimum level of export in proportion to the level of output in return for subsidies or preferential treatment extended by the government. The inability to break into new markets contradicts one of the most important arguments of the export-oriented strategy which posits that export-oriented industries will have the ability to adjust to adverse external shocks by shifting from one market to another based on their competitiveness. It should be mentioned in this context that this last statement is based on the findings of our survey. It was observed that the exports of food and beverages over the last few years have not declined. Whether this occurred as a result of newcomers is not clear, nor is it clear whether old firms maintained or increased their level of exports to the same markets. However, no diversification in terms of export destinations was observed. Exports were concentrated in the Gulf markets, especially the Iraqi market.

In this context we can distinguish between two groups of exporters**.** The first one represents the majority of exporters and comprises exporters who have confined their exports to what in Jordan are normally described as ‘traditional markets’. The latter refers mainly to Arab markets. External markets in this group are perceived as an extension of the domestic market. The second group comprises firms that have managed to penetrate ‘non-traditional markets’ such as, Europe, the USA or Japan. In order to account for the nature of the export destinations in our regression we incorporated a dummy variable that took the value of 1 for exporting firms to non-traditional markets (four in our case) and zero elsewhere. The export dummy in this exercise was found to be significant, as depicted below. This suggests that efficiency in these particular firms is associated with export level. This might be true because this group of firms is competing in open and competitive markets. The estimated coefficients were as follow:

logY= 2.47 + 0.39logK + 0.53logL + 0.13Exports, R^2=0.89, Num. of observations=40

3.4 (0.71) 3.7 (0.09) 5.2 (0.12) 2.2(0.27), T-ratios followed by SE in parentheses.

The above result suggests that it does matter where and how firms participate in export markets. The estimated coefficients of this last regression are significantly different, as revealed by the ‘Chow test’, from what was estimated when we included all the firms in our regression.

Exports, measured as a share of total output, are not the best indicator of trade orientation in countries such as Jordan which have many bilateral trade agreements that encompass quantitative restrictions, as well as barter trade arrangements with most of the Arab countries. Furthermore, the estimated economies of scale in the last regression amounts to 1.05, and the estimated intercept was higher than what had been estimated earlier. This finding indicates that some exporting firms might be operating at a higher production frontier.

It is worth mentioning that this last result does not imply the direction of causality between export and efficiency. More efficient industries may have undergone self-selection in certain export markets.

1.6 Firms’ Attributes

1.6.1 The Size Effect

The importance of investigating size stems from the presumption that larger firms can exploit economies of scale and they will be, as a result, in a better position to penetrate export markets. One of the important hypotheses linking export with efficiency concerns potential gains that exporting firms can achieve through the extension of their markets, and hence exploiting economies of scale.

Our results suggest that firms in the food industry are operating at constant returns to scale. The sum of the labor and capital coefficients is nearly 1 in most cases. However, in order to test the hypothesis of constant returns to scale we imposed this assumption on our production function by dropping one of the independent variables and estimating the following C-D production function, which is normally referred to as the restricted production function:

Ln(Yi/Li) = α LnAi+ßLog(Ki/Li), results of this regression were as follow:

Ln(Y/L) = 1.99 + 0.49log(K/L), Adjusted R^2 =0.20, Num. of observation=40

4 (0.49) 3.5 (0.11), T- ratios with standard error in parentheses

The estimated coefficients were significant. However, the coefficient of determination has dropped substantially in this regression to a level of nearly 0.2 compared to 0.88 which was estimated in the unrestricted form, i.e., before we imposed the constant returns to scale assumption. Indeed the two regressions are not comparable because the dependent variables are not the same. In order to test the restriction that α +ß=1 we performed the residual form of the F-test[13]. The observed $F_{(0.05\ 37)}$ value of 5.47 with 37 degrees of freedom is significant at the 0.95 percent level, implying that we can reject the hypothesis that there are constant returns to scale in the food industry in Jordan. The observed estimates of scales are significantly different from unity.

The last result implies that we cannot simply rule out the possibility that larger firms are different in many aspects from small firms, though we could not formally confirm that all larger firms are technically more efficient than small ones. It seems that inter-firm variation in efficiency are considerable. The pooling of our data into two groups, either EXOFs and ISFs, or large and small firms is not adequate to reveal all the existing differences between the firms. In order to observe the difference in technical efficiency between small and large size firms, we included dummy variables for two different groups of firms in order to account for size differential. The first group contains small firms employing 50 employees or less. The second group contains firms employing more than 100 employees. The estimated coefficients were as follows:

LogY= 3.25 + 0.43logK + 0.43logL -0.14D, Firms employing <=50 employees, $R^2 = 0.88$

2.9(1.09) 4.1(0.09) 3.5(0.15) -1.7(0.22), T-ratio followed by SE in parentheses, Number of observation =12

LogY= 2.73 +0.37logK + 0.51logL + 0.11D, Firms employing > 100 employees, $R^2 =0.88$

2.8(0.97) 3.6(0.10) 4.8(0.13) 1.3(0.21), T-ratio followed by SE in parentheses, Number of observation =18

D denotes a dummy variable of size depending on the number of employees in each firm. The size dummy in small firms was found to be negative and significant, implying that efficiency is negatively associated with size in this small group. On the other hand, the size dummy in the large group holds a positive sign, though it was found to be statistically insignificant. This finding indicates that difference is more pronounced when we compare the largest group of firms with the smallest one.

Our results here suggest that there exist some differences of efficiency between small and large firms, though we could not detect the existence of increasing returns to scale in large firms. However, we also could not accept the hypothesis of constant returns to scale. This result indicates that exports may be correlated with higher firm-level productivity but the pattern is firm specific. There seem to be a wide dispersion in productivity between firms within the same size category due to differentials in technology, labor skill or organizational structure. Indeed, in the descriptive section above, we noted that deviation from the mean of the partial productivity measures such as labor productivity and capital output ratio was high.

In the literature, the association between export and a firm's size is not clear. For example, Berry et al. (1992: 69) argue that the contrast between the Taiwanese and Korean experiences highlights the fact that manufactured export can be pursued successfully mainly with reliance on quite large firms (the Korean case) or on relatively small ones (the Taiwanese case). This implies that the association between export and a firm's size is not resolved as to whether larger or smaller firms can export more. Indeed, in the food industry in Jordan, a positive and significant relationship between exports level and firm's size (number of employees) was observed. The Spearman correlation coefficient between the two variables was estimated at 0.34 and it was significant at 0.97 percent. This indicates that larger firms are more likely to be involved in export markets and they exhibit a higher level of productivity. This also suggests that perhaps exporting requires a minimum efficient scale, especially if the related commercial sector is not well developed as is the case in Jordan.

[13] F test as described in Mirer (1988: 280) is based on the following formula: $F=((RSS_r-RSS_u)/m)/((RSS_u/(n-k))$, where RSS_u denotes residual sum of squares for the restricted regression, RSS_u denotes residual sum of squares for the unrestricted regression, n denotes the number of observations, K the number of regressors in the unrestricted form, and m the number of linear restrictions (degrees of freedom in the numerator). (7.912-6.89)/(6.893*37)=5.47

1.6.2 Age Variable

The argument concerning age runs as follows**;** the older the firms, the more efficient they are. However, this does not indicate the direction of causation. The older firms may be more efficient because they learn from previous experience and will try to avoid the same mistakes. But it is equally possible that other older firms may have been eliminated in the course of struggling for competitive survival.

We have observed in the descriptive section above that ISFs are significantly different from EXOFs in their age. Hence, we ran a new regression by including the age variable, number of years in business, in our regression. The coefficient of age was insignificant when the regression includes all the firms. However, since the two groups are significantly different in terms of their age, we split the data set between EXOFs and ISFs to determine the importance of age for each group. The age variable in the ISFs group was found to be significant, indicating that the number of years in business is an important explanatory variable in this group. This comes as no surprise, since ISFs were the first to be established in the country. In this group, personal connection and historical relations are very important channels through which firms maintain their shares in the domestic market. On the other hand, the coefficient of age was insignificant for the export-oriented firms. This could be because involvement in the export market was not necessarily associated with the age of the concerned firms. It is possible that exporting firms have benefited from exogenous productivity enhancing factors favoring exports. These factors include new technology, government policies facilitating reaching new markets and so forth.

As a matter of fact, many relatively new firms have been established in Jordan and geared to serve demand in some external markets, especially regional ones. Some Jordanian exporters are young plants that were founded with their main purpose being to sell particular food products abroad. Jordanian economic policies during some periods provided various subsidies to exporters, such as a tax allowance drawback system. These measures may have allowed less efficient plants to compete even in the export markets[14]. Few firms in our survey confirm that they have been involved in exporting to Europe, the USA or the Japanese markets. Most exports are concentrated in the Arab and Gulf markets and quite recently in the Palestinian market.

Efficiency may also be related to foreign participation in firms' ownership. Foreign partners may introduce new technology and knowledge. Foreign firms are alleged to be more efficient than private domestic firms because of greater experience in management and superior organizational structure. On the other hand foreign firms may be inefficient, as argued by Pitt (1981: 49), because they operate in unfamiliar circumstances. However, in our sample, as is generally the case in the food manufacturing sector, very few firms have foreign participation; therefore, no additional explanatory variable was included to account for this variable.

To sum up, the observed scale estimates of the coefficients are generally plausible, and are similar to what has been estimated in other countries. For example, Tybout et al. (1991: 246) have estimated very similar coefficients for the food industry in Chile. In other countries, as reported by Roberts et al. (1996: 122), returns to scale in the food industries ranged between 0.96 and 1.07 in Mexico. Variations were dependent on methodology employed and explanatory variables included in the regression. For Norway, returns to scale in the food industry were estimated at 1.034 while that for Canada was 1.26. These results suggest that the estimated returns to scale in the food industry in Jordan are reasonable. Our estimates are similar to those estimated in Chile and Mexico and are lower than those for Norway and Canada.

The study finds that the returns to scale estimates were not very sensitive to the method used in the estimation of the coefficient. For example, employing a different methodology such as 2SLS or the full-capacity scenario has affected the magnitude of the estimated coefficients of labor and capital. However, the total returns to scale maintained almost the same level and evolved always around 1. The estimated labor coefficients were significantly higher than those that for capital.

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[14] In our case there are a few firms which were established in the east of Jordan to cut transportation costs with Iraq. There is some Iraqi participation in the capital of such firms.

A few studies have attempted to investigate returns to scale and productivity at a micro-level in Jordan. Khateeb et al. (1994) employed a generalized constant elasticity of substitution model to investigate TFP and economies of scale for 28 industrial firms in Jordan over the period 1985-1990. The study concluded that Jordanian large industrial firms are operating under increasing returns to scale. Bani Hani et al. (1989: 65) employed the C-D production function to investigate TFP in the industrial sector. The study found that firms in the manufacturing sector are operating under decreasing returns to scale, though the elasticity of output with respect to capital input was higher than that for labor. The differences in the magnitude of the coefficients as estimated here and in these studies may be attributed to differences in sample selection and dissimilar methodology adopted in estimating capital. While we concentrate here on the food industries, the two studies cited above covered a wider range of firms, ranging from cement to oil refinery and potash, which are very diversified.

1.7 Marginal Productivity and Factor Share

Under perfect competition assumptions in the neo-classical sense, i.e. equilibrium in labor and capital markets, we can investigate marginal productivity and the factor share in food industries in Jordan. In the C-D production function ($Y=AK^{\alpha} L^{\beta}$), marginal productivity of labor = $\partial Y/\partial L$ in general, which equals $(\partial/\partial L) * (AK^{\alpha} L^{\beta})$

$= ß (A K^{\alpha} L^{\beta-1})$

$= ß*(AK^{\alpha} L^{\beta}/L) = ß*(Y/L)$. Similarly, the marginal productivity of capital is $\partial Y/\partial K$ which for C-D functions $= \alpha*(Y/K)$.

$ß/\alpha$ = states that the ratio of L's and K's exponents in the C-D is equal to the ratio wL/rK, where wL denotes total wage bill, and rK = total payments to capital, so $ß/\alpha$ is equal to the ratio of factor shares in the value of total output.

In our estimation it is clear that the return on labor as estimated by the C-D function exceeds the factor share as estimated in our fieldwork. The elasticity of output with respect to labor inputs ranged from a level of 0.47 to a level of 0.56, depending on the adopted methodology and what explanatory variables were included in the regression. This is compared with a factor share of 0.33 percent. Meanwhile, the elasticity of output with respect to capital has ranged from a level of 0.40 to 0.47, compared with a factor share for capital of nearly 0.67 percent. It is clear that the capital factor share exceeds its estimated elasticity. This finding indicates that the marginal productivity of labor is much higher than that for capital. In addition, one can argue that the food industry is not operating at equilibrium conditions which should satisfy the condition that the value of:

MP(L)/value of MP(K) = (MC of L)/(MC of K), or relative marginal productivity of labor to marginal product of capital should equal the relative marginal cost of both input variables. This basically means that wage does not equal marginal productivity of labor and interest rate does not equal marginal productivity of capital.

Our finding suggests that the food industry in Jordan should employ more labor (more likely skilled labor) if it is to improve its competitiveness. Instead of installing new capital, it is economically and socially more beneficial to seek ways and means to utilize existing capital. In this context, it has been observed that the export share is positively correlated with higher labor productivity. The Spearman correlation between export share and labor productivity was found to be positive (0.64) and significant, suggesting that firms that exhibit a higher level of labor productivity, *inter alia*, are more likely to be involved in the export markets.

The above results imply as well that there may be considerable resource misallocation associated with commercial and industrial policy. It also suggests that greater allocative efficiency could be achieved by encouraging resources and new investments to be directed into more labor-intensive activities. The above result indicates as well an allocative inefficiency in the food industry which may result from failure to choose the most appropriate technology to conform to the available resources. Bruton (1967: 1115) concluded after studying the experience of some of the Latin American countries that the inappropriateness of the input mix of production was the result of under-valuation of foreign exchange interest rate and wage rate policies. On the one hand there was inappropriateness of the composition of output in the sense that productive activity was based on the incentives generated by protectionist policies made up to meet the balance of payments crisis.

Under such regimes it is more likely that the pattern of production will be divorced from the country's comparative advantage and the country's factor endowments. Another point worth highlighting in this context has more to do with the fact that most of the LDCs were dependent as a result of their openness on the industrialized countries to acquire their technology. Taylor (1991: 111-112) recalls a point made earlier by Perbich, who emphasized the fact that imported technology will conform to larger economy tastes for both consumer goods and capital goods. 'Northern' technology may prove too capital-intensive for southern countries leading to the LDCs 'structural technological heterogeneity'. This proposition could find some support in the fact that capacity utilization in the food industry as it emerged in our fieldwork was relatively low and was estimated at 0.61 percent.

According to Krueger (1978: 253), factor proportion tends to change after liberalization in favor of labor-intensive activities. However, this does not seem to be the case in Jordan, where we observe that the labor mix in the food industry has not changed over the period 1988-1996.

1.8 Conclusion

Our main conclusion is that the economic process in export-oriented and import-substitution industries is similar when we divide our data into two groups according to their trade orientation. We have observed some differences in the structure, the size and the factor intensity, and even in the estimated TFP between the EXOFs and the ISFs. However, we could not formally confirm that the two groups of industries are significantly different. Intercept and slope dummy coefficients were found to be insignificant, suggesting that the two groups of firms are not structurally different. We may require more variables and different methods to confirm this finding.

The nature of the export markets and the fact that EXOFs and ISFs have similar access to foreign technology and the accompanying high level of import penetration might partly explain why we could not trace a significant difference between the two groups. Our results suggest that there is a wide inter-firms productivity dispersion within each group. This could also explain why we could not observe significant differences between the different groups.

Differences in returns to scale were observed when we included a dummy variable for export destinations to capture the 'non-traditional markets' effect. The variable was found to be significant. This indicates that exports may be positively correlated with efficiency under certain conditions. It seems that government policies in their efforts to secure some export markets for Jordanian products have discouraged firms from seeking to penetrate more competitive markets, hence paving the way for the emergence of non-competitive export industries by targeting 'secured export' markets.

It seems that the food industry in Jordan operates at constant returns to scale. However, we could not formally accept this hypothesis. There seem to be firms that operate at increasing returns to scale, while there are some firms which operate under diminishing or constant returns to scale. Our estimates suggest that returns to scale are significantly different from unity. However, not much evidence emerged to support the hypothesis that many firms are operating at increasing returns to scales.

When we compare the largest group with the smallest group, the findings suggest that there are some differences at the two extremes, large and small, of our sample. Large firms seem to exhibit higher levels of efficiency and they are more likely to be involved in the export market. The size dummy for small firms was found to be negative causing returns to scale to decline as a result. A significant and positive correlation between export level and size was estimated. However, this finding should be treated with caution because the numbers of observations are relatively small.

The elasticity of output with respect to labor was higher than for capital, suggesting that manufacturers should concentrate on more labor-intensive industries while trying to fully utilize existing idle capacity.

The factor inputs' share and their estimated elasticities indicate that there is a disequilibrium in the factors market. This may be because labor is abundant and much cheaper than capital, which has to be imported at higher prices. Apparently, the correction should be maintained through more labor-intensive techniques. We perceive this as an indicator of the misallocation of resources.

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Table 1: Descriptive Indicators of the Food Industry

Variable		**Number of Observation**	**Mean**	**Standard Deviation**	**Standard Mean**	**T-Ratio***
Capital Labor	EXOFs	20	29135.41	13672.70	3057.40	-1.692 (0.10)
Ratio	ISFs	20	16877.57	7991.57	1786.90	
Capital Output	EXOFs	20	3.22	3.14	0.703	1.36
Ratio	ISFs	20	2.18	1.28	0.2862	-0.18
Value Added	EXOFs	20	2294336	3304241.70	738850.90	1.7 (0.094)
	ISFs	20	973792.7	940493.38	210300.71	
Labor	EXOFs	20	12850.91	8545.60	1910.85	1.34 (0.186)
Productivity	ISFs	20	9568.76	6768.24	1513.42	
Age	EXOFs	20	14.05	11.27	2.52	-1.692 (0.10)
	ISFs	20	21.5	16.14	3.61	
Employment	EXOFs	20	139.2	109.81	24.55	1.99
	ISFs	20	83.7	58.71	13.12	-0.053

* Numbers in parentheses are the significant ratios.
Source: Own estimates from fieldwork survey.

Table 2: Ordinary Least Square Method Results with Output as the Dependent Variable

Variable	**Regression 1**	**Regression 2**	**Regression 3**	**Regression4**
Intercept	1.82	1.95	2.16	1.84
	2.6 (0.69)*	2.8 (0.69)	2.3 (0.93)	1.87 (1.04)
Capital	0.437	0.4	0.4	0.48
	4.08 (0.096)	3.7 (0.096)	3.6 (0.097)	2.4 (0.18)
Labor	0.54	0.56	0.54	0.47
	5.5 (0.12)	5.2 (0.12)	4.6 (0.14)	2.6 (0.21)
Dummy	na	0.087	-0.09	0.026
Export level		1.5 (0.0.14)	0.18 (1.3)	0.9 (1.44)
Slope Dummy for	na	na	0.19	0.7
Labor (DiLogLi)			0.35 (0.13)	0.63 (0.27)
Slope Dummy for	Na	na	na	-0.65
Capital (DiLogKi)				0.33 (0.22)
Adjusted R^2	0.88	0.88	0.88	0.87
Economies of Scale	0.98	0.96	0.94	0.995
Num. Of Observations	40	40	40	40

Source: own estimates based on fieldwork findings; na: not applicable; * T -ratios and SE in parentheses

Appendix 1

A1.1 Endogeneity Problem in the C-D Production Function

The problem of simultaneous bias could be overcome by different methodologies. One of the most common approaches is to use the two stage least squares method (2SLS), whereby an instrumental variable (IV) is employed to reduce the bias in the estimated coefficients. IV should be a variable which is exogenous and therefore unrelated to the error term, but which at the same time may serve as a proxy for labor in our estimation. Following Haddad (1992), the average wage rate was used as a proxy for labor input, since firms' decisions to use labor and capital depend on the wage rate but the latter is not correlated with output. The average wage was found to be highly correlated with labor. The Spearman correlation coefficient was estimated at 0.56 and it was significant at 0.95 percent. Hence we proceeded by using average wage as an instrument for labor.

Meanwhile, capital is assumed to be exogenous. The result of the 2SLS for all firms was as follows:

Y= 6.6 + 0.65L + 0.32K R^2=0.83 A5.1

(6.2) (0.14) (5.09)(0.12) (1.8) (0.17), T-ratios followed by SE.

This result indicates that our original estimation is not biased upward and therefore we can proceed with the OLS estimation.

Furthermore, in order to determine how labor and output would correlate in a full capacity situation within the firm, we assumed hypothetically that all the firms were operating at full capacity. Consequently, we adjusted the level of output accordingly in order to reflect the full capacity. On the input side, the maximum number of workers employed by each firm was used to replace the current number of workers used in the original estimation, while capital stock was employed without being adjusted to the level of capacity utilization. The null hypothesis is that at full capacity we should have similar coefficients to the ones we obtained from our OLS. The estimated coefficient for this model has produced slightly different coefficients as follows:

Y= 4.03 + 0.56L + 0.45K Adjusted R^2 = 0.90

4.6(0.87) 7.7 (0.084) 6.09 (0.079) Num. of observation=40

T-ratios and standard errors in parentheses.

The magnitude of the coefficients has changed, with the capital coefficient increased, reflecting the full capacity utilization scenario. However, one should be cautious when interpreting the capital coefficient, since we assume that utilizing full capacity has not embodied any diminishing returns to capital. As the utilization of capital increases, one would expect the productivity of the machines to decline. Labor remains influential and exhibits the highest coefficient. However, returns to scale (the sum of the coefficients) is very similar to what was originally estimated, indicating that our estimation of the returns to scale is robust, though one has to be careful in interpreting the estimated elasticities of output with respect to labor and capital. The intercept estimated here is lower than the original estimation, implying that utilizing full capacity will reduce the effect of omitted variables.

With these results obtained by employing the 2SLS and the hypothetical scenario on full capacity, one can safely proceed with the OLS without worrying too much about the simultaneity problem.

One test for assessing the validity the instruments chosen is to compare estimates of the labor coefficient using OLS and instrumental variables. If the estimated coefficient is higher using instrumental variables, the instruments are invalid because the upward bias implicit in the OLS estimates is clearly not taken care of. Based on this argument it seems that the second scenario we employed is more reliable than the 2SLS.

1.2 The Food Industry In Jordan

Many developing countries emphasized production of consumer goods in the early stages of their development because this production was easy to start with and there was sufficient domestic demand to safeguard the operation of established plants. Based on the presumed linkages with agricultural sector output, it was believed that the result would be an integrated agro-industry that involved a maximum amount of exports and domestic business, and a minimum of imports. Such integration should have put domestic manufacturers in a stronger position to compete in world markets (UN, 1969: 19).

Food and beverages can be processed for the domestic market as substitutes for imports. Imported ingredients such as flour, fat, flavor concentrates and malt can be used in the production of baked goods, ice cream, soft drinks and other products. Processed foods using imported raw materials substitute for finished product imports, and their production creates employment and otherwise helps the economy. This was one among a few strong arguments that legitimized subsidizing the food industries in many developing countries.

The food industries (FI) in Jordan cover three main branches: 1) Food manufacturing, including preparation of any kind of meat, vegetable, crops, seeds and other derivatives; confectionery; dairy and poultry products; fodder and yeast. 2) Beverages, covering production of soft drinks, fruit juices and mineral water 3) Cigarettes and tobacco.

The food industries were some of the earliest industries to be established in Jordan. A large part of this sub-sector is geared to serve domestic demand. By the mid 1970s, it was the largest among the other sub-groups such as the chemical and the durable consumers goods industries. In 1975, it accounted for nearly 25 percent of the manufacturing output and accounted for nearly 36 percent of total employment in the manufacturing sector. By 1987 it accounted for nearly 19 percent of gross output and employed about 23 percent of total manufacturing sector employees, as table 2.1 below exhibits. Decline in the relative share of the food industries has resulted mainly due to the rapid growth in the share of other sub-groups such as chemicals and electrical machinery, which grew in real terms at rates of 37 and 60 percent respectively over the period 1975-85, compared with nearly 28 percent for the food and beverage industries. The food processing industries were dominated by dairy products, sweets and confectionery industries and bakery and grain mill products. These three divisions accounted for more than 50 percent of the food industry's output and employment by 1987. The situation had changed slightly by 1996, with the bakery industry, which is mainly domestically oriented, accounting for more than 30 and 50 percent of output and employment respectively. The relative importance of some industries having the potential to expand in external markets, such as confectionery (11 percent in 1987) and preserved fruits and vegetables (6 percent in 1987), had declined by 1996 to a level of only 3 percent for confectionery and 4 percent for preserved fruits and vegetables[15].

It can be seen from table 11 above that the share of the food, beverage and tobacco industries in proportion to gross output in the manufacturing sector increased from a level of 19 percent in 1987 to a level of 23 percent by 1996. Meanwhile, the percentage of employment in the food and beverage industries relative to the rest of the manufacturing sector dropped from a level of 23 percent in 1987 to a level of 20 percent in 1996. The decline in employment relative to the whole sector accompanied by the increase in output share suggests that there was an increase in labor productivity in the food industry relative to the rest of the manufacturing sector over the period under investigation.

The question that arises at this level concerns how representative our sample is of the whole population. In fact, the sample selection was meant to include as many EXOFs as possible in order to carry out a comparison between two distinct groups of firms based on their trade orientation. Hence, export in our sample would be higher than the average for the whole industry, as the table below exhibits. Table 1.2 below shows some descriptive statistics to provide an insight into how our sample compares with the whole population as reported in the survey conducted by the Department of Statistics (DOS).

The table 1.2 above reveals a great deal of similarity between major indicators in both the industrial survey that covers the whole sector and the sample we covered in our fieldwork. Differences in ratios that involve capital may be attributed to the different methods adopted in estimating capital and the time lag between our survey (in 2000) and the year when the DOS survey was conducted (1996).

[15] The selection of the years 1987 and 1996 was dictated by the fact that in 1987 Jordan started its first adjustment program while 1996 represents the last year for which data is available. The DOS was preparing to publish the 1997 industrial survey while I was conducting my fieldwork.

Table A1: The Food Industry in Jordan 1987-1996: Major Indicators JDs (000)

ISIC		1987 Gross Output	1987 Value Added	1987 Number of Employees	1987 Export Sales	1996 Gross Output	1996 Value Added	1996 Number of Employees	1996 Export Sales
15	**Manufacturing of Food products**	75769	18678	7411	4588	365729	66790	15845	65810
1511	Production, processing and preserving of meat products	0	0	27	0	27081	8889	1008	2622
1513	Processing and preserving of fruit and vegetables	4022	641	388	2226	15317	2104	713	4944
1514	Manufacture of vegetable and animal oils and fats	2004	933	552	214	82400	11445	1120	50152
1520	Manufacture of dairy products	10337	2560	674	0	40084	7781	2149	39
1531	Manufacture of grain mill products	20376	3514	576	107	65791	7468	711	0
1533	Manufacture of prepared animal feeds	9394	1098	149	1562	16563	1299	197	0
1541	Manufacture of bakery product	14318	4907	2727	200	85010	20675	8127	4758
1543	Manufacture of cocoa, chocolate and sugar confectionery	8456	2759	1495	206	8625	2108	642	224
1549	Manufacture of other food products	6862	2266	823	73	24858	5021	1178	1327
1551	Distilling, rectifying and blending of spirits	3643	2685		41	12193	7120	291	1735
1554	Manufacture of soft drinks	19951	11573	760	70	81705	38693	1917	9
16	Tobacco products	51415	39869	886	2795	127491	101958	1428	2067
	Total Food Beverage and Tobacco	150778	72805	9057	7494	587118	214561	19481	67877
	Manufacturing Sector	793221	325525	39291	143329	2520421	689957	98059	697209.6
	Food industry share of the total sector %	0.10	0.06	0.19	0.03	0.15	0.10	0.16	0.09
	Food and beverage share of the total sector%	0.13	0.10	0.21	0.03	0.18	0.16	0.18	0.10
	Food, beverage and tobacco share of the total sector %	0.19	0.22	0.23	0.05	0.23	0.31	0.20	0.10

Source: (DOS), Industrial Survey, 1987-1996.

Table A2: Descriptive Indicators of the Food and Beverage Industries in Jordan

	Value Added/ Gross output	KL ratio (JDs)	KO ratio	Labor Productivity (JDs)	Export/Output
Survey Results (a)	25.5 %	16076.45	2.06	11013.90	14.6%
Sample results (b)	30%	23006.5	2.70	11209.84	18%

Notes: * Kl: capital labor ratio, KO: capital output ratio.

Source: a) Industrial Survey, DOS. 1996; b) Own estimates from the fieldwork conducted for the purposes of this study; c) Table A5.2.1 in appendix 5 contain s the details.