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DOMESTIC MARKET STRUCTURE AND EXPORTS
IN A DEVELOPING COUNTRY

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ABSTRACT

This paper stylizes a special case of a domestic market structure commonly found in many Indian industries. In Stackelberg leader and follower framework, it shows, under certain behavioral assumptions, that within the strategic size group of large firms, relatively cost-efficient firms, who could be domestic market leaders are less export oriented than the relatively inefficient.

DOMESTIC MARKET STRUCTURE AND EXPORTS IN A DEVELOPING COUNTRY.

Recent developments in trade analysis in imperfect competition have resulted in a gamut of special theoretical models both in general and partial equilibrium framework. These models show that industrial organizational factors like domestic market power, scale economies and product differentiation (or income levels and income distribution) etc., could provide a basis for a country's trade or exports.[Krugman (1980), Lancaster (1980)] In this framework some of the theories have shown that the domestic imperfect market structure could itself be a major basis of exports. [Brander (1981), Brander and Krugman (1983)]. This could be true if the domestic market is protected from imports which provides possibility for price discrimination between the domestic and export markets.

This paper stylizes a special case of a duopolistic domestic market structure in order to examine the question of exports. The results derived on the basis of a theoretical model are examined empirically.

One of the prominent features of many Indian industries, especially the light engineering industries is that within specific (and broadly classified) industries, a few large and large number of geographically dispersed small firms co-exist producing broadly defined differentiated (but substitutable) products [Desai (1982)]. In this type of domestic market structure, the large and small firms can be viewed as different strategic size groups. The behavior of large firms might be mostly towards maximizing super-normal profits in the sheltered domestic markets. The major source of competition for large firms

would be only among themselves. The behavior of small firms, which face large group competition among themselves and also with the larger firms might be towards survival and expansion into larger size.

It is generally observed, in the inward-oriented India's industrial regime, that exports of manufactured goods had been basically a residual activity. However, in many industries, both large and small firms play a role in exports. For example in 1983/84, the small scale sector contributed to about 27.4 per cent of the total exports of the engineering industry. When the domestic and export markets are segmented through protection of the domestic market (and all the firms are price takers in world market), different firms might perceive the export market differently depending on their relative strategic position in the domestic market.

Using a Stackelberg leader and follower model, this paper shows that a firm which is a follower in the domestic market exports more than the dominant leader firm. It is argued that large firms ignore the small firms as long as the small firms' domestic market share remains small and none of the small firms attempt to grow into a large firm. In Section I, the theoretical model is derived. In Section II, some of the hypotheses that can be derived from the theory are tested empirically. Section III gives the concluding remarks.

I. The Model.

There are two firms - a large firm who acts as the leader and another firm who is the follower. The leader has lower costs. In addition, there are a large number of very small firms whose

output is given and who act as the competitive fringe. They are non-strategic players in the domestic market and take prices as given in the domestic market. The leader and follower are strategic players with full information.[1]

As mentioned earlier, the domestic and export markets are taken to be segmented through protection of the domestic industry.[2] Under the assumption of small country in the world market, firms can export as much as they desire at the given world price.

The leader is taken to know the market demand and also the costs of the follower firm. The leader large firm sets the domestic price and the corresponding level of his output where his profits are maximum.[3]

In the following we ignore the small firms, under the assumption that a minor share of the market is left to them and derive the results for the large firms. But it is necessary to take into notice that the small firms are also the follower firms in the domestic market.

Let 'X_3' be the output produced by the small non-strategic firms. The residual inverse market demand curve of the leader and the follower firms;

$$P = a - b (X) \quad \text{------------------} \quad (1).$$

P is the domestic market price, X is the total domestic sales of the industry, (net of the output of the competitive fringe).

$X = X_1 + X_2$

X_1 and X_2 are the sales of the leader and follower large firms, respectively.

Henceforth, the leader is referred to as firm (1) and the follower as firm (2).

$c_1(X_1)^2$ and $c_2(X_2)^2$ are the cost functions of the leader and follower firms.[4] `Pw` refers to the world price. `E1` and `E2` refer to the exports of the firms (1) and (2).   We take `c2` > `c1`.

The profit functions of the leader and the follower are;

$\pi_1 = PX_1 + PwE_1 - c_1(X_1+E_1)^2$ ------- (2)

$\pi_2 = PX_2 + PwE_2 - c_2(X_2+E_2)^2$ --------(3)

The first order derivatives of (2) and (3) with respect to exports are;

$\delta\pi_1/\delta E_1 = Pw - 2c_1(X_1+E_1)$ ---------(4)

$\delta\pi_2/\delta E_2 = Pw - 2c_2(X_2+E_2)$ ---------(5)

 By equating (4) and (5) to zero, we get,

 $E_1 = (Pw/2c_1) - X_1$ -------- (6)

 $E_2 = (Pw/2c_2) - X_2$ ----------(7)

    The follower takes `X1` as given and solves;

Max {$\pi_2 = (a - bX_1 - bX_2)X_2 - c_2(X_2+E_2)^2$ -------(8)

 $\delta\pi_2/\delta X_2 = a - bX_1 - 2bX_2 - 2c_2(X_2+E_2)$ -----(9)

 From (5), $X_2 + E_2 = Pw/2c_2$. By substituting this into (9) and equating it to zero we get,

 $X_2 = (a - bX_1 - Pw)/2b$ ------------ (10)

 (10) is the reaction function of firm `2` which is known to the leader. By substituting (1) into (2), the profit function of the leader, for `P` and substituting (10) for `X2` into (2) and equating it's first order derivative with respect to `X1`, to zero we get the equilibrium domestic sales of the leader, which is;

$X_1 = (a - Pw)/2b$ ------------(11)

By substituting (11) into (10), we get the equilibrium domestic sales of the follower as follows;

$X_2 = (a - Pw)/4b$ ----------- (12).

By substituting (11) into (6) and (12) into (7), we get the exports of the firms in equilibrium.

$E_1 = (Pw/2c_1) - (a - Pw)/2b$ ----- (13)

$E_2 = (Pw/2c_2) - (a - Pw)/4b$ -------(14)

From (13) and (14), $E_1 \gtrless E_2$ implies;

$(1/c_1)-(1/c_2) \gtrless 1/2b[(a/Pw)-1]$ ------- (15)

From (15) it is obvious that the relative extent of exports of the leader and the follower firms depend on the extent of the cost differences of the firms in relation to the parameters of the domestic demand curve ('a' and 'b') and the world price. The initial condition we have is '$c_2 > c_1$'. And it is necessary to take into notice that 'a' is always greater than 'Pw'. Ceteris paribus, an increase in 'a' or a decrease in 'b' implies an increase in the domestic market size. If we take that the difference between the costs of the firms is not very large, there is high likelihood that the exports of the follower (E_2) will be higher than those of the leader, if the domestic market size is larger i.e., given the other conditions 'b' decreases (or 'a' increases). In other words, the leader ends up taking a very major part of the (large) domestic market and the follower gets pushed into the export market.[5] If 'Pw' is lower, given the other conditions, there is high likelihood that 'E_2' > 'E_1'. In other words if the world market is very competitive, with 'Pw' being far lower than the domestic market price, this behaviour of the follower exporting more could take place. But if the cost

difference between the leader and the follower is too large, then obviously, the exports of the leader will be higher than those of the follower firm.

In the highly protected Indian markets, the domestic price that the large oligopoly firms could realize is generally quite higher than the world price. So the corresponding relative profitability of domestic sales versus exports is high. [Patibandla (1991b)]. In such conditions the leader large firms would attempt to take major part of the domestic market and would be less concerned about exports than the (higher cost) follower firms.[*] These possibilities are subject to empirical verification, which is presented in the following section

II. The Empirical Analysis.

The objective of the empirical exercise is to test for the question of who would have higher export orientation, the leader firms who has lower costs or the follower firms, under the existing domestic market structure conditions in the Indian industry. Given the possible limitations of the available firm level data and also omission of other relevant variables in explaining exports under the limited scope of the paper, we take these empirical exercises to give suggestive proofs rather than conclusive test of the theory.

The industry, that is taken for the study is at the disaggregate (SITC) classification of the engineering industry i.e., Hand, small and cutting tools industry. Firm level data is collected for 24 firms for the year of 1983/84 through direct field interviews and the company balance sheets. The firm size distribution, in terms of sales turnover, ranges with a maximum value of Rs.1592 million and a minimum value of Rs.16.2 million. Firms with sales turnover below the minimum value are taken to be the competitive fringe (very) small firms and are not taken into the sample.[7]

II.1. Measurement of the variables.

ZS = firm size variable. Firm size is measured on the basis of total sales turnover of firms (normalized by the lowest value in the sample). (From the theoretical section, $ZS = X+E=Pw/2c$).

E = absolute exports of firms.

Measurement of Relative Cost Efficiency (U) of firms.

Relative cost efficiency of firms in the sample is measured on the basis of Farrell's (1957) production frontier approach. According to this approach, a firm's total cost efficiency consists of technical and allocative components. Technical efficiency refers to minimization of inputs to produce a given level of output under a given technology. Allocative efficiency refers to optimum combination of factors of production under the given factor prices. In this paper we restrict ourselves to the technical efficiency part.

The cost (or technical) efficiency measure (U) is basically a relative measure because the best practice technology frontier is determined by the most efficient firms in the sample. In other words, the potential (or the maximum) output for a given level of inputs employed is determined by the most efficient firms in the industry. The deviations of the rest of the firms from the efficient frontier are taken to be the relative cost efficiency of firms.

Following Aigner and Chu (1968), (U) is measured on the basis of parametric approach. The production relation between outputs and inputs, in deterministic terms, can be expressed as:

$Y = (X:B) + u$

where 'Y' is a vector of output observations and 'X' is a matrix of input observations. 'B' represents the parameters and 'u' represents the one sided error. The one sided error forces

$Y \leq f(X)$. In the frontier estimations, 'u' is taken to have a negative expectation indicating presence of technical inefficiency in production. The firm level relative efficiency measure is estimated by following Richmond's (1974) methodology by using the estimated residuals and correcting for the intercept term of the production function.

If we take the Cobb-Douglas form:

$\log Y = \log [f(X)] - u$

where $u \gtrless 0$ and thus $o \leq e^{-u} \leq 1$ and where $\log [f(X)]$ is linear in Cobb-Douglas. 'X' is exogenous, independent of 'u'. If we let 'w' be the mean of 'u' then;

$\log Y = (a_o - w) + \sum_{i}^{n} a_i \log X_i - (u-w)$

where 'w' has zero mean. The above equation can be estimated by ordinary least squares to obtain the best linear unbiased estimates of (a_o-w) and 'a_i'. The estimated residuals can be used to correct the constant term by shifting it up until no residual is positive and one is zero. The extent of deviations of the rest of the observations can be used to measure the relative inefficiency. The inverse of the estimated inefficiency is taken to be the relative cost efficiency of firms ($U \leq 1$).

The production function is taken to be a two input case of labor (L) and capital (K) . Value-added (Y) is taken for the output and salaries and wages for labor and capital is in historical costs. The functional form is taken to be the Cobb-Douglas production function. The estimated production function for the sample is as follows;

$$\ln(Y) = 2.05 + 0.58(\ln L) + 0.37(\ln K)$$
$$(3.1)* \quad (5.2)* \quad (3.06)*$$

$R^2 = 0.90$ F = 99.2   N = 24

Figures in the brackets are 't' values.

* significant at 0.01 level.

The measured relative efficiency of the firms is determined not only by the organizational factors but also by technology gap between firms in an industry. There could be technology gap between firms because of adoption of imported or indigenous technology and also technology of various vintages by different firms in an industry (which could be the strategic choices of firms).

II.2. The Results.

The following equation tests for the effect of changes in relative cost efficiency for a given level of firm size (or total sales of firms) on exports of the firms in the sample. In other words, exports (E) are regressed against the ratio between relative cost efficiency and firm size (U/ZS).

E = 15874 - 1673606 (U/ZS)*

    (3.05)*   (1.71)**

R^2 = 0.12   F = 2.76   N = 24.

Figures in the brackets are 't' values.

* Significant at 0.01;

** Significant at 0.10 levels.

The above estimated equation has reasonable level of statistical significance to derive reliable interpretations. The negative sign of the estimated parameter associated with (U/ZS) indicate that, for a given level of total sales turnover (or firm size), increase in efficiency results in lower exports.•

The above result give reasonable empirical support to the basic proposition of the paper. Under the given domestic market structure conditions in the Indian industry, the firms who could be the domestic market leaders and are relatively cost efficient would tend to take higher share of the domestic market, than the relatively inefficient, in search of the super normal profits of the sheltered domestic market. These firms would be less bothered about exports because the world price is generally far lower than the price they could realize in the protected domestic market. The relatively inefficient firms would tend to be more export oriented, as they have access to smaller share of the domestic

market (given their production capacity). This does not mean that higher the relative inefficiency higher is the export orientation. The condition required for the result is that the cost differences between the firms are not too large. If a firm is highly inefficient, it would be priced out in both the markets (especially in the long run and has to exit from the industry, with a zero option of market segmentation behaviour).[9]

III. Concluding Remarks

The paper has shown that in the case of a developing country, industrializing on the basis of inward oriented policies, the relatively efficient firms are less export oriented than the relatively inefficient. This result is explained on the basis of the argument that the relatively efficient (large) firms could be the domestic market leaders and take higher share of the domestic market than the relatively inefficient, in search of the super normal profits associated withe the sheltered domestic market. There is a high likelihood of this behaviour taking place in the Indian industry, in general, if the firms could realize domestic price significantly higher than the world market price. And in the context of increasing competitive conditions of the world market for the manufactured goods, the world market prices have a tendency to decline rather than increase.

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FOOT NOTES

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1. The model can be derived on the basis of specification of the product in terms of a homogenous good or differentiated goods. In the case of differentiated goods, the condition required is that the goods have to be substitutable to have strategic inter dependence between firms in the industry.

2. Protection of the domestic industry implies that the domestic price is generally higher than the world price.

3. If we take a collusive Stackelberg leader and follower framework, it can be argued that there could be higher possibility of follower firms to accept the collusive market shares dictated by the leader because of the export option. This is because as long as the followers can produce at the world market price, they do not have to depend on the domestic market solely in order to survive or to achieve higher capacity utilization, as they could sell in the export market as much as they desire.

4. As is evident the results in this paper are independent of the assumptions of a linear demand curve and quadratic cost curves. These assumptions are made to keep the analysis simple and the results sharp.

5. Here, the largeness of the domestic market is in terms of the relation between the market size and cost and production capacity conditions of the firms

6. The profit rate of the Indian industry is observed (by a report by the World Bank) to be about 30 per cent while it is only about 4 per cent for the South Korean industry. The domestic profit rate of the Indian industry, in general, is very high not only due to the protection of the industry from imports but also due to the domination of the market by few oligopoly large houses. See Bardhan (1984).

7. According to the Government of India's definition on 1984, a small firm is the one with net assets not exceeding Rs.0.35 million.

8. In a previous paper of the author (1991a), for a sample of firms belonging to the aggregate classification of the

engineering industry, firm level exports are regressed against a firm level scale economies index, based on Christensen and Green (1976),. These results indicate that firms which were realizing lower costs over a period of time, were becoming less export oriented.

9. In the short run, a highly inefficient firm could distribute it's output in the domestic and export markets by covering the variable cost only. Because of it's strategic position, if it is not able sell much in the domestic market, by exporting it will realize higher capacity utilization and consequently lower costs. Secondly it is important to take into consideration that in the inward oriented industrial regime, for all the firms exports might be basically a residual activity given their levels of production capacities (in a developing country context) and super normal profits of the domestic market. The relatively inefficient firms having higher export orientation in comparison to the efficient, does not mean that they have a very high export orientation.

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