EXPLAINING THE DIFFERENCES IN FIRM LEVEL PRODUCTION CAPACITY REALIZATION IN BANGLADESH FOOD MANUFACTURING: A PANEL DATA STUDY

Ruhul A Salim
Curtin University of Technology, Australia

ABSTRACT

The aim of this paper is to examine the impact of a set of firm-specific and policy related variables such as size, age, ownership and effective rate of assistance on the rate of production capacity realization (PCR) of firms. This study uses a panel of 92 food manufacturing firms of Bangladesh over the periods 1992-1994 and 1997-1999. Firm size is found to have positive impact while capital intensity and age of firm have negative impact on PCR at the firm level. The striking result is that the policy related variables such as the effective rate of assistance (ERA) and outward orientation (OPN) do not have any significant impact on PCR. These results are confirmed by the extensive test of sensitivity analysis. The insignificance of *ERA* and *OPN* may be attributed to piecemeal and partial nature of policy reforms. The results suggests the need for further reform of trade policies, in particular, focusing on reducing nominal and effective protection levels in order to enhance competition and competitiveness so that an efficient production can take a firmer root in the industrial sector of the economy.

JEL Classifications: L11, L25, L66.
Keywords*:* Productive Capacity realization, Economic Reform, Capital Intensity, Effective Rate of Assistance, Openness
Corresponding Author's Email: Ruhul.Salim@cbs.curtin.edu.au

INTRODUCTION

Firms' productive performance varies, even if firms use an equal set of inputs and production technology. Several earlier studies (for example, Soderbom and Teal 2004, Zheng *et al* 1998, and Srinivasan 1992) attempted to identify factors influencing inter-firm variation in productive performance in different countries. Although the identification of these factors is critical for industrial policy formulation and industrial growth particularly for a developing country like Bangladesh, studies on this issue are very much limited. Using the firm level cross section data Salim (1999) showed that the productive performance of manufacturing firms varied largely due to the firm-specific heterogeneity, production environment, and government policies in Bangladesh. To supplement these findings the aim of this paper is to analyze the major determinants of production capacity realization (here after PCR) [1] in Bangladesh food manufacturing using the firm-level panel data. The contribution of this study lies in investigating factors determining PCR using the most recent and long time period panel data along with sensitivity analysis.

Section 2 presents theoretical underpinnings and empirical evidence of determinants of capacity realization. In section 3, an analytical framework is developed which draws heavily on theoretical and empirical studies in the Industrial

Organization (IO) literature. Variations in the rates of capacity realization across firms and through time are then explained using several factors, whose expected and effective impact is discussed at some length in section 4, along with detailed sensitivity analysis. Summary and conclusions are given in the final section.

A CRITICAL REVIEW OF THE THEORETICAL AND EMPIRICAL LITERATURE

All producers are not equally efficient in production, because access to information, structural rigidities (for example, pattern of ownership) time lags to learn technology, differential incentive systems, and organizational factors (such as *X*-efficiency and human capital related variables) all affect firms' ability in production. Mueller pointed out that '.....the role of non-physical inputs, especially information and knowledge, which influence the firm's ability to use its available technology set fully' (1974 p: 731). Given these factors, few firms achieve maximum feasible output from their available inputs and existing technology.

There are two classic views on the explanation of productive capacity under-realization of production agents. One of these purports capacity under-realization as a long-run problem in which the patterns of productive capacity realization depend on non-price factors affecting managerial decisions such as economies of scale, oligopolitistic market structure, cyclical demand for output and insufficient supply of complementary inputs. Winston (1971) developed a model of capacity utilization in line with this argument. The other view is that capacity under-utilization is a short-run phenomenon and its analysis is concerned with the determinants of the profitability of increasing capacity realization of production units. It claims that increases in profitability lead to higher capacity realization. However, this analysis does not include non-price elements (such as the market structure and the size of the market) as explanatory variables of capacity realization. The underlying assumption is that firms choose their capacity realization rate to maximize profit. However, testing these models empirically has proven to be quite difficult.

Recent theoretical works in the IO literature offer two other views on the differences in observed capacity realization of firms. Firms may build excess capacity for both strategic and non-strategic reasons. Profit-maximizing firms may hold non-strategic excess capacity in markets where demand is cyclical or stochastic, where plants are inherently lumpy or subject to economies of scale, or where imported inputs are allotted on the basis of built-in production capacity. The latter reason was and still is more common in developing countries, particularly countries which adopted, or still follow an import substituting industrial strategy. Empirical evidence for the above explanations is quite sparse. Leibenstein (1976) emphasized the importance of organizational factors, while Lecraw (1978) indicated the importance of technology related factors, such as capital intensity and scale of operation, as being responsible for differential performance of firms. Schydlowsky (1973) offered six possible reasons why capacity utilization of production units varies substantially: factor intensities, relative factor prices and, particularly, the cost differential between labor shifts (i.e. the shift premium) economies of scale, the elasticity of substitution between inputs, the elasticity of demand and the availability of working capital. However, Leibenstein type analysis is related to firm-specific characteristics, such as size, age, proportion of non-production (white-collar) workers to total workers, and managerial efficiency.

Caves and Barton (1990) argued that differential performance of firms in terms of realization of productive capacity could be analyzed through the well-known structure-conduct-performance (S-C-P) theory of industrial economics. Neoclassical S-C-P is related to the dimension of market structure, such as the degree of seller concentration, growth of demand and so on. However, the recently developed 'endogenous growth' theory emphasizes the role of human capital on firm's productivity performance. The crucial role of human capital in the production

process is two-fold: first, management skills strongly influence the firm's ability to produce the maximum possible output by realizing existing production capacity. The realization rate increases through the implementation of many specific activities, such as maintenance, design and modification, and quality control. Second, there is an important feedback effect to the firm's endowments of human capital from efforts to improve productivity in response to external stimuli. For example, successful implementation of worker training programs may, by increasing human capital endowment, augment the ability of a firm to undertake further improvement.

The impact of firm-specific characteristics, such as age and size of firms, market structure and policy related variables, such as concentration and effective rate of protection (ERP) on a firm's (industry's) performance in terms of profitability have been widely tested in the IO literature. However, relatively few studies have been carried out to test these hypotheses taking capacity realization as firms' (industries') performance. A summary description of the earlier studies, listed in chronological order, in Table 1. The principal finding that emerges from these studies is that, in most cases, capital intensity, market structure, openness, import content in production, and scale of operation are important variables in determining capacity realization. Most studies found statistically significant positive association between technology related variables, such as capital intensity and productive capacity realization. The authors argue that a capital intensive firm has an incentive to utilize production capacity at a higher rate, in order to economise on the high cost of scarce capital, because, modern technology involves high capital intensity. Two studies, one on Bangladesh, and one on Israel manufacturing industries found a negative association between these two variables, but these results were not statistically significant.

Most studies found a significant positive association between the scale of operation (size of firm) and capacity realization (Table 1). Capacity realization was viewed as a measure of efficiency, so a positive relationship between these two variables could be expected, because a more efficient firm (industry) expands faster than a less efficient one. They also argued that large firms could enjoy both technological and managerial economies of scale, and it could generally be expected that they would operate at higher levels of realization than for small firms. Pasha and Qureshi (1984) found a negative association between size of firm and realization in a study on Pakistan. Since Pakistan had followed an import substitution strategy for several decades, capacity realization depends on the availability of imported inputs and machinery. Large firms enjoyed undue advantage through political power in terms of easier access to loans and import licenses and were able to accumulate more productive resources than small firms. However, they were less obliged to realize maximum possible production capacity. Under these circumstances, a negative association between firm size and capacity realization was not unexpected.

All studies presented in Table 1, except Winston (1971) study for Pakistan and Goldar and Renganathan (1991) for India, found a negative relationship between market structure and capacity realization. The inverse relationship between these two variables is not unexpected according to the theory of the IO. In a highly concentrated market, firms would generally be in a position to make super-normal profits, even when the rate of capacity realization is low, and would, therefore, have less incentive to improve capacity realization. Exceptionally, in Pakistani and Indian studies, capacity realization appears to increase with levels of market concentration; a feature that may reflect the outcome of the anti-monopoly policies of these countries. Goldar and Renganathan (1991) however, argued that restrictions on the entry of new firms helped existing firms to realize a higher level of production capacity.

In some studies, the use of an 'openness' variable expressed in terms of the ratio of exports to total output plays an important role in explaining variation in PCR. Most studies found a significant positive relationship between these two variables indicating that the openness influences PCR from both demand and supply standpoints. Exports increase demand for a product, stimulates firms to increase output through increased realization of production capacity, in order to take

advantage of the greater demand. On the supply side, exports enhance competition and international competition, leading to increased realization of production capacity. Some studies investigated the influence of import content of raw materials in production on capacity realization and found a negative relationship.

TABLE 1

DETERMINANTS OF PRODUCTIVE CAPACITY UTILIZATION (PCU): SELECTED STUDIES

		Variables											
Studies	Countries	AGE	SZE	CINTSY	MSTRE	GD	IS	OPN	IC	ERP	DPVT	DFRN	R^2
Winston (1971)	Pakistan		+*	+*	+**		-	+*					0.90
Diokno (1974)	Philippines		+*	+*	-**			+**	-			-	0.28
Lecraw (1978)	Thailand	+	+**	+**									0.85
Bautista (1981)	Philippines			+**	-			+					0.51
Thoumi (1981)	Colombia			+**	-**			+**	-*				0.36
Morawetz (1981)	Israel	+	+**	-	-**			+	-			-	0.57
Lim (1981)	Malaysia		+**	+**				+**	-				0.29
Pasha and Qureshi (1984)	Pakistan	-*	+**				+*			+ *			0.48
Goldar and Renganathan (1991)	India			+	+**				-				0.34
Srinivasan (1992)	India		-*	-*	+								0.41
Salim (1999)	Bangladesh	-*	+*	-	-**			+*		+	+		0.59

*Note: Definition of Variables: AGE = Age of firm (industry) SZE = Scale of Operation (usually proxied by the size of firm in terms of fixed assets, or employment, or real output, or value added) CINTSY = Capital Intensity, MSTRE = Market Structure (usually proxied by CR4) GD = Growth of Demand (usually measured by growth of real output of firm or industry) IS = Import Substitution (usually defined import as a percentage of total supply) OPN = Openness or Export-orientation (usually defined export as a percentage of total firm's or industry's output) IC = Import Content of Production (usually proxied by raw material allocation to firm or industry) ERP = Effective rate of protection, DPVT = Dummy variable equals 1, if the firm is privately owned and zero otherwise, and DFRN = Dummy variable equals 1, if the firm is foreign or joint venture and zero otherwise. The symbols + and - indicate positive or negative association between PCR and independent variables and * denotes significant at the 1 per cent level and ** denote significant at the 5 per cent level. If there is no such signs indicating variables are not significant.*

The authors maintained that foreign exchange crises are most common in developing countries and the supply of imported inputs is subject to rationing. Either the supply of inputs is delayed, or sometimes it is inadequate, so that capacity realization is adversely affected by the erratic supply of imported inputs along with variable quality. Earlier studies also identified some other explanatory variables, such as age of firm (industry) proportion of non-production workers to total workers of firm (industry) growth of demand, import substitution, effective rate of protection and ownership dummy variables. However, no single variable was uniquely determined (statistically significant in all studies). Most variables were determined ambiguously (different signs) and provided contradictory interpretations. The weak results of these studies may be due to the poor quality of data, or to the omission of information in estimating independent variables, or the dependent variable or both.

Although these studies made important contribution to the IO literature, however, they have the following shortcomings. First, in the majority of studies, capacity realization measures are not reliable, since these measures are *ad hoc* and are not adequately based on economic theory. For example, some studies used electricity based measures, some engineering capacity (installed capacity) some shift measures, and some capital utilization. Few studies used estimated realization rates through the traditional production (or cost) functions. As discussed in the literature, all these capacity utilization measures are subject to limitations. Second, the majority of studies included only a few variables (such as size, ownership and market structure) in their analysis. Domestic and international trade policies (such as subsidies and tariffs) play an important role in firms' capacity realization. Some earlier studies included the effective rate of protection (ERP) to analyze the impact of these policy issues on capacity realization. However, ERP is a narrow measure as it only takes account of trade policy issues. So the repercussions of a change in trade policy on different activities cannot be forecast from a simple examination of the relative ERPs measures. The effective rate of assistance (ERA) is a better measure than the ERP, as it incorporates both domestic and trade policy issues, and indicates the potential gains from resource re-allocation due to policy changes. Third, most of these studies are now dated. Many changes took place in the production environment of developing countries due to market-oriented liberalization reform in the 1980s, but few of these studies were done after these changes took place. Other problems are encountered in measuring the independent variables included in these studies, increasing the need to interpret these results cautiously.

ANALYTICAL FRAMEWORK

Studies discussed above, demonstrated that a number of factors could cause variations in capacity realization across firms. Drawing on theoretical and empirical studies, this section attempts to identify these factors and outlines a range of hypotheses that pertain to inter-firm differences in capacity realization. Some of these factors may help and some may hinder firms in realizing maximum production capacity. The maintained hypotheses that reflect the possible relationships between PCR and these independent variables are discussed below.

In the literature, it is hypothesized that there is a negative relationship between age (*AGE*) and productive capacity realization, because equipment and machinery used by older firms do not embody the most recent technological advances, whereas younger firms are able to adopt the most efficient technologies available at the time of their establishment. However, there is a contrary hypothesis, that *AGE* captures the learning by doing phenomenon in a firm. The longer a firm is in production, the greater is the management experience and the fewer are labor bottlenecks and thus, older firms may have higher capacity realization. Empirical findings in earlier studies are mixed. The industrial sector in Bangladesh is at an early stage of development. Except for jute and cotton textile industries, all other industries including the food processing have recent origins. Most firms in these industries are less than 20 years old and some firms are still expanding production capacity with modern technology.

Therefore, age of firm in food processing industries may positively influence capacity realization in Bangladesh.

Economists argue that firm size (*SZE*) reflects the existence of scale economies. Larger firms have better access to foreign technology, a greater ability to bear risk and greater advantages from R&D. The larger the firm size, the lower the unit cost (because of scale economies and externalities in production) and the higher is the demand for output. As a result, capacity realization increases with firm size, so a positive relation is expected between these two variables. However, Pilat (1995) argued that firm size can give little information about the effect of scale economies on capacity realization, even if firm size does give an indication that it would be biased towards low capacity realization, because it could profitable to have a large firm operating for a few hours per day. Moreover, small firms adopt technology that is more appropriate, are more flexible in responding to changes in technology, product lines and markets, foster more competitive factor and product markets, and thus, are able to realize a higher rate of productive capacity. In Bangladesh, previous industrial policies encouraged firms to increase output in order to fulfill the planned targets without emphasizing efficiency and higher capacity realization in production. By influencing government administration, large firms were able to accumulate subsidized imported inputs and machinery disregarding full utilization of plant capacity. A negative relationship may, therefore, be expected between firm size and capacity realization.

Many authors argued that ownership (*DPVT*) of firm is also an important factor in determining capacity realization. In addition to public and private firms, there are joint ventures between private and public firms or foreign participation with either public or private firms or both. In the literature, it is hypothesized that public sector firms have greater access to import licenses, credit and technology, and so operate at a high level of capacity realization. The 'property right school', however, argues that managers within public firms tend to look after their self-interest rather than profit maximization. Since property rights are non-transferable in the case of public enterprises, the 'owners' (that is the public at large) have no incentive to pressure the managers of these enterprises to realize high level of production capacity, so public enterprises perform less efficiently than private enterprises. However, the empirical evidence actually provides weak support for this hypothesis. Bardhan (1992) argued that whether a firm is public or privately owned is less important. As long as its financial constraint is 'hard', there is no reason that this firm performs poorly.

Joint venture (*DJNT*) firms are assumed to realize high production capacity for at least two reasons. First, they have good management experience and good organizational structure; second, they encourage research and development. Garnicott (1984) demonstrates that foreign participation facilitates access to the latest and best practice technology and offers a positive impact on research and development. However, because of structural rigidities, joint venture firms may fail to cope simultaneously with domestic and foreign markets and so firms cannot operate at a high level of capacity realization. Economic theory, therefore, gives little guidance about the relationship between ownership and capacity realization of firm. Therefore it remains an empirical issue.

In the production process, the proportion of non-production workers to total employment (*PNWT*) includes managerial administration, labor relations, R&D and engineering personnel who contribute to effective acquisition and combination of productive resources. It reflects the average education level in the industry. Therefore, with a higher proportion of highly educated labor would also be more receptive to new approaches to production and management, leading to a positive association between the share of non-production employees and the rate of PCR. However, this view is opposed in a OECD study (1986) in that an increase in the proportion of 'white collar' or managerial staff imposes a certain rigidity in the production process, thereby retarding rapid adjustment to variations in demand. There is also a view that increasing bureaucratization of the production process may reflect 'feather bedding' and the development of *X*-inefficiencies within the context

of protected and regulated industries. Economic theory is indeterminate in postulating the relationship between this variable and the rate of PCR. In Bangladesh, a large proportion of industrial enterprises are in public sector, with excessive employment and excessive wage and fringe benefits for employees. Bangladesh does not have a social security system, so employment in clerical and administrative activities has been used as one way of helping people to improve their quality of living. Therefore, a negative relationship between *PNWT* and PCR is expected.

Capital intensity (*CINSTY*) has been shown to be an important variable in determining capacity realization. It is hypothesized that firms with higher capital intensity are likely to operate at higher realization rates, because they cannot afford the rental cost of unused capital. In other words, more capital-intensive plants have a greater incentive to economize on cost of capital through a high rate of capacity realization. However, if the cost of capital becomes relatively cheap due to subsidized credit or low interest rates, then firms may accumulate more capital than is required for production and are likely to operate at a lower rate of capacity realization, so a negative relationship could be expected between these two variables. During the 1970s and 1980s, industries in Bangladesh enjoyed various types of concessions and incentives such as tax holidays, accelerated depreciation allowances and exemption of reinvested income from both corporation and personal income taxes. Heavy protection was also given to industries in the form of subsidized inputs and machinery through import licensing, making capital relatively cheap. Thus, distorted factor prices and import licensing rules encouraged capital-intensive techniques and over-expansion of industrial capacity. Capacity realization remained low in most of the large industries, particularly in import substituting capital-intensive industries, so a negative relationship is hypothesized between capital intensity and rate of realization.

Market structure (*MSTRE*) is generally seen as a potentially important variable in determining the level of capacity realization. The usual practice is to employ a proxy for market structure using a firms' concentration ratio. In the standard IO paradigm, a high concentration ratio is expected to diminish competitive rivalry among firms with the likelihood of under-utilization of production capacity. Chamberlin (1938) pioneered the analysis of the relationship between market structure and capacity realization. His well-known explanations for the existence of excess capacity in industries are based on monopolistic competition. Due to the absence of competition among sellers, few firms undertake independent experiments to seek better ways of carrying out production activities. Scherer (1996) contended that concentration does not lead to greater R&D intensity, and so leads to a decrease in capacity realization. Again, concentration may inhibit the information flow across firms within an industry and thus permit inefficient production units to survive. All these arguments suggest that, *ceteris paribus*, rates of capacity realization decrease with a greater concentration of producers.

However, another line of argument suggests that high concentration brings about greater innovation and technological change, which may be sufficient to offset the adverse monopoly effects of high concentration. Again, concentrated industries suffer from less uncertainty of demand than other firms and can plan better for high utilization of production capacity. These arguments suggest a positive relationship between industry concentration and the rate of PCR. Bangladesh possesses an oligopolistic market structure in the industrial sector, created by the policy regimes pursued during the seventies to early eighties. Foreign competition was eliminated through trade restrictions, and domestic competition was hindered through a system of industrial licensing and various fiscal and financial privileges directed to specific groups of entrepreneurs. In his recent study Salim (1999) showed that the concentration ratio declined in some industries, such as jute, garments, fish and seafood industries, perhaps due to the removal of the investment ceiling and import licenses as part of economic reforms. Still the market structure in Bangladesh manufacturing remains concentrated. Given the oligopolistic market structure, our *a*

priori expectation is a negative relationship between market structure and capacity realization.

The openness variable (*OPN*) has been used mostly in aggregate analysis. Many earlier studies have documented a positive association between exports and economic growth at an aggregate (national) level in many developing countries (Feder 1982, Yanikkaya 2003 and others). Findlay (1985) demonstrated that export-orientation *per se* is not 'necessarily growth-inducing'; the missing link is found in such real determinants of growth as capital formation, capacity utilization and technological progress which are so vital for the dynamic internal economic transformation of these economies. Some industry (firm) level studies also lend support to a positive relationship between openness and performance. Export-oriented firms (industries) are expected to realize higher production capacity than non-exporting firms for two reasons: first, firms with high export proportions are likely to be subject to more external competition than firms producing mainly for local consumption. This competition may cause a 'cold-shower' effect on domestic managers. To stay in business, a firm competing in the world market might be forced to realize a higher production capacity than one selling only in a sheltered domestic market. There is an implicit 'challenge-response' mechanism induced by competition, forcing domestic industries to adopt new technologies, to reduce 'X-inefficiency', and generally to reduce costs whatever possible. Second, a firm selling in more than one market has an advantage over a firm selling in a single market, particularly when it comes to coping with unexpected demand problems.

However, neoclassical theory suggests that capacity realization is exogenous and therefore is unaffected by trade openness. It may be argued, in line with the 'new' growth theories that trade policies affect capacity realization and technological progress, which in turn, lead to long-run growth. In these models, openness to trade provides access to imported inputs, which embody new technology and increase the effective size of the market facing producers, raising the demand for output and leading to higher utilization of technology (Grossman and Helpman 1990). High export intensity may signal the achievement of economies of scale. It may be argued that exporting may involve relatively greater risks and consequently firms may attempt to export only if the return is higher than on domestic sales. This suggests that firms will exploit avenues to reduce costs and this is possible by realizing a higher rate of production capacity. Most industries in Bangladesh are import substituting except jute, leather and tea. However, following the economic reforms in the early eighties, some export-oriented sub-sectors within various industries were developed such as ready-made garments, fish and sea food and electronics. Manufacturing exports as a percentage of total exports of the country steadily increased since 1982. From all the above arguments, *a priori*, a positive relationship between export-orientation and the capacity realization of firm is presumed.

Trade and domestic regulatory incentive policies *(ERA)* play a critical role in determining capacity realization of manufacturing firms. In general, tariff protection and other industry regulatory or assistance measures are thought to lessen the competitiveness of industry, because all of these assistance measures protect domestic industries from foreign competition. These policies also create price distortions and have indirect costs, which increase exponentially with the magnitude of price distortions. By limiting competition with foreign products, all sorts of protection become counter-productive. Therefore, protection is expected to have an adverse impact on firm-specific capacity realization. However, in line with the so called 'infant industry argument', it can be argued that protection helps to realize higher production capacity. The low rates of protection may promote best practice techniques and thereby improve capacity realization through the reduction of risk provided by protective barriers. This is similar to the argument of Schumpeter (1942) that a reduction in competitive pressure or an increase in market power may reduce the risk and stimulate the rate of PCR of a firm. The above arguments for and against protection lead to the conclusion that economic theory is indeterminate concerning the nature of the relationship between the *ERA* and PCR of firm (industry).

Protection and regulation have historically been an important feature of Bangladesh industry. Following independence in 1971, Bangladesh pursued inward looking policies with the emphasis on a leading role for the public sector in economic activities. A series of measures, such as quantitative restrictions (*QRs*), highly differentiated tariff rates (0 to 400%), and various licensing procedures along with an overvalued exchange rate and huge subsidization programs were put in place to protect domestic industries from competition. These policies created bottlenecks by preventing speedy availability of inputs for the production process and by holding up the import of necessary spare parts and critical equipment, which affect firms' capacity realization. However, since the early 1980s, *QRs* were replaced by tariffs, tariffs rates were reduced (average tariff rate is less than 40% as of 2002) and rationalized and licensing systems were removed so that the economy become substantially open and outward looking, which have influenced the production environment of firms. Therefore, a positive association between ERA and PCR in Bangladesh manufacturing is expected.

THE MODEL

Drawing on earlier theoretical and empirical studies the following equation is specified. Accordingly, this model facilitates comparison of the results with those reported in previous studies.

$$PCR_{it} = f\left(\begin{array}{l} \overset{?}{AGE}_{it}, \overset{?}{SZE}_{it}, \overset{?}{CINSTY}_{it}, \overset{?}{PNWT}_{it}, \overset{?}{MSTRE}_{jt}, \overset{?}{ERA}_{jt}, \\ \overset{+}{OPN}_{jt}, \overset{+}{DPVT}, \overset{+}{DJNT} \end{array}\right) + u_{it} \qquad (1)$$

where *PCR* stands for firm-specific production capacity realization indices, *AGE* for age of firm, *SZE* for size of firm, *CINSTY* for capital intensity, *PNWT* for the proportion of non-production workers to total workers, *MSTRE* for market structure (four firm concentration ratio, CR_4), *ERA* for effective rate of assistance, *OPN* for openness of firm, *DPVT* for dummy variable for private firm (takes value 1 when the firm is private or zero otherwise), *DJNT* for joint venture firms (takes value 1 for a joint venture firm or zero otherwise) and u_{it} for white noise error term. Subscripts *i* refer to firms, *j* refers to sectors, and *t* refers to years

DATA AND THE INTERPRETATION OF RESULTS

This study uses firm level data from the *Master tape* of the Census of Manufacturing Industries (CMI) conduced by the Bangladesh Bureau of Statistics (BBS). BBS conduct the similar census every year for the Government. Private researchers, academic and scholars are limited access to the more recent firm level information. This study uses the CMI data for the period 1992-1994 and 1997-1999 [2]. Food processing is one of the vital sectors of the national economy of Bangladesh in terms of employment, contribution to GDP and foreign exchange earnings. This sector is second only to textiles in terms of value of output, accounting on the average for 27 per cent of total industrial output and 24 per cent of total manufacturing employment over the period from 1991 to 1999 (BBS, Statistical Yearbook). Therefore, this study uses 4-digit firm-level panel data from the Bangladesh food manufacturing industries. The CMI covers all public and privately owned enterprises with 10 or more employees. However, it provides information on a varied number of firms in the same industry for different years because of either the entrance (exit) of new firms or both. This study takes 92 firms with over 25 employees after removing the inconsistent firms in terms of data and errors.

To estimate the above model three approaches are used: pooled regressions with no controls for firm or time effects, fixed effects and random effects models. The results obtained using these estimators, are presented in Table 2. The results are generally consistent with a priori expectations as outlined above. The results show

that the firm-size matters for productive performance. Although economic theory gives little guidance about the relationship between *SZE* and *PCR*, the industrial structure and institutional systems in Bangladesh provide some expectations of a negative relationship as explained earlier. That means the bigger the firm size the lower is the rate of productive capacity realization. But the results show that variable *SZE* has positive influence on capacity realization. The variable is statistically significant at one percent level in both the fixed effects and the random effects models. It may be argued that big firms took advantage of licensing and other protective measures by influencing policy regimes that might help to acquire scale economies.

TABLE 2
DETERMINANTS OF PRODUCTION CAPACITY REALIZATION

Variables	Pooled Model (1)	FE Model (2)	RE Model (3)
INTERCEPT	0.174** (0.052)	0.085 (0.043)	0.137 (0.104)
SZE	0.143***(0.037)	0.115***(0.018)	0.121*** (0.015)
AGE	0.162** (0.039)	0.201** (0.052)	0.217** (0.035)
CINSTY	-0.132* (0.045)	-0.114** (0.038)	-0.121** (0.036)
PNWT	0.085* (0.032)	0.102** (0.037)	0.115** (0.028)
MSTRE	-0.141** (0.053)	-0.124** (0.047)	-0.129** (0.041)
ERA	-0.127 (0.107)	-0.132 (0.097)	-0.135 (0.085)
OPN	0.145 (0.134)	0.135 (0.121)	0.142 (0.104)
DPVT	0.051 (0.043)	0.047 (0.035)	0.032 (0.027)
DJNT	0.035 (0.052)	0.043 (0.037)	0.040 (0.032)
R^2	0.31	0.42	0.57
No. of firms	92	92	92
Sample Size	552	552	552

Note: *At the outset both an F and Hausman tests are used to test whether individual firm effects are significant as well as whether the regressors are correlated with the individual effects. The results (F=1.54 and χ^2=27.71) suggested for the fixed firm effects specification but rejected the exogeneity in the random effects model. Therefore, the focus of this study is on the fixed effect estimates; however, for comparison random effects estimates are also presented. Figures in the parentheses are standard errors. The asterisks ***, **, and * indicate significance at 1, 5 and 10 per cent level, respectively. Firm-specific and year dummies used in estimating model 2 are not shown.*

The negative coefficient of *AGE* variable supports the argument that older firms have lower capacity realization rates. However, after the opening up of the economy, incumbent firms had to restructure their technology to face the prospect of competition from abroad. Since the policy reform in Bangladesh is still half-hearted, so it may be that competition and the learning by doing effects were not enough to offset the 'old age' effect. Capital intensity (*CINSTY*) as expected, influences *PCR* negatively and its coefficient is statistically significant at 5 per cent level. These results appear to be consistent with the country's trade and industrial policy regimes. Enterprises were supplied with foreign equipment and machinery at subsidized rates and that encouraged firms to build excess capacity without regard for its full utilization. The variable *PNWT* (proportion of non-production workers to total work force) is positively related with PCR and statistically significant. One explanation of this positive association of *PNWT* with *PCR* may be that all sub-sectors of food

processing industries, except for sugar products, are at an early stage of development, so that increases in non-production workers in these industries are due to expansion and demand pressure from home and abroad following the policy reforms. More white color people were needed to obtain higher *PCR*, with modern technology. Since increases in non-production workers imply development of human capital, a positive impact of PNWT on capacity realization is expected.

The negative signs of the market structure (*MSTRE*) variable supports the hypothesis that the higher the concentration ratio or degree of monopoly in an industry the lower is capacity realization. This variable is statistically significant, which suggests that the (monopolistic and oligopolistic) market structure did not change even after the implementation of economic policy reforms. This is supported by the views of many policy-makers and international donor agencies who believe that market structure realization attributed to economic policy reforms in Bangladesh are incomplete (Mahmud 2002). The positive sign of the openness variable (*OPN*) implies that the more open firms (or sectors) have better rates of capacity The influence of *ERA* on capacity realization is not clear. It seems to have exerted a significant negative influence on capacity realization after the reforms. Before the reforms, most of the enterprises in the food-processing sector, except for sugar products were new, and *ERA* provided insulation for these firms from external influences and thus helped to realize higher production capacity, at least in the short run. But, when *ERA* is continued over a longer period, it has the potential to produce a negative effect on *PCR* which is found in this study. The economic reforms have included removal of protective measures which allow uncompetitive firms to survive such as quantitative restrictions, reduction of tariffs and increasing assistance (subsidies, tax holidays, tax exemptions, etc.). Some firms survive only because of such protection and assistance and not through the efficient utilization of their capacity. Therefore, the negative correlation between *ERA* and *PCR* is not unexpected.

The two ownership dummies exerted an insignificant influence, although their coefficients have the expected positive signs in all years. Since these variables are not statistically significant, it may be argued that rate of capacity realization is independent of the locus of ownership. Such an outcome might be the result of the failure of liberalization to promote competition because of the replacement of the public sector monopoly by private sector monopolies. In fact, the privatization process in Bangladesh has been judged as grossly mismanaged (Sobhan 1990). However, these results are not certain because these variables might capture other aspects of firms' heterogeneity more than just ownership. In this context, it may be argued that efficiency gains hinge on the structure of the manufacturing sector and overall economic environment of the economy rather than just on the change of ownership. This is in agreement with Hemming and Monsoor who concluded that '..... if privatization involves no more than a transfer of activities from the public to the private sector, it may yield only limited gains' (1988:15). The overall fit of regressions is restricted. R^2 values are 31, 42 and 57 per cent respectively in three different models which implies that a large proportion of inter firm variation in capacity realization remains unexplained. This implies that other important variables, which may have an important influence on PCR, are omitted from these regressions. Had it been possible to include other excluded variables these results would have been more robust.

ROBUSTNESS AND SENSITIVITY ANALYSIS

How robust are the inferences drawn above can be checked by undertaking sensitivity analysis. Leamer (1983) introduced a simple and systematic way to test the robustness of the coefficients in the extreme bound analysis (EBA). This paper follows the variant of the EBA suggested by Levine and Renelt (1992). This test involves estimation of the regression of the following form:

$$PCR_{it} = \alpha_j + \beta_{zj} Z + \beta_{fj} f + \beta_{xj} X_j + \varepsilon_{ij} \qquad (2)$$

where *PCR* is productive capacity realization rate, *Z* is independent variable of interest, *f* is the set of free variables that always appears in the regressions and $X_j \in \xi$ is a set of up to three variables taken from the pool χ of *N* remaining 'doubtful' independent variables. EBA consists of estimating regression (2) for all possible *M* combinations of $X_j \in \xi$ from the *N* doubtful regressors. For each model *j*, there is an estimate β_{zj}, and a standard deviation, σ_{zj}. According to Levine and Renelt (1992) the lower extreme bound is found from β_{zj}-σ_{zj} and the upper extreme is found to be $\beta_{zj}+\sigma_{zj}$. If the lower and upper bounds so obtained remains in the positive (or negative) domain, the variable Z can be considered as robust. If not, it is fragile, as its sign depends on alterations in the set of explanatory variables.

TABLE 3
EXTREME BOUND ANALYSIS (EBA)

Variable	Type	β	Stand error	R^2	Extrm. bound	Additional variables	Robust/Fragile
SZE	base	0.13	0.012	0.31			R
	highest	0.15	0.014	0.35	0.18	CINSTY, ERA, OPN	
	lowest	0.07	0.010	0.32	0.05	MSTRE AGE, PNWT	
AGE	base	-0.26	0.051	0.42			R
	highest	-0.17	0.052	0.45	-0.07	CINSTY, SZE , OPN	
	lowest	-0.18	0.052	0.40	-0.28	MSTRE, ERA, PNWT	
CINSTY	base	-0.09	0.081	0.42			F(1)
	highest	-0.07	0.080	0.46	0.09	SZE, ERA, OPN	
	lowest	-0.10	0.079	0.40	-0.26	MSTRE, *AGE*, PNWT	
PNWT	base	0.28	0.026	0.42			R
	highest	0.35	0.027	0.36	0.40	CINSTY, ERA, OPN	
	lowest	0.28	0.031	0.33	0.22	MSTRE, AGE, SZE	
MSTRE	base	0.05	0.017	0.31			R
	highest	0.16	0.022	0.28	-0.12	CINSTY, ERA, OPN	
	lowest	0.08	0.024	0.25	-0.03	SZE, AGE, PNWT	
ERA	base	-0.22	0.043	0.42			F(1)
	highest	-0.06	0.041	0.40	0.02	CINSTY, AGE, *OPN*	
	lowest	-0.26	0.045	0.35	-0.35	MSTRE, SZE, PNWT	
OPN	base	0.15	0.071	0.31			F(1)
	highest	0.18	0.070	0.28	0.32	CINSTY, ERA, SZE	
	lowest	0.04	0.068	0.27	-0.01	*MSTREE*, AGE, PNWT	

Note: *R: robust/ F: fragile, with the number between brackets representing the number of additional variables necessary to provoke sign reversal (the implicated variables are in italic in the penultimate column).*

The results from the extreme bound analysis are presented in Table 3. The first column corresponds to the M variables, while the last one reports the final diagnosis of variables. If the coefficient is fragile, the number between brackets indicates the number of additional variables necessary to provoke a sign reversal, and the implicated variables given in italic form in the penultimate column. Most of the variables appear to have robust correlation with PCR_{it}. However, the robustness of *SZE* and *MSTRE* does not seem firmly established, as the lower bound is particularly close to zero. In case of *SZE*, the explanation can be found from the strong correlation with one of the other regressors. From the Appendix Table 1 it can be seen that the partial correlation between *SZE* and *AGE* is 0.619. The positive sign of *SZE* implies the general dynamism of firms over time. The older the firm is the larger is its size. However, the variable *AGE* has negative coefficient indicating that, when a firm's machinery and equipment become old, there is less likelihood of achieving full capacity realization. Although *SZE* and *AGE* are two important variables, reflecting the reality appear to be working opposite in realizing production capacity. In case of *MSTRE* variable half-hearted market reforms are partly responsible. Many policy-makers and academics of the country are of the view that market structure in Bangladesh remains oligopolistic if not monopolistic even after the implementation of economic reform. Moreover, many people argued that the market structure variable proxied by the four-firm concentration ratio is extremely susceptible to misrepresentation, partly because it essentially captures only some of the myriad of forces that combine together to influence the level of competition in any particular sector.

Most of the firms in Bangladesh food manufacturing except tea processing & blending are import competing rather than export oriented. This industry is still in the development stage. Using largely local raw material this sector is geared mainly to meet the domestic needs. Moreover, most of the firms are sheltered by the government policies. Therefore, the fragility of *OPN* and *ERA* are not a surprise at all. Again, the coefficients of these variables are not statistically significant as it observed from Table 2. The fragility of variables *CINSTY* is not unexpected as it is strongly correlated with *SZE*. However, in view of this potential multicollinearity among explanatory variables and the interaction between firm-specific and sectoral variables and policy variables, the above inferences can be considered quite strong.

SUMMARY AND CONCLUSIONS

This paper analyses the influence of a number of variables on productive capacity realization across firms and over time. While some of these factors are firm-specific characteristics such as size, age and ownership, others are policy-oriented variables such as openness and effective rate of assistance. The objective is to identify influential variables which might be manipulated by government policy to improve the rate of PCR. While not all factors are statistically significant, there are some important indicators for policy purposes. One is that initiatives are required to be industry specific to target accurately those influential variables which can improve productivity performance in terms of capacity realization. For example, age of firm (AGE) has significant negative impact on capacity realization of firms. The policy implication is obviously that modernization in terms of plant and equipment in all sectors of the industry will tend to improve the rate of capacity realization. A striking finding was the insignificance of the current trade and industrial policy reforms related variables (such as OPN and ERA). This implies that policy reform to remove impediments to the competitive process may have had little impact to date on productive capacity realization. This is also supported by the lack of robust correlation between these variables and PCR. This is attributed to piecemeal and partial nature of policy reforms. Thus, the results suggest further reforms with judicious dismantling of the existing tariff structure and lavish assistance policies of firms in order to enhance competition and competitiveness that ensure efficiency of production agents. Greater emphasis on export promotion would accelerate improved resource allocation performance and increase realization of production capacity in the industrial sector.

APPENDICES

VARIABLE CONSTRUCTION

Productive Capacity Realization (PCR): In the literature, productive performance of economic agents is measured in a number of ways. Traditionally, it is measured by indices of profitability, labor productivity, capital utilization, technological change, capacity realization, and above all, by total factor productivity (TFP) growth. Some of these measures, such as labor productivity and capital utilization are partial productivity measures, the limitations of which are well known in the literature. This study focuses on total performance measures in terms of capacity realization of production agents. Productive capacity realization is defined as the ratio of actual to maximum possible output obtainable from a given set of inputs and technology, *i.e y/y**. Firm-specific capacity realization indices are calculated by using the modified version of the stochastic-coefficient frontier production function followed by Kalirajan and Salim (1997). Summary of PCR calculations are given in the following Table 1:

APPENDIX TABLE 1
PRODUCTIVE CAPACITY REALIZATION IN FOOD PROCESSING INDUSTRIES

Sectors	Minimum	Maximum	Mean
Dairy products (3112)	0.629	0.834	0.726
Fish and sea foods (3114)	0.584	0.694	0.777
Hydrogenated veg. oil (3115)	0.787	0.860	0.814
Edible oil (3116)	0.619	0.900	0.821
Grain milling (3118)	0.625	0.805	0.722
Rice milling (3119)	0.462	0.814	0.620
Bakery products (3122)	0.420	0.862	0.564
Sugar factories (3123)	0.329	0.622	0.454
Tea and coffee processing (3126)	0.399	0.886	0.539
Tea and coffee blending (3127)	0.666	0.799	0.732
Total	0.329	0.900	0.587

Source: Calculated from CMI data (Master Tape, Current Production). Note: Numbers in the parentheses are industrial codes from 'Bangladesh Standard Industrial Classification' (BSIC).

Firm Size (SZE): Firm size can be measured by taking one of the attributes of firms: value added, value of shipments, sale proceeds, employment, or fixed assets. However, the measurement of firm size by using value added, value of shipments, and sale proceeds is not reliable, since these variables are susceptible to price fluctuations. Price inflation or deflation alters firm size measurement. Again, the employment measure can be compromised by technological change, which alters capital to labor ratios in production (Koch 1980). None of these alternatives is particularly suitable as a unit of measurement of firm size. Hence, the fixed asset measure, while not optimal, is used in this study.

Capital Intensity (CINSTY): There are a number of alternative measures of capital intensity. The most common measure is the capital-labor ratio (K/L) where K is fixed assets and L is the total number of workers employed. The main limitation of this approach is that it ignores the quality of labor in the production process. An alternative measure of capital intensity in the literature uses a value added criterion, *i.e.* value added per employee (Lary 1968). According to Lary, if the value added per employee of a firm (or industry) is less than

the average of all firms (industries) then that firm (industry) is labor intensive, while if the value added exceeds the average of all firms (industries) it is capital intensive. The severe limitations[3] of Lary's method precluded us to use in this study. Morawetz (1981) provided an alternative method in which the various categories of capital and labor are weighed with accounting prices. As the available data do not permit such a disaggregation of labor and capital, this method could not be undertaken. This study uses the capital-labor ratio, as a measure of capital intensity, which is less controversial and computationally simpler.

Market Structure (MSTRE): The best known and most frequently used measure for market structure is the *concentration ratio*. The *X*-firm (where *X* is number of firms) concentration ratio, CR_x, is defined as the share of the largest *X* firms in the industry concentrated (using whatever measure of size is thought to be appropriate and available). This is formally written as $CR_x = \sum_{i=1}^{x} P_i$ where CR_x is the measure of *X*-firm concentration ratio and P_i is the share of firm i in sales, value added, employment, or whatever measures of economic activity are chosen. Now, a value of CR_x close to zero would indicate that the largest *X* firms supply only a small share of the market while 100 per cent would indicate a single or monopoly supplier. The chief problem with this measure is the selection of *X*, the number of firms. Unfortunately, economic theory suggests nothing in this regard. This study constructs a four-firm concentration ratio using gross value of output of four-digit level selected manufacturing industries of Bangladesh, ranking by the size of fixed assets.

Effective Rate of Assistance (ERA): Effective Rate of Protection (ERP) is the conventional measure for analyzing the impact of policies on production units. Another measure recently developed in the literature is known as the Effective Rate of Assistance (ERA). The ERP accounts only for trade policies while the ERA incorporates both trade and domestic assistance policies, which directly affect the prices of factors, material inputs, products, the assistance in the form of price and quantity controls, import bans, and similar policies were also translated through appropriate methodologies into quasi-taxes and quasi-subsidies including debt default (which is assumed as a subsidy). Thus, the ERA is the relevant measure for this study. Following the methodology of the HIID's (Harvard Institute of International Development) study (1990) ERAs are estimated for this study.

Other Variables: Several other variables used in this study are constructed using simple calculations. The age of a firm (AGE) is computed as the difference between the year of the census and the year of operation for production. Openness (OPN) is calculated as the ratio of exports of a particular firm over total output at the three-digit industry level. Finally, two dummy variables (DPVT, DJNT) reflecting the type of ownership are used.

APPENDIX TABLE 2
CORRELATION MATRIX, SELECTED SERIES

Variables	AGE	SZE	CINSTY	MSTRE	OPN	ERA
AGE	1.000					
SZE	0.619	1.000				
CINSTY	0.136	0.729	1.000			
MSTRE	0.073	0.223	0.073	1.000		
OPN	-0.252	-0.204	0.089	0.093	1.000	
ERA	0.118	0.693	-0.100	0.085	-0.138	1.000

ENDNOTES

*I am grateful to Professor Kalirajan, Dr. Ric Shand and seminar participants at the Australian National University for their comments on an earlier version of the paper. I am also grateful to the anonymous referee and the editor of this journal for various helpful comments and suggestions which materially improved the quality of the paper.. However, I am alone responsible for any errors remain.

[1] In the literature, the term 'capacity utilization' is used to describe the most efficient output minimizing the present values of the cost stream given stock of capital and technology (Morrison 1988 and Kang and Kwon 1993) while this study uses the term 'capacity realization' to describe maximum possible output obtainable from a given set of inputs and technology by following Klein (1960) and Färe *et al* (1989). Clearly, capacity realization is a broader concept than capacity utilization. For details please see Salim, R (1999).

[2] Since 1991, BBS started new methodology and harmonized industrial classification codes with ISIC (International Standard Industrial Classification). This is why we used here firm-level data from 1992. Moreover, 1995 and 1996 are two years of political turmoil so the CMI data are very irritable for this period. Therefore, we excluded data for these years. Finally, the year 1999 is the last year in which CMI data are available.

[3] These are: first, it confuses labor productivity with capital intensity. Second, it cannot capture the quality variations or human capital issue in the presence of widespread market imperfections and excessive government intervention in an economy's factor and product markets, particularly in developing countries. Third, economies of scale of firms (or industries) are not reflected in this measure.

REFERENCES

Bangladesh Bureau of Statistics (BBS) *Census of Manufacturing Industries* (CMI) (several issues), Ministry of Planning, Government of Bangladesh.

Bangladesh Bureau of Statistics (BBS) *Statistical Yearbook* (Several issues), Ministry of Planning, Government of Bangladesh.

Bardhan, P. (1992) Economics of Market Socialism and the Issue of Public Enterprise Reform in Developing Countries, *Pakistan Development Review*, 30 :565-79.

Bautista, R. M. (1981) Philippines: country study in Bautista, R. *et al* (eds) *Capital Utilization in Manufacturing*, Oxford University Press.

Caves, R. E. & Barton, D. R. (1990) *Efficiency in U. S. Manufacturing Industries*, Cambdrige, Mass: The MIT Press.`

Chamberlin, E. H. (1938) *The Theory of Monopolistic Competition: A Reorientation of the Theory of Value*, Cambridge, Mass: Harvard University Press.

Diokno, B. (1974) Capital Utilization in Government 'Favoured' Export-Oriented Firms, *Philippine Economic Journal*, 13 :149-88.

Färe, R., Grosskopf, S. & Kokkelenberg, E. C. (1989) Measuring Plant Capacity, Utilization and Technical Change: A Nonparametric Approach, *International Economic Review*, 30 :655-66.

Garnicott, K. (1984) The Developments of Industrial in Australia, *Economic Record*, 60 :231-35.

Goldar, B. & Renganathan, V. S. (1991) Capacity Utilization in Indian Industries, *Indian Economic Journal*, 39 :82-92.

Grossman, G. & Helpman, E. (1990) Trade, Innovation, and Growth, American Economic Review, (Papers and Proceedings) 80 :86-91.

Harvard Institute of International Development (HIID), (1990) An Assessment of the Impact of Industrial Policies in Bangladesh', Working Paper No. 16, Planning Commission, Dhaka.

Hemming, R. & Monsoor, A. M. (1988) Privatization and Public Enterprises, IMF Occassional Paper No. 56, Washington, D. C.

Kalirajan, K. P. & Salim, R. A. (1997) Economic Reforms and Capacity Realization in Bangladesh: An Empirical Analysis, *Journal of Industrial Economics*, XLV, :387-403.

Kang, J. & Kwon, J. (1993) Capacity Utilization in Korean Manufacturing Industries, *International Economic Journal*, 7 :23-45.

Klein, L. R. (1960) Some Theoretical Issues in the Measurement of Capacity, *Econometrica*, 28 :272-86.

Lary, H. B. (1968) *Imports of Manufactures from Less Developed Countries*, Columbia University Press, New York.

Leamer, E. (1983) Let's Take the Con Out of Econometrics, *American Economic Review*, 73 :31-43.

Lecraw, D. (1978) Determinants of Capacity Utilization by Firms in Less Developed Countries, *Journal of Development Economics*, 5 :139-53.

Leibenstein, H. (1976) Allocative Efficiency vs X-efficiency, *American Economic Review*, 56 :392-15.

Levine, R. & Renelt, D. (1992) Asensitivity Analysis of Cross CountryGrowth Regressions, *American Economic Review*, 82 :942-61.

Lim, D. (1981) Malaysia: Country Study in Bautista, R. *et al* (eds) *Capital Utilization in Manufacturing*, Oxford University Press.

Mahmud, W. (2002) Market Reforms and Manufacturing Production in Bangladesh, (mimeo) Bureau of Economic Research, University of Dhaka

Morawetz, D. (1981) Israel: Country Study in Bautista, R. *et al* (eds) *Capital Utilization in Manufacturing*, Oxford University Press.

Morrison, C. J. (1988) Capacity Utilization and Productivity Measurement: An Application to the U. S. Automobile Industry, in Dogramaci, Ali & Färe, R. (eds) *Application of Modern Production Theory: Efficiency and Productivity*, Kluwer Nijhof, Netherland

Mueller, J. (1974) On Sources of Measured Technical Efficiency: The Impact of Information, *Amerian Journal of Agricultural Economics*, 56 :730-38.

OECD. (1986) Main Economic Indicators, Paris, (mimeo).

Pasha, H. A. & Qureshi, T. (1984) Capacity Utilization in Selected Industries of Pakistan, *Pakistan Journal of Applied Economics*, 3, pp. 29-56.

Pilat, D. (1995) Comparative Productivity of Korean Manufacturing, 1967-1987, *Journal of Development Economics*, 46 :123-44.

Salim, M. R. A. (1999) *Capacity Realization and Productivity Growth in a Developing Country: Has economic Reform Had Impact?*, Ashgate, UK.

Scherer, F. M. (1996) *Industry Structure, Strategy, and Public Policy*, Harper Collins

Schumpeter, J. (1942) *Capitalism, Socialism and Democracy*, Harper and Row, NY.

Schydlowsky, M. D. (1973) On Determining the Causality of Underutilization of Capacity: Working Note, Department of Economics, Boston University, (mimeo).

Sobhan, R. (1990) The Development of the Private Sector in Bangladesh: A Review of the Evaluation and Outcome of State Policy, BIDS Research Report No. 124, Dhaka.

Soderbom, M. and Teal, F., Size and efficiency in African manufacturing firms: evidence from firm-level panel data *Journal of Development Economics*, 73(1) :369-94.

Srinivasan, P. V. (1992) Determinants of Capacity Utilization in Indian Industries, *Journal of Quantitative Economics*, 8 :139-56.

Thoumi, F. E. (1981) Colombia: Country Study in Bautista, R. *et al* (eds) *Capital Utilization in Manufacturing*, Oxford University Press.

Winston, G. C. (1971) Capital Utilization in Economic Development, *Economic Journal*, 81 :36-60.

Yanikkaya, H. (2003) Trade Openness and Economic Growth: A Cross-country Empirical Investigation, Journal of Development Economics, 72(1) :57-73

Zheng, J., Liu, X. and Bigsten, A., (1998) Ownership Structure and Determinants of Technical Efficiency: An Application of Data Envelopment Analysis to Chinese Enterprises (1986–1990), *Journal of Comparative Economics*, 26(3) :465-484.