

Growth, Efficiency and Productivity of Indian Manufacturing Firms in the Post-Reform Era

ABSTRACT

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The present study estimates the growth of output (GROUT), efficiency (both input oriented technical efficiency (ITE) and output oriented technical efficiency (OTE)) and productivity (Total Factor Productivity Growth (TFPG)) of Indian manufacturing firms including the following nine industry-groups: Chemical & chemical products industry (Chemical industry), Food Products, beverages & tobacco industry (Food products industry), Leather & related products industry (Leather industry), Machinery industry, Metal & metal products industry (Metal industry), Non-metallic mineral products industry, Paper & paper products industry (Paper industry), Textile industry and Transport & transport equipment industry (Transport Industry) in the post –reform era. The growth rate of output has been measured as done in the standard literature and efficiency (both ITE and OTE) and TFPG have been measured using Non-parametric Data Envelopment Analysis (DEA), exploring Centre for Monitoring Indian Economy (CMIE) Prowess Database at company (firm) level for the period March, 1995- March, 2016. This study finds out the determinants of growth, efficiency (both ITE and OTE) and productivity separately for all the nine industry groups considering the effect of advertising-intensity (ADV), marketing-intensity (MKT), R&D-intensity (RD), net export-intensity (NX i.e. difference between export intensity and import intensity), firms-size, diversification index and age of the firms in a simultaneous panel regression framework considering the following endogenous variables: GROUT, ADV, RD, MKT and NX for Growth Block; ITE, ADV, RD, MKT and NX for ITE Block and OTE, ADV, RD, MKT and NX for OTE Block; TFPG, ADV, RD, MKT and NX for TFPG Block;. The empirical result suggests that the sample manufacturing firms are experiencing 13.95% of growth of output during the study period. The highest 36.19% growth has been experienced by non-metallic mineral products industry and the lowest 6.89% of growth has been experienced by the food products industry. About 39% of sample Indian manufacturing firms are working above the mean growth rate of output. The highest 56% of sample firms are working above the mean growth rate of output in transport industry and the lowest 14% of sample firms are working above the mean growth rate of output in non-metallic mineral products industry. The highest 50.17% of Indian sample firms are experiencing the growth of (0-10) %. The maximum percentage of sample firms included in all the nine industry groups is having growth of output lying in between the range (0-10) %. About 11.45% of sample firms are experiencing negative growth. The highest 35.71% of sample firms included in the paper industry are having negative growth rate of output. More than 100% growth is being experienced by only 0.79% firms. The highest 7.14% of sample firms included in the non-metallic mineral products industry is having growth rate of output more than 100%. The mean input oriented technical efficiency has been increased from 0.845 in 1995 to 0.868 in 2016 for the sample firms. The grand mean input oriented technical efficiency is 0.884 for the sample firms. If the inputs are efficiently used, then the same level of output could be produced by reducing 11.6% of inputs. For the present sample, the mean input oriented technical efficiency is the highest (0.940) in leather industries and the lowest (0.825) in food products industry. About 30% of the total sample firms are input-efficient on an average. The highest 64% of sample firms in leather industry are input-efficient whereas the lowest 12% of sample firms under

chemical industry are input-efficient. The estimated result of mean input slack shows that the same amount of output can be produced by reducing raw materials input by 29.420%, energy & water input by 23.820%, labour by 26.486%, land by 3.941% and capital by 139.457% for the sample manufacturing firms all industries taken together on an average. Among all the inputs used in the production process, capital is being most inefficiently utilized by all the considered nine industry groups. Among all these industry groups, chemical industry is utilizing capital, energy & water input and land most inefficiently. Non-metallic mineral products industry is employing raw materials input most inefficiently. Transport industry is using labour most inefficiently. The mean output oriented technical efficiency has been increased from 0.852 in 1995 to 0.874 in 2016 for the sample firms. The output oriented technical efficiency is 0.897 for the sample manufacturing firms on an average. If the inputs are efficiently used, then the additional 10.3% output can be produced by utilizing the same level of inputs. The mean output oriented technical efficiency is the highest (0.954) for the sample firms in leather industries and the lowest (0.835) for the sample firms in chemical industries. About 31% of sample manufacturing firms are output efficient on an average. The highest 64% of sample firms of leather industries are output-efficient whereas the lowest 14% of sample firms in chemical industry are output-efficient. On an average, the mean efficiency change, the mean technical change and the mean scale change are 1.000, 0.967 & 1.004 respectively for the sample firms all industries taken together. The mean TFPG is 0.958 for the sample firms, indicating that TFPG has declined by 4.2% over the study period. For the present sample, the efficiency change has been increased only for paper industry, the technical change has been increased only for food product, leather, machinery industry, metal, textile and transport industries, the scale change has been increased only for paper and transport industries and TFPG has been increased only for paper and textile industries in the study period. For the current sample, the mean efficiency change is the highest (1.017) for metal industry and the lowest (0.973) for food products industry. The mean technical change is the highest (0.979) for machinery industry and the lowest (0.940) for metal industry. The mean scale change is the highest (1.017) for metal industry and the lowest (0.995) for non-metallic mineral product industry. The mean TFPG is the highest (0.967) for leather industry and the lowest (0.938) for food product industry. Among all the industry groups, the highest 18% of sample leather firms are having MPI more than one. The highest 73% of sample metal firms are having average efficiency change more than one. The highest 15% of sample machinery firms are having average technical change more than one. The highest 77% of sample metal firms are having average scale change more than one. The growth rate of efficiency change is the largest contributor of total factor productivity change for all the industries except leather industry. On an average, growth rate of efficiency change, technical change, scale change and total factor productivity change are 118.05%, 5.24%, 10.63% and 125.24% respectively for the current sample over the study period. For the present sample, mean growth rate of efficiency change is the highest (271.98%) in paper industry and the lowest (5.4%) in leather industry. Mean growth rate of technical change is the highest (8.16%) in non-metallic mineral products industry and the lowest (2.49%) in food products industry. Mean growth rate of scale change is the highest (43.79%) in paper industry and the lowest (2.95%) in food products industry. Mean growth rate of TFPG is the highest (287.53%) in paper industry and the lowest (29.89%) in chemical industry. The

comparative analysis between growth, efficiency and productivity suggests that high growth implies high productivity but does not necessarily imply high level of efficiency for the sample Indian manufacturing firms. On an average 36% of the sample firms are working above mean TFPG, mean input oriented technical efficiency and mean output oriented technical efficiency. The highest 43% of sample firms in leather and paper industries are operating above mean TFPG, mean input oriented technical efficiency and mean output oriented technical efficiency whereas the lowest i.e. only 30% of sample firms in chemical industry are operating above mean TFPG, mean input oriented technical efficiency and mean output oriented technical efficiency. About 38.60% of highly productive sample firms are having high ITE as well as high OTE on an average. For the present sample, high productivity will indicate high efficiency (both ITE & OTE). For chemical, food products, leather, machinery, non-metallic mineral products and textile industries, the most of the sample firms are having high ITE as well as high OTE. The determinant analysis suggests that the increase in ADV, MKT, RD and NX enhances firms' performance and these strategic variables in turn get significantly affected by firms' performances for the sample firms included in all the nine industry groups. For the present sample, the younger firms are performing better than the older firms in chemical, food products, machinery, textile and paper industries while the older firms display superior performance in leather, metal, non-metallic mineral products and transport industries. As the market share gets diversified, the firms' performance will be better in leather, metal, paper and textile industries while as the market share gets concentrated, the firms' performance will be better in chemical, machinery, transport, non-metallic mineral products and food products industries. The larger sized firms are showing better performance in chemical, food products and machinery industries whereas the smaller sized firms are having better performance in leather, metal, textile and paper industries. Real Effective Exchange Rate (REER) is negatively related to NX, indirectly affecting different firms' performances in food products, machinery, metal and non-metallic mineral products industries. Some policy measures are suggested to promote growth, efficiency (both ITE and OTE) and productivity for different manufacturing industry-groups.

Key Words: Total factor productivity growth, Manufacturing Sector, Indian Economy

JEL Classifications: D24, L6, O50