MSME Competitiveness Analysis of economy in transition from Factor Driven to Investment Driven Stage: Case study of Andhra Pradesh

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Abstract

The purpose of this paper is to identify the growth areas in manufacturing sector which can provide impetus to a factor driven economy to scale up and reach investment driven stage. It assesses the competitiveness of four manufacturing sub-sectors of an emerging sub-national economy through Porter diamond analysis. We explore the relationships between various components of Porter's diamond for select manufacturing sub-sectors in the State. While the key findings of the analysis include a distinction between the competitiveness drivers for low skill labor intensive sectors and capital intensive manufacturing sectors. The main findings include the identification of competitiveness drivers for the manufacturing sub-sectors and role of the state government in giving them an accelerated push.

Keywords: Competitiveness, Emerging Economy, MSMEs, Porter Diamond Analysis, Structural Transformation

I. INTRODUCTION

Exploring the prospect of economic growth for developing countries, significant research has been conducted by economists in suggesting alternative development models (Solow, 1956) (Gustav, 2004). (Rodrik, McMillan, & Sepulveda, 2016) have asserted on the structural transformation of an economy for increasing its productivity levels. This essentially means shifting of the resources into those economic activities that ensure higher value addition and hence productivity. As industrial productivity is highly correlated with competitiveness (Backus, 2019), structural transformation becomes an imperative action for the least developed and developing countries. The pattern of structural change undergone by an economy may however vary, like the case of African economies that have showcased a decline in the labor productivity growth from the modern sectors of the economy as an outcome of increased incomes from agriculture (Diao, Rodrik, & Margaret, 2017).

(Joshi & Somayaji, 2019) have asserted that economies have raised their competitiveness as a function of different development pathways followed. While some economies chose to increase their competitiveness by marking a linear shift through strengthening the factor driven parameters like infrastructure, education, and technology; few economies chose to build upon their industrial productivity by strengthening the goods market efficiency and institutional indicators. While industrial applications of technology play a critical role in transforming an economy from factor driven to investment/efficiency driven, nations that are at a mature stage of factor-based comparative advantage can accelerate their low/semi-skill labor intensive industrial base by adopting the export-oriented production (Kitson, Martin, & Tyler, 2004). In the context of developing economies it has been observed that although their small & medium manufacturing units do not have a significant representation in the global value chains, few clusters have become evolved into being export-oriented (Tambunan, 2009). In this case competitiveness of these units has been a function of various levers like level of innovation and business strategy (Anton Agus, Muzakan, Muhammad, Syamsuddin, & Sidiq, 2015). Among the other critical levers of increasing competitiveness were development into a cluster agglomeration in order to achieve the optimum resource sharing, knowledge management, and local leadership (Aries, 2016).

(Porter M. E., The Economic Performance of Regions, 2003) has extensively analyzed the different types of industries operating out of an economy and inferred that regional competitiveness is a function of the proportion of traded, resource dependent and local industries. In essence competitiveness of a region can be leveraged through the plurality of the industrial base and production, and subsequent industrial innovation. At micro-economy level, competitiveness however is a function of firm's ability to compete in markets- national and global. Accelerating competitiveness by improving an economy's productivity and business environment can be determined by Porter's Diamond framework (Porter M. E., Location, Competition, and Economic Development: Local Clusters in a Global Economy, 2000) (Porter & Ketels, 2003).

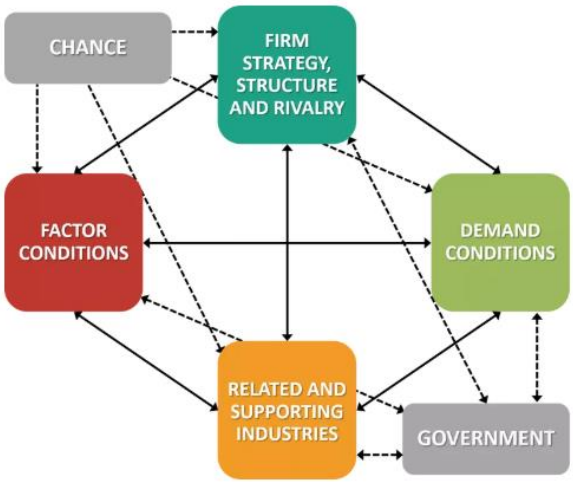


Figure 1: Porter's Diamond Model of Competitive Advantage

Delving deeper to the individual forces that constitute the Porter's diamond model: Factor conditions capture the natural endowments, physical infrastructure and connectivity aspects, availability of human resources, etc. Demand Conditions include buyer sophistication and the presence of well integrated firms within the cluster. Meanwhile Firm Strategy & Rivalry sets the context for production process sophistication within the industries, capacity for innovation in the industrial segments, and nature of competitive advantage. Lastly, the component Related & Supporting industries encompasses the indicators like local supplier quality & quantity, value chain breadth, etc. Additionally, the component 'Government' in the diamond-model includes indicators related to the regulatory facilitations provided to the businesses through property rights, efficiency of legal framework in settling disputes, transparency in policy making, property rights etc. While 'Chance' capitulates the possibilities of those events that can affect the operations of a business, such as disease outbreak, violence outbreak, or any major breakthrough in that industry.

Studies mapping the determinants of competitiveness based on the Porter Diamond Framework have been conducted to assess the competitiveness of MSMEs at firm level (Kharub & Sharma, Comparative analyses of competitive advantage using competitive advantage using of MSMEs in Himachal Pradesh), 2017). For the Indian landscape, the overall attractiveness of industries like automobiles (Bhatia J. D., 2016), plastics (Mandal, Porter's Five Forces Analysis of the Indian Plastic Industry, 2011), sports goods (Jhamb P. D., 2016) have been well explored through various determinants of competitiveness. While the Porter's Diamond Framework emphasizes on driving competitiveness by creating a fostering business ecosystem connected through common institutions and shared externalities in a given cluster, (Porter M. E., The Five Competitive Forces that Shape Strategy, 2008) has derived a framework that can be applied to individual firms in an industry, so as to assess the attractiveness levels of the industry and the operating forces that govern a particular industry. He has asserted that it is the industry structure that drives competition and profitability. (Dobbs, 2014) has elaborated upon the Porter's Five Competitiveness forces and provided template consisting of indicators for each and every Competitive force, summarized below:

- **Competitive Rivalry** which encompasses the variables 'industry growth', 'product differentiation', 'switching costs', fixed and/or storage costs', 'capacity expansion', and 'exit barriers'
- **Threat of Buyers/buying groups** which includes the variables 'industry products', 'buyer information', 'buyer backward integration', 'buyer switching costs', buyer profitability'
- **Threat of Supplier/Supplier Groups** which includes 'supplier concentration', 'supplier volume/profit', 'forward integration of suppliers', 'supplier products', and 'supplier substitutes'
- **Threat of New Entrants** that includes 'supply side economies of scale' and demand side benefits of scale' along with 'distribution channels' and 'government policy'
- **Threat of substitutes**

This paper tries to evaluate the competitiveness of the manufacturing sector of an emerging market- sub-national economy of India- state of Andhra Pradesh, which has been recently created after bifurcation of the erstwhile state of Andhra Pradesh into the state of Telangana and the state of Andhra Pradesh (GoI, 2014). By computing the Porter's Diamond for various manufacturing sub-sectors, this paper tries to highlight the drivers of competitiveness for the manufacturing sub-sectors of the state. Further, it tries to do a detailed assessment of major variables forming the determinants of competitiveness viz. Demand Conditions, Factor Conditions, Firm Strategy Structure & Rivalry, and Related and Supporting Industries, Government & Chance for each of the manufacturing sub-sectors.

By associating the industry perception for each of the manufacturing sub-sectors with respective determinants, we not only try to plot the major driver for a particular sector, but also identify the related causes behind the performance/non-performance of that sector towards specific variables. Eventually, the paper leads to associating the government interventions with the perception results and suggests actions that emerging markets can undertake in order to structurally transform their economy.

II. LITERATURE REVIEW

This section details into three broad themes: Clusters as an instrument to building competitiveness, SME productivity and competitiveness in developing countries, and Porter Diamond for various manufacturing sectors in developing countries.

(Porter M. E., 1998) had argued that firms create competitive advantage by locating themselves into a cluster that is highlighted by optimal sharing of resources like transport infrastructure, sophisticated methods of production, continuous innovation in either processes or products. Further, for developing countries economic development can be facilitated by clusters through more internal and regional trade. Cluster Development Programs in developing economies have facilitated the clusters in meeting the targeted outcomes. (Garone & Maffioli, 2016) have studied Brazil's (Sao Paulo and Minas Gerais) local productive arrangement system through testing for the effects of related policy on firms located in these clusters. They found that the beneficiary firms increased their exports by 90% as compared to the firms in control group; employment levels of the firms in treatment group also increased by 17% creating gain in efficiency and positive spillovers. The results being more on less along same lines have also been highlighted by similar studies on clusters of other developing economies (Giuliani, Matta, & Pietrobelli, 2016), indicating the robustness of local linkages driving performance of SMEs located within a geographical location and optimizing shared resources for market access through improved access to new production technologies and organizational innovation (Kutschke, Rese, & Baier, 2016). However, a common challenge remains to build sustainably performing clusters on which extensive research has been carried out, suggesting the pivotal role of cluster-level services & facilitations offered by institutions. While, (Ingstrup, 2013) by studying four different clusters of Denmark, has asserted that cluster facilitation varies by the type of cluster, industry, and skill levels. (Schrammel, 2013) asserts clusters to be self-sufficient on provisioning of services like market information symmetries, personnel procurement, organizing platforms for networking, access to finance & venture capital, foreign trade promotion, technology access etc.

Viewing Small & Medium enterprises as a critical instrument of clusters, SME productivity becomes an important factor to assess competitiveness of the industry. Various strategies have been adopted by developing nations to augment the SME productivity; with SMEs in Malaysia strategically orienting towards greater information and market access through networks for enhanced firm performance (Wan Mohd Nazdrol bin, Abdullah, & Breen, 2013). Meanwhile economies like Indonesia that have chosen to build an export-oriented manufacturing sector, have gone for internationalization of their SMEs so as to increase their profitability through greater market exposure and learning opportunities (GInting, 2014). (Md. Nur, 2018) has emphasized on the determinants of export competitiveness of manufacturing sector by taking the case study of Bangladesh, wherein the factors like access to finance, trade facilitation, and government policies are found to be most significant.

Across industries there is large dispersion in the total factor productivity for manufacturing sectors. (Okada, 2005) has empirically investigated the competitiveness of the manufacturing sectors of Japan, and has found that highly regulated industries such as medical instruments, pharmaceuticals have shown less growth in the Total Factor Productivity as compared to the sectors that are more exposed to both domestic and international competition. Developing countries on the other hand can leverage their competitiveness by either harnessing their resource based industries or integrating themselves into the Complex Product Systems like Automobiles or Electronics Systems (Chaminade & Vang, 2006). Alternatively, (UNCTAD, 2005) highlights the productivity enhancement of SMEs in developing countries through building the local business community for traditional sectors that absorb a majority of regional labour, and linking them with institutional investors- foreign or domestic.

There is a vast pool of literature on Porter Diamond evaluation for various manufacturing activities involving complex assembly products like auto components (Jacob & Jagannathan, 2007), to simple manufacturing and less-capital intensive products like plastics, to highly capital and labour intensive like textile (Rodrigues & Khan, 2015). Similar studies have also been accomplished for MSME clusters (Kharub & Sharma, Investigating the role of Porter Diamond determinants for competitiveness in MSMEs, 2016). This paper tries to assess the competitiveness of manufacturing sector of a developing economy at sub-national level, by constructing Porter's Diamond for select manufacturing activities. Since, developing economies are characterized by strong presence of low-medium skilled workforce (Albaladejo & Weiss, 2017), the scope of this study is limited to labour intensive manufacturing sectors and evaluating their competitiveness.

III. METHODOLOGY

3.1 Study Design

The state of Andhra Pradesh has been conducting an annual assessment of its competitiveness since 2015. Back in 2015, it entered into a Memorandum of Understanding with the World Economic Forum for benchmarking itself against the global economies in terms of competitiveness. The first competitiveness assessment for the state was done in collaboration with the World Economic Forum and the Confederation of Indian Industries. The Global Competitiveness Index is a benchmarking tool developed in consonance with Porter's Framework of Competitiveness and includes both quantitative and qualitative aspects of assessment (Schwab, 2018). Whilst the qualitative aspect includes the survey of the business community and capturing their perceptions on various facets of competitiveness; the quantitative component is the aggregation of many indicators pertaining to the macro-economic environment, human development indicators etc. pooled in from international and national databases.

This paper originates from the competitiveness opinion survey data collected for the state of Andhra Pradesh for the year 2018-19. Sampling frame is decided by keeping in mind the structure of the economy; for Andhra Pradesh the agriculture-industries-services share in 2018 was 31%-24%-45%. Hence the sampling frame consisted of entrepreneurs proportionately representing this mix. Another important point to be noted is the geographical spread of the survey, which encompassed entrepreneurs from all the thirteen districts of the state.

The responses against each indicator for the determinants in Porter's Diamond were captured on a Likert Scale ranging from 1-7, with representation for each score number indicated in the questionnaire (Appendix 1). Shortlisting the MSMEs from the data collected, we got entrepreneurial perceptions from 193 establishments that were surveyed. These establishments ranged from low skill labor intensive sectors like metal casting, auto repair, and basic food processing activities to semi-skilled sectors like textiles & apparel, electronics assembly, etc. to high skill capital intensive sectors like petrochemicals and pharmaceuticals.

Table 1 below summarizes the number of manufacturing establishments surveyed across each product. category. It is evident that Food Processing, Textiles & Apparel, Minerals & Metals, and Heavy Engineering (Heavy Machinery & Construction taken together as one category) emerge as major sectors of the economy employing most of the state's labor force. Other manufacturing industries, carrying a smaller representation are however not analyzed in depth through the Porter Diamond.

Table 1: Category of Manufacturing Units & Distribution of firms

PRODUCT CATEGORY	MANUFACTURING ESTABLISHMENTS CAPTURED
FOOD PROCESSING	49
TEXTILES & APPAREL	46
MINERALS & METALS	33
HEAVY MACHINERY	12
CONSTRUCTION	12
PETROCHEMICALS & CHEMICALS	13
PAPER & PRINTING	10
ELECTRONICS & ELECTRICAL	7
PLASTICS	6
PHARMACEUTICALS	4
TOTAL	193

3.2 Descriptive Statistics Analysis of determinants of competitiveness

Since the responses against the questions asked in the Opinion Survey carry a strong perception component, descriptive analysis of the data is done to find the mean for the indicators grouped under the Six determinants of Competitiveness. The descriptive statistics were analyzed both inter-industry and intra-industry. While the intra-industry analysis of the perception variables gives a holistic picture of the determinants and variables constituting the competitiveness of that sector; the inter-industry analysis positions the status of a particular indicator for each industry and identifies the industry where it has the weakest linkage.

3.3 Porter Diamond Analysis

Porter Diamond Analysis is done on each select manufacturing sub-sector. The lengths of the diamond axes in the analysis represent the strength of linkage of different determinants of competitiveness with each other. Alternatively, the Diamond Area analysis represents the strength of the particular manufacturing sub-sector. For all the four manufacturing sub-sectors studied, competitiveness is investigated through the business perception data.

3.4 Hypothesis

While analyzing the Porter Diamond for each manufacturing sub-sector, we also test for the following hypothesis:

Hypothesis1: Economies in transition from factor driven to investment driven stage, have a key role of Government in driving the competitiveness of their manufacturing sectors

IV. EMPIRICAL FINDINGS & ANALYSIS

4.1 PORTER'S DIAMOND MODEL

4.1.1 **Food Processing:** The 49 food processing establishments surveyed include activities like horticulture processing, milling, marine food processing (includes fishes, shrimps, prawns etc.), fruit processing (pickle making, jelly making etc.), meat processing, edible oil refining, dairy products manufacturing, etc. Since the Food processing sector in developing countries is highly intertwined with the agriculture sector (Agarwal & Neogi, 2017), the state of Andhra Pradesh with an agriculture share of nearly 30% has a huge presence of food-processing establishments across all its districts.

Nature of this Industry in developing countries is that requiring low skill and being highly labor intensive, with a large domestic spread of input linkages sources from within the economy (Jongwanich & Nedelyn, 2009); The industry at large is quite fragmented with a large number of small sector firms. The presence of high level of informality and only a few conglomerates deters the industry from achieving the economies of scale (Kapoor & Sharma, 2016). Also, because of low investments in transportation and storage, most of the produce does not go through a rigorous harmonization and quality control process in the face of export competition (Trienekens & Zuurbier, 2007); exposing it to local markets with lesser buyer preferences and selling at significantly lower prices.

- For sub-national economy of Andhra Pradesh, **Factor Conditions** are at a better position, with a mean score of 4.80 out of 7. Food Processing sector in the state receives quality power supply for its operations, and has an access to quality infrastructure (ports & roads) that give it a good market exposure. However, the sector does not have strong linkages between university-industry-research that deters product development and hence catering to wider global markets.
- **Demand Conditions** for the food processing industry are strong, with a mean score of 4.97 out of 7. As the industry faces a high stringency of environmental regulations, the prospects of product innovation are higher for this sector. Value of 4.9 on the indicator 'Government procurement of advanced technology products' is yet another positive signal for the sector as it renders room for productivity enhancement.
- **Related & Supporting Industries** the sector shows a weaker value (4.74) as compared to other manufacturing sub-sectors. This is due to the sparse local availability of specialized training services that can upgrade the skill levels of the work-force to global market levels. The strength of clusters in terms of raw material availability and backward linkages is relatively stronger as compared to other manufacturing sub-sectors. However, limited availability of latest technologies is not deterring the sector from achieving export-led competitiveness.
- For the fourth determinant '**Firm Strategy Structure & Rivalry'**, FDI and related technology transfer is comparatively faster for the food processing sector due to open-ness of the sector for foreign investments and the related spillovers in technology that accrue from it. However, capacity for innovation among the manufacturing firms of the state and Intellectual property protection remains a serious glitch that is limiting competitiveness.
- For the Porter Determinant of '**Government**', the food processing sector is facilitated by a dedicated policy that spreads across specific products and is looked into by a defined institutional agency (Andhra Pradesh, 2015) .
- Lastly, over the Porter determinant '**Chance**', the food processing sector shows a very strong score of 5.22 on 7. This is mainly because of lesser susceptibility of the industry to violent out-breaks and disease out-breaks. In fact, food processing activity in Andhra Pradesh is driven by the determinant of Chance.

4.1.2 **Textile & Apparel:** The Textile & Apparel Sector contributes significantly to the total exports and employment generation. (India Brand Equity Foundation, 2017). The 46 Textile & Apparel Establishments surveyed include spinning mills, cotton mills, textile mills, handlooms, etc. The industry is characterized by low labor costs and vertically integrated production facilities (Kim, 2019). However, the skilling aspect for labor force varies across the two segments with textile being semi-skilled and capital intensive, and apparel as low-skill labor intensive.

- Among the **Factor Conditions**, the Textile and Apparel Industry faces strong infrastructure connectivity in terms of roads and electricity supply quality. However, the industry reports lower values for Quality of port infrastructure, highlighting the not so strong terms of trade for related cargo and cabotage, which are not making the sector export-

competitive and curtailing the products only to the domestic markets. The MSMEs in this sector is also supplemented with the robust financial instruments and incentives.

- For **Demand conditions**, the sector bears a higher value for the indicator 'stringency of environmental conditions' which point towards the scope of product innovation and making it eco-friendly. As per the perception of the business community, since buyer sophistication is low in this particular sector, most of the MSMEs related to garment manufacturing continue to remain small and cater to small sized orders based on seasonal demands of local customer.
- **Related & Supporting industries** have the highest value (4.90) among all the studied manufacturing sub-sectors. Although the business perception on supplier quality and quantity is strong, one of the critical issues in garment manufacturing sector has been the highly fragmented value chain which prevents the sector from modernizing, scaling-up, and changing the product mix and become increasingly export-competitive (Verma, 2002). This goes in line with the mediocre state of development of the related clusters (value 4.69). Also, the value for indicator 'Local availability of specialized training services' is highest for this sector (4.67), which is due to the fact that many skill development programs centered around imparting training on tailoring operate in the state.
- **Firm Strategy Structure & Rivalry** for the Textiles & Apparel Sector carries a score of 5.00. This is constituted by the sector's strong performance over the indicators: 'production process sophistication', 'Degree of Customer Orientation', 'Extent of Marketing', and 'Intellectual Property Protection'. Though the capacity for innovation and company spending on R&D is lower for the local firms, firm level technology absorption is higher (5.23) than the food-processing sector. This goes well in line with (Varukolu, 2009), that states level of technology adoption by a firm is significantly positively related with the firm's size.
- **Government** policies and incentives are one of the critical levers for this sector that drive its competitiveness. Establishment of Textile Park in the State has facilitated many MSMEs in terms of availing the common facilitation centers and a streamlined regulatory approval process. Scores from the perception data also highlight this through higher value over this determinant for all the selected indicators.
- The Textile & Apparel sector has the largest score over the Porter determinant '**Chance**' (5.50), among all the studied manufacturing sub-sectors. This shows that the sector is less exposed to the random outbreaks of violence and diseases.

4.1.3 **Minerals & Metals:** The 33 establishments studied under this category include iron & steel manufacturing, steel fabrication, granite cutting, refractory bricks manufacturing, cast iron manufacturing, lead and lead-related alloys manufacturing, ceramic tiles manufacturing, etc. Developing economies that have availability of natural endowments like iron ores, coal, and other minerals enjoy relative comparative advantage over other economies. Such capital intensive industries not only produce outputs in higher volumes but also employ a greater number of labor (Burange & Yamini, 2008). The Indian Iron & Steel sector is driven by a strong and growing demand for steel-domestic & international, huge pool of medium-skilled labor-force working at competitive costs (RBSA Valuation Advisors, 2018).

- Among the **Factor Conditions,** business perception of Minerals & Metals industry highlights the good quality of overall infrastructure connectivity offered by the state of Andhra Pradesh. Also, the industry perception on the indicators of presence of skilled labor force and a scientific knowledge base are stronger as compared to all the other manufacturing sub-sectors studied. In essence scores on, 'Quality of scientific Research Institutions' (4.87), 'University Industry Research Collaboration' (4.67), and 'Availability of scientists & engineers' (5.20) vets the fact that a large pool of human resource is available for getting absorbed in the sector.
- **Demand Conditions** are very poor for this sector due to least buyer sophistication. As a result, the domestic firms might not be incentivized to expand their scale and cater to global markets. Also, a lesser score on 'stringency of environmental regulations' highlights the polluting nature of these industries and the scope for modernization and capacity expansion by shifting to newer technologies.
- For **Related & Supporting Industries,** besides the sector having developed clusters with related ancillary firms, the local quality and quantity of suppliers remains an issue. This points towards the vitality of building construction standards and codes, which institutionalize the suppliers to feed quality material into the value chain. Alternately, the presence of an indigenous mining sector has supported the industries in this sector by making raw material available at fairly lower costs and hence reducing the scenario of sourcing the raw material (KPMG, 2008).
- **Firm Strategy Structure & Rivalry** is the driving determinant of competitiveness for this Industry. However, descriptive statistics of sub-indicators constituting this determinant do not offer a very promising outlook of the industry in terms of global competitiveness. Production process sophistication of industries is average as compared with International benchmarks. Also, in terms of Value Chain breadth the sector does not offer many products across the value chain. Further, expenditure on R&D activities by this sector has been much below the global norms.

With domestic firms having average levels of capacity for innovation (5.03), it becomes imperative for the state to channelize the incoming FDI in this sector towards technology upgradation.

- For the determinant '**Government**', certain policy initiatives taken by the state government like reduction in customs duty for all primary and secondary metals and opening certain key metals for private investments has yielded a strong positive business perception.

4.1.4 **Heavy Engineering:** The establishments studied under this category include manufacturing activities like assembly and fabrication of automobile components, manufacturing of industrial filters, manufacturing of electric motors & transformer components, manufacturing of heat exchanger & pressure vessel etc. As fixed inputs to this sector are capital investment and skilled labor force, it is dominated by large organized players. The nature of exports from this sector have evolved from low value goods exported to developing countries to more sophisticated goods channelized to the next stage of global value chain in developed economies (IICCI, 2009).

- **Factor Conditions**, are noted to be the highest for this sector among all the studied manufacturing sub-sectors, from the existing sample data. In essence, the quality of overall infrastructure and port infrastructure are the key facilitators to this sector; also, easy access to financing through various government schemes is also a performance driver for this sector. Though the business perception over 'University-Industry Research collaboration' is the strong (4.73), perception over the 'Quality of Scientific Research Institutions' and 'Availability of Scientists & Engineers' has a lower value indicating towards the research collaborations and quality manpower that have to be built up.
- **Demand Conditions** for this sector are the strongest among all the studies manufacturing sub-sectors. This is primarily because of the high degree of buyer sophistication and government procurement of advanced technology products. Also, the rise in exports which reached USD 65 bn in 2017 (IBEF, 2018) have contributed significantly to the rise in production levels from this sector.
- For **Related & Supporting Industries**, development of existing clusters in the state of Andhra Pradesh has been assigned with the highest perception scores. Also, availability of the latest technology for this sector is higher owing to the nature of final produced output. (Almodovar & Teixeira, 2014) highlight the significance of knowledge networks that have huge spillover effects on the activities of the associated firms. The case of Andhra Pradesh is characterized by a wide range of institutions of higher education, that can provide the sector with manpower. These forward and backward linkages drive the industry with a strong positive multiplier effect, contributing to the economic growth (Dixit & Joshi, 2011).
- Business perception over **Firm Strategy Structure & Rivalry** for this Industry is the highest (5.09) amongst all the studied manufacturing sub-sectors. The main contributors to this perception are High Capacity for innovation in the industry, higher degree of company spending on R&D and higher levels of firm level technology adoption. Also, business perception is highest for Intellectual Property Protection in this sector.
- **Government** facilitation is the driver to competitiveness for Heavy Engineering Sector in state of Andhra Pradesh. In essence, the sector has gained massively from the SEZs, Industrial parks, and Industrial Corridors across the state of Andhra Pradesh. Also, the incentives for various R&D activities provided by the Government (Technology Acquisition Fund Programme) have enabled the growth of this sector in the state.

4.2 DIAMOND ANALYSIS & AXES LENGTH ANALYSIS

Table 2 summarizes the scores on the Six-Porter determinants for all the manufacturing sub-sectors analyzed above (Food Processing, Textile & Apparel, Minerals & Metals, and Heavy Engineering). It highlights the major determinant that drives the competitiveness of each sector, for the sub-national economy of Andhra Pradesh. Figure 2 shows the constructed Porter diamond from these scores for the four manufacturing sub-sectors.

Table 2: Scores on Determinants of Porter Diamond for the four manufacturing sub-sectors

SCORES ON A SCALE OF 1-7	Food Processing	Textile & Apparel	Minerals & Metals	Heavy Engineering
Factor Conditions	4.80	4.75	4.8	4.86
Firm Strategy Structure & Rivalry	4.91	5.00	4.92	5.09
Demand Conditions	4.97	4.89	4.79	5.14
Related & Supporting industries	4.74	4.90	4.76	4.79
Government	5.02	5.19	4.90	5.27

Chance	5.22	5.50	4.87	4.73

In the table above, top two determinants for each sector are highlighted in green

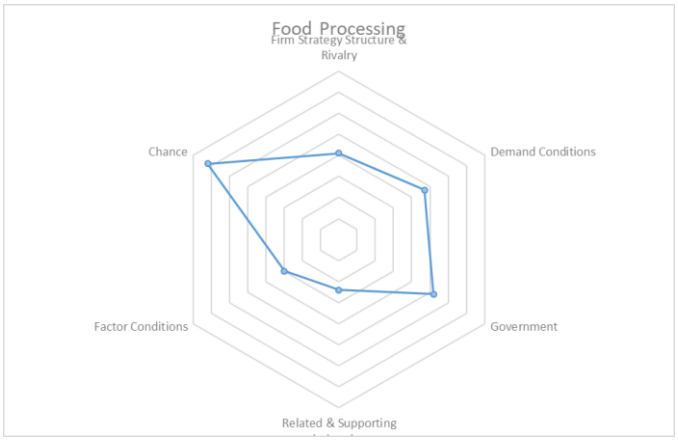
It can be observed from Table 2 that score on the determinants 'Government' has been among the highest two out of all the determinants. This validates the Hypothesis 1: Economies in transition from factor driven to investment driven stage, have a key role of Government in driving the competitiveness of their manufacturing sectors

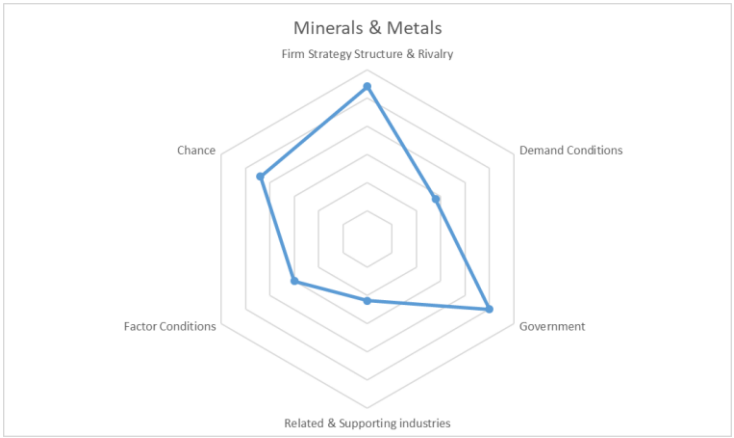
For analyzing the relationships between the Porter Determinants, we reduce the hexagonal figure into a four-sided quadrilateral and take only those parameters that are worked upon by firms endogenously for impacting their business performance. By doing so, the determinants of 'Chance' & 'Government' are kept out and we observe the dynamics between the remaining four determinants, i.e. 'Firm Strategy & Rivalry', 'Factor Conditions', 'Demand Condition', and 'Related and Supporting Industries'.

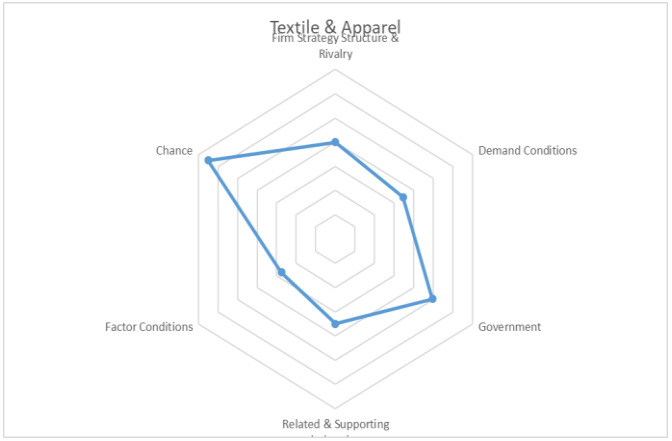
Table 3: Axes length between the Porter Determinants

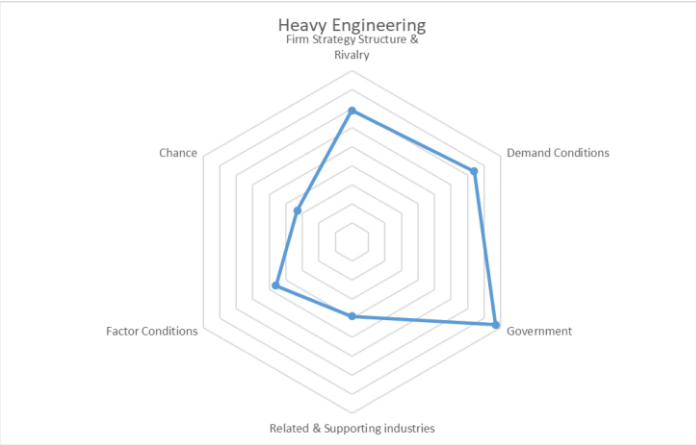
AXES LENGTH (maximum 9.89)	Food Processing	Textile & Apparel	Minerals & Metals	Heavy Engineering
FACTOR CONDITIONS TO FIRM STRATEGY	6.87	6.90	6.87	7.04
FIRM STRATEGY TO DEMAND CONDITIONS	6.99	6.99	6.87	7.23
DEMAND CONDITIONS TO RELATED & SUPPORTING INDUSTRIES	6.87	6.92	6.75	7.03
RELATED & SUPPORTING INDUSTRIES TO FACTOR CONDITIONS	6.75	6.82	6.76	6.82
DIAGONAL 1 (maximum 14)	9.65	9.90	9.68	9.88
DIAGONAL 2 (maximum 14)	9.77	9.64	9.59	10.00
AREA	47.14	47.72	46.42	49.40

Figure 2: Porter Diamond









From Table 3 the following observations can be made:

- For Food-Processing & Textile & Apparel establishments the strongest linkage that can drive competitiveness is Firm Strategy and Demand Conditions
- For manufacturing units in Minerals & Metals, firm strategy is linked to the factor and demand conditions; and this linkage can drive competitiveness of the sub-sector
- For manufacturing units in Heavy Engineering, the strongest linkage that can drive competitiveness is between Firm Strategy & Demand Conditions

(Dogl, Holtbrugge, & Schuster, 2012) have built on Porter's argument of competitiveness through the diamond area. In essence, a large diamond is indicative of higher competitiveness while smaller diamond area represents low competitiveness. Table 3 summarizes the diamond-area of the studied manufacturing sub-sectors. It is clear that the Heavy Engineering Industry in Andhra Pradesh is the most competitive. This is followed by the Textile & Apparel and Food Processing Industry respectively.

V. CONCLUSION

It is hence observed that for Andhra Pradesh, a sub-national Indian economy in transition from Factor driven to investment driven stage:

- There is an abundance of labour-force which is mostly semi-skilled. Hence the labour intensive manufacturing sectors like Food Processing & Textile & Apparel, that currently build their competitiveness based on the Government facilitations and Chance (primarily computed by health of the labour force and their ability to work), have to undertake a series of steps so as to remain competitive in the global markets: a) Professional Management of the Labour, b) Degree of Customer Orientation to be enhanced so as to cater to global markets by following their product quality standards
- Capital as well as Labour Intensive manufacturing sector such as Minerals & Metals and Heavy Engineering which is already embedded into the national value chain should undertake a series of steps so as to elevate its competitiveness and integrate itself to the global value chain: a) Strengthen the University-Industry research collaboration so as to increase the innovation potential, b) Coordinate efforts to increase the availability of specialized research and training services for mid & senior level personnel, c) Strengthen the local supplier quality and quantity as per the international product standards, d) Expand the value chain breadth of the products offered so as to cater to a large market network.

APPENDIX

DESCRIPTIVE STATISTICS (MEAN VALUES)					
Factor conditions		**Food Processing**	**Textiles & Apparel**	**Minerals & Metals**	**Heavy Engineering**
FC1	Quality of overall infrastructure	4.91	4.78	5.24	5.36

FC2	Quality of port infrastructure	4.91	4.40	4.77	4.89
FC3	Quality of electricity supply	5.26	5.36	5.15	5.09
FC4	Ease of access to loans	4.85	4.53	4.52	5.18
FC5	Venture capital availability	4.67	4.57	4.44	4.55
FC6	financing through local equities market	4.65	4.85	4.31	4.80
FC7	Quality of scientific research institutions	4.52	4.62	4.87	4.45
FC8	University industry research collaboration	4.35	4.43	4.67	4.73
FC9	Availability of scientists and engineers	5.09	5.19	5.20	4.73
		4.80	**4.75**	**4.80**	**4.86**
Demand conditions					
DC1	Government procurement of advanced technology products	4.90	4.78	4.77	5.30
DC2	Government success in ICT promotion	5.11	4.93	5.09	5.27
DC3	Buyer sophistication	4.78	4.61	4.43	5.18
DC4	Stringency of environmental regulations	5.11	5.23	4.87	4.82
		4.97	**4.89**	**4.79**	**5.14**
Related and Supporting Industries					
RS1	Availability of latest technologies	5.17	5.22	5.16	5.50
RS2	Local supplier quantitity	4.79	4.88	4.68	4.82
RS3	Local supplier quality	4.70	5.03	4.52	4.64
RS4	Local availability of specialized research and training services	4.26	4.67	4.61	4.10
RS5	State of cluster development	4.80	4.69	4.83	4.91
		4.74	**4.90**	**4.76**	**4.79**
Firm Strategy Structure & Rivalry					
FS1	Firm level technology absorption	5.06	5.23	5.18	5.55
FS2	Company spending on R&D	4.85	4.85	4.97	5.09
FS3	Nature of Competitive Advantage	4.52	4.60	4.50	4.91
FS4	Value chain breath	4.83	4.56	4.55	4.55
FS5	Capacity for innovation	4.94	4.95	5.03	5.27
FS6	Production process sophistication	4.85	5.02	4.74	4.91
FS7	Extent of marketing	4.92	5.00	4.97	4.73
FS8	Degree of Customer orientation	5.17	5.34	5.21	5.18
FS9	FDI and technology transfer	5.11	5.00	5.03	5.09
FS10	Intellectual property protection	4.89	5.48	4.97	5.64
		4.91	**5.00**	**4.92**	**5.09**
Government					
G1	Transparency of Government Policy Making	5.17	5.02	4.55	5.00
G2	Judicial independence	5.02	5.00	4.67	5.36
G3	Efficiency of legal framework	4.87	5.11	4.67	5.18
G4	Property rights	4.98	5.56	5.19	5.64
		5.02	**5.19**	**4.90**	**5.27**
Chance					
C1	Business costs of terrorism	5.28	5.95	4.81	5.00
C2	Business costs of crime and violence	5.24	5.59	5.06	5.18
C3	Business costs of malaria	4.93	5.32	4.68	4.55
C4	Business costs of tuberculosis	5.52	5.24	4.96	4.44
C5	Business costs of HIV/AIDS	5.13	5.41	4.83	4.50
		5.22	**5.50**	**4.87**	**4.73**

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