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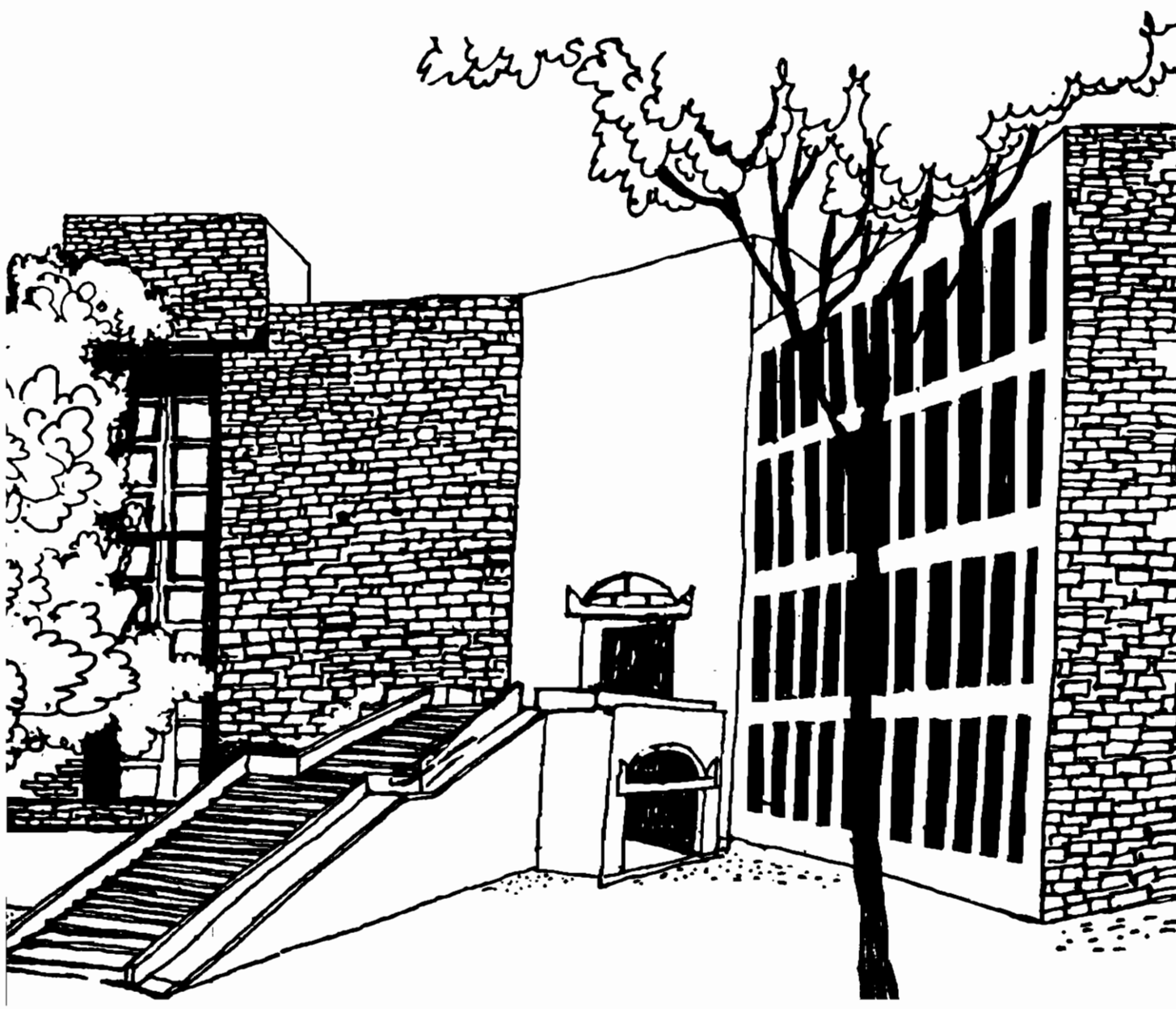

STRUCTURE, CONDUCT AND PERFORMANCE OF SMALL SCALE CHEMICAL INDUSTRY IN GUJARAT

By

G.S. Gupta
A.K.A. Rathi

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G.S. Gupta and A.K.A. Rathi[1]

1. Rationale

A study of the small scale chemical industry in Gujarat has been attempted, for the growth of the Indian economy hinges significantly on the growth of its industrial sector, of which chemical industry happens to be a major component, Gujarat enjoys the number one position with regard to chemical industry in India, and the small scale industrial sector is encouraged to generate employment and to combat inequalities. A quick look at the data would indicate that the small scale sector is a significant component of India's industrial sector. According to the second census of modern small industrial units (1987-88), there were 9.87 lakhs of units in the census frame, and the data from 5.82 lakhs of these units account for 36.7 lakh employees, Rs.9,296 crores of fixed capital and Rs.43,220 crores of output (at current prices) [1]. Gujarat with about 6% of these units occupies the fifth position, the first four being Uttar Pradesh, Madhya Pradesh, West Bengal and Andhra Pradesh respectively.

Chemical industry enjoys the highest weightage of 12.51% in the country's index of industrial production. Further, this industry sector has grown at the annual rate of 8.8% during 1980-81 through 1992-93, which happens to be the second highest (next to that of electrical machinery industry) among all industries and is much above the average industrial growth of 6.4%

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[1] The authors are Professor of Economics and Finance at Indian Institute of Management, Ahmedabad and Director, Forest and Environment Department, Govt. of Gujarat, Gandhinagar, respectively.

during the corresponding period. An analysis of chemical industry versus all industries in India indicates that in 1988-89, its share in all industries stood at 6.7% in terms of number of factories, 7.3% in employment, 10.4% in fixed capital investment, and 13% in terms of gross output. Gujarat enjoyed the top position among all states with regard to chemical industry with a share of 16.8% in terms of number of factories, 18.9% in employment, 28.8% in fixed capital investment, and 24.5% in terms of gross output during 1992-93 [2]. These shares are generally more than twice of Gujarat's share in all industries in India, which stood at 10.7% in terms of number of factories, 8.5% in employment, 9.6% in invested capital, and 10.9% in terms of gross output in 1988-89 [3].

The second all-India survey of small scale industry, included data from Gujarat for 2,868 chemical units, having 30,612 employees, Rs.159 crores of fixed capital investment and Rs.747 crores worth of gross output at current prices, with corresponding all-India figures of 25,941 units, 3.14 lakhs employees, Rs.881 crores of fixed capital investment and Rs.5,273 crores worth of gross output [1].

2. Approach

No systematic data are published on the small chemical industry at the micro (firm) level. Thus, for the purpose of this study, a survey of the small chemical units in Gujarat State was conducted. A detailed questionnaire was designed for the purpose, which was first administered personally to five units to ensure its effectiveness. Subsequently in 1991, the questionnaire was mailed to randomly selected 1000 units covering various chemical products. With vigorous follow-up, the filled-in questionnaires were received from 223 units. On

editing, some missing/incompatible data were discovered, which were sorted out through personal visits and rejection of a few units from the sample. The final sample thus consists of 208 small chemical units in Gujarat, and the data so collected covered a period of five years viz. 1986 to 1990. These units constitute 7.3% of all the small chemical units in Gujarat. Incidentally, it may be noted that while all the units under the sample belonged to the small scale industrial sector at the time of establishment, five of them had crossed over to the medium sector by the time of this survey. In what follows, the simple averages (mean values) of the corresponding five years data are considered for the variables in question (the minimum and maximum values for all the variables were obtained but those for only sub-groups-I and II are included in the tables, for not complicating the reading) and the compound (exponential) annual rate of increase in a particular variable during the five years is taken as the growth rate. Due allowance for the future must be made for the magnitude of a variable if its current magnitude is to be assessed, but not much change is expected so far as the growth rates and the ratio variables are concerned. In what follows, the industry's structure, conduct and performance are analyzed using the framework developed by Bain [4].

3. Industry Structure

The data pertaining to the structure of the small scale chemical industry in Gujarat by product groups and the distribution of firms by structural variables are presented in Tables 1A, 1B and 1C. It is observed that about 20% of all the firms are engaged in each of the production of dyes, and dyes and pigments intermediates. Roughly 12% of them produce inorganic chemical (sodium silicate, sodium bisulphite, metal oxides/ chlorides/ sulphates, etc.) and about the same proportion of firms manufacture organic chemicals (chloral,

Table 1A: Industry Structure - I

(No. of Units)

Product Group	No. of Units	Organization Form			Location (district)						
		Prop.	Partner	Pvt.	Ahm.	Baroda	Bharuch	Valsad	Kheda	Mehsana	Others
1. Dyes	41	9	28	4	8	2	10	19	1	1	0
2. Pigments	16	2	13	1	7	0	2	4	3	0	0
3. Dyes/Pigment intermediates	40	2	20	18	5	3	3	23	2	2	2
Sub-total-I	97	13	61	23	20	5	15	46	6	3	2
4. Inorganic chemicals	25	5	16	4	2	4	2	4	3	8	2
5. Organic chemicals	23	2	10	11	2	4	1	9	3	1	3
6. Drugs	7	1	3	3	1	1	1	3	0	1	1
7. Drug intermediates	11	0	9	2	0	3	0	5	2	0	1
8. Medical products	5	2	1	2	0	0	0	0	0	0	5
9. Solvents & plasticizers	9	2	3	4	0	2	4	0	2	1	0
10. Resins and allied	17	5	9	3	1	2	1	11	0	2	0
11. Others	14	2	5	7	2	0	4	2	2	3	1
Sub-total-II	112	19	56	37	8	16	13	34	12	16	13
All	208	32	117	59	28	21	28	80	18	18	15

Table 1B Industry Structure - I

(No. of Units)

Product Group	Promoters Qualifications *							Technology Source *				
	Chem Engg	Other Engg	Pharm Med	Sci Grad.	Other Grad.	Non Grad.	Other Prof.	Self Expe.	Hir.exp persons	Devel. in house	Bought indig.	Othe firm
1. Dyes	7	6	1	47	31	46	1	4	11	2	1	2
2. Pigments	7	5	0	19	10	21	0	0	6	4	1	
3. Dyes/Pigment intermediates	16	10	1	28	39	83	6	4	10	7	0	21
Sub-total-I	30	21	2	94	80	150	7	8	27	13	2	55
4. Inorganic chemicals	7	3	3	22	20	31	0	1	5	5	1	13
5. Organic chemicals	13	9	4	19	13	17	7	3	9	9	0	4
6. Drugs	2	3	1	9	6	18	4	1	2	3	0	1
7. Drug intermediates	3	1	2	13	3	18	0	0	5	3	1	2
8. Medical products	0	0	3	6	1	10	2	3	0	1	0	1
9. Solvents & plasticizers	2	3	3	10	5	3	1	0	4	2	0	3
10. Resins and allied	8	2	1	10	10	17	3	3	1	6	1	7
11. Others	4	3	2	7	5	13	0	1	4	5	0	4
Sub-total-II	39	24	19	96	63	127	17	11	30	34	3	35
All	69	45	21	190	143	277	24	19	57	47	5	90

* More than one promoter/tech. source for a firm is possible

Table 1C: Industry Structure - I

(No. of Units)

Product Group	Fuel consumed *						Mode of sales *			
	Light diesel	Coal	Furnace oil	Wood	Diesel oil	Others	Direct	Sole sel. agents	Agents	Brokers, Dealers & traders
1. Dyes	30	3	1	1	0	6	33	0	8	12
2. Pigments	10	5	0	1	1	2	15	0	1	5
3. Dyes/Pigment Intermediates	34	4	0	0	1	1	33	5	7	9
Sub-total-I	74	12	1	2	2	9	81	5	16	26
4. Inorganic chemicals	5	1	3	8	0	8	24	1	4	3
5. Organic chemicals	12	2	4	0	3	2	23	3	5	2
6. Drugs	7	0	1	0	1	2	6	1	1	0
7. Drug intermediates	9	0	1	0	0	1	11	1	5	1
8. Medical products	1	0	0	0	1	3	4	0	0	1
9. Solvents & plasticizers	3	0	0	1	1	4	7	2	3	0
10. Resins and allied	2	0	2	0	1	12	17	1	6	2
11. Others	4	2	0	1	1	6	11	2	2	0
Sub-total-II	43	5	11	10	8	36	103	11	26	9
All	117	17	12	12	10	43	184	16	42	35

* More than one fuel/sales mode for a firm is possible

nitrochlorobenzene, benzoic acid, etc.). The other important products, in the descending order in terms of the number of firms are resins and allied products (8%), pigments (8%), drug intermediates (5%), solvents and plasticizers (4%), drugs (3%), medical products (adhesive tapes, surgical handgloves, diagnostic reagents, etc.) (2%) and other miscellaneous products (6%). Incidentally, note that while firms had multi-products, each of them were in only one product group. Thus, while a firm might have produced more than one kind of dyes but then it did not produce any non-dyes product. A majority of the firms (56%) are organized on the partnership form, the rest are private limited companies (28%) and proprietorship based (16%) firms. This trend is almost universal across various products, barring dyes, pigments, inorganic chemicals, and resins and allied products, where proprietorship is more popular than private form. About 40% of the units are located in Valsad district, Ahmedabad and Bharuch each have roughly 13% of the units, Baroda has 10%, Kheda and Mehsana each have 9%. Thus, most of these units are found on Valsad-Mehsana belt. Some exceptions to this rule are the pigments' units, which are heavily concentrated in Ahmedabad, and inorganic chemicals' units, which are found maximum in Mehsana.

Small chemical industry in Gujarat is dominated (36%) by non-graduate promoters (owners/directors). The second and third positions are taken by science (25%) and other (19%) graduates, respectively. This was followed by engineering degree or diploma (15%). Thus, the educational and professional background does not merit much in the promotion of chemical units. There is hardly any variation to this rule across products. An overwhelmingly large proportion (41%) of firms borrowed (stole) the technology from other firms, about 26% got it through hiring experienced persons, 22% developed it in house, and 9% and 2% sourced this through self-experience and buying indigenously, respectively.

Exceptions to this trend are found in products like organic chemicals, drug intermediates, and solvents and plasticizers, where the technology was sourced more through hiring experienced persons than any other source. Also, in case of medical products, the main source happened to be through "self-experience".

Over 50% of the firms used light diesel oil for their fuel requirement. Other fuel sources, viz. coal, furnace oil, wood, diesel (high speed) oil, etc. were more or less equally used by the remaining firms. The major deviation to this trend was in products like inorganic chemicals, where wood was the most important fuel source, and resins, where other fuel sources (viz. LPG, kerosene, naphtha, electricity, etc.) had the dominant role. As regards the mode of sales is concerned, roughly two-thirds of the firms sold directly to the customers, 15% through agents, 13% through brokers, dealers and traders, and the rest through sole selling agents. There were no discerning deviations to this phenomenon across products.

Moving from the structural variables based on the number of firms (Tables 1A, 1B and 1C) to the ones based on the magnitudes of the relevant variables (Tables 2A and 2B), one finds that the average age of a firm in this industry stands at 9.6 years. It is the least (6.1 years) for firms producing solvents and plasticizers, and the most (24.2 years) for those engaged in the production of medical products. The number of promoters for a firm averaged at 3.8 persons, with a range of 3.0 persons each in solvents and resins, and 5.4 persons in drugs. The promoters spent practically all their days (25.9 days/month) in looking after their units, and this was almost uniform across products. These units required 15.7 cubic metres of water per day on average, but this requirement was the least (5 cubic metre) for medical products and the most (25.7 cubic metre) for inorganic chemicals. On an average, a firm had 73.1 kilo

Table 2A: Industry Structure - II

(Mean values)

Product Group	Age	Number of promoters	Promoters time spent/mon	Water needed per day	Power connected	Power self generated propn.	Annual insurance premium
	(Yrs)	(No.)	(Days)	(Cu.m.)	(K.W.)	(%)	(Rs.'000)
1. Dyes	8.4	3.4	26.6	10.2	60.6	2	7.8
2. Pigments	11.8	3.9	28.3	21	42.5	23.8	6.2
3. Dyes/Pigment intermediates	8.1	4.9	26.3	15.1	103.7	13.9	27.2
Sub-total I	8.8	4.1	26.7	14	75.4	10.5	15.5
Min	1	1	4	0.1	1.5	0	0
Max	30	20	30	80	375	267	150
4. Inorganic chemicals	10.4	3.8	26.6	25.7	97.6	8.5	10.4
5. Organic chemicals	10.3	3.5	24.7	16.4	78.2	9.5	28.1
6. Drugs	8	5.4	24.6	24.3	131.9	30.7	31.3
7. Drug intermediates	10.5	3.6	26.5	12.4	52	2.6	9
8. Medical products	24.2	4	27	5	46	25.1	33.3
9. Solvents & plasticizers	6.1	3	25.3	5.8	47.9	19.8	14.5
10. Resins and allied	10.4	3	21.9	19.3	108.8	0.5	26.7
11. Others	9.4	2.9	23.6	6.9	45.9	20.7	24.3
Sub-total II	10.3	3.5	24.9	16.5	80.5	11.6	21
Min	1	1	1	0.1	1	0	0
Max	59	11	30	300	1200	125	162
All	9.6	3.8	25.9	15.7	73.1	11.1	19.2

Table 2B: Industry Structure - II (Contd..)

(Mean values)

Product Group	Annual turnover	Total capital invested	Fixed capital	Plant & machinery investmen	Employees	Workers	Skilled workers
		(Rs. lakhs)				(Numbers)	
1. Dyes	56.9	21.6	11.4	7.7	13.6	10.4	2.9
2. Pigments	65.6	29.1	13.9	9.1	14.7	10	1.6
3. Dyes/Pigment intermediates	154.3	51.8	25.7	19.1	32.2	24.5	6.3
Sub-total-I	97.3	35.3	17.7	12.5	21.4	16.2	4.1
Min	0.5	0.6	0.1	0	1	1	0
Max	672	181	83	54	107	95	31
4. Inorganic chemicals	122.7	36.5	18.5	13.8	18.9	15.4	3.6
5. Organic chemicals	190	48.2	31.3	21.7	26.4	20	5.3
6. Drugs	356.7	79.7	29	18.3	45.3	31.5	9.3
7. Drug intermediates	59.4	26.9	18.6	13.3	13.4	9.4	2
8. Medical products	97.5	49.4	23.7	12.6	51.4	39	9.2
9. Solvents & plasticizers	77	27.6	12.8	9.5	11.2	8.3	2.4
10. Resins and allied	154.4	58.7	23.1	17.4	21.9	11.6	3.5
11. Others	89.2	43.5	20.1	14.7	28.9	22.1	6.9
Sub-total-II	140.5	45.1	22.6	16	24.3	17.7	4.7
Min	0.8	2.1	0.4	0.3	2	1	0
Max	1720	406	181	149	204	157	41
All	120.9	40.6	20.3	14.4	23	17	5.8

watt of the connected power. Self generating capacity of the firms, on an average, was 11.1% of the connected power. The connected power varied significantly across the products, with the minimum of 42.5 kilo watt in pigments and the maximum of 131.9 kw in drugs. The proportion of self-generated power was the least (0.5%) in resins and the most (30.7%) in drugs. Most of the firms had the insurance policies and on an average, a firm spent Rs.19,200 by way of annual insurance premium. This premium was the least (Rs.6,200) in pigments and the most (Rs.33,300) in medical products.

The annual turnover (sales) of an average firm in the industry stands at Rs.121 lakhs, with the minimum of Rs.57 lakhs in dyes and the maximum of Rs.356.7 in drugs. The total invested capital was Rs.41 lakhs for an average firm, with the least of Rs.22 lakhs in dyes and the most of Rs.80 lakhs in drugs. The corresponding figures for investments in fixed capital, and in plant and machinery for an average firm stand at Rs. 20 lakhs and Rs.14 lakhs, respectively. An average firm employed 23 persons, of which 17 were workers and out of which 5.8 were skilled workers. Thus, a firm employed 6 officers/ supervisors/ staff and 11.2 unskilled workers. The employees were maximum (51.4) in medical products and minimum (11.2) in solvents and plasticizers The proportion of various categories of employees varied across products. Skilled persons were relatively few (11%) in pigments and about the same (15-20%) elsewhere. It will be interesting to note that the average turnover (Rs.121 lakhs) and employment (23 persons) per unit in the sample firms are quite large compared to the corresponding figures for all SSI units in the country, which stand at Rs.11.4 lakhs and 5.7 persons respectively [5].

The above structural analysis suggests that the small chemical industry in Gujarat is

dominated by dyes, and dyes/pigment intermediates, partnership form of organization, Valsad district location, non-graduate promoters, technology sourced through other competing firms, light diesel oil as the source of fuel, and sales direct to the consumers. Further, an average firm has existed for 9.6 years, has 3.8 promoters working almost for full-time, requires 15.7 cubic metres water per day, 73.1 kilo watt of power connection, Rs.40.5 lakhs of total capital investment, and 23 employees, and generates an annual turnover of Rs.121 lakhs. Among various products, manufacturing of drugs is the most capital intensive, most skill intensive, and most productive in terms of sales proceeds. The other extreme in these regards goes, in general, to dyes, though with regard to skilled manpower, pigments' need is the minimal.

4. Industry Conduct

Industry conduct is normally analyzed through pricing strategy, product strategy, technology, research and development, advertising, etc. However, in the small scale sector, some of these factors are either not of much significance or are of confidential nature. In view of this, the analysis is restricted to factor proportions (technology) by products only, whose data are provided in Table 3.

An average small scale chemical unit in Gujarat had fixed (equipment and structure) and working (inventories, cash and net debtors) capital in the proportion of 57 : 43, and equipments (plant and machinery) and structures (land, buildings, furniture, fixtures) in the ratio of 67 : 33. The former ratios varied significantly across products (minimum of 43 : 57 in resins and maximum of 70 : 30 in drug intermediates) while the latter relatively in a narrower range (lowest of 62 : 38 in inorganic chemicals and highest of 76 : 24 in medical

Table 3: Factor Proportions (Technology)

(Mean values)

Product Group	FC/TC	PM/FC	TC/E	TC/W	TC/SW	FC/E	FC/W	FC/SW	PM/E	PM/W	PM/SW
	(%)		(Rs. '000)								
1. Dyes	61	64	198	242	730	123	145	411	75	91	253
2. Pigments	54	65	190	252	696	105	143	318	65	90	203
3. Dyes/Pigment intermediates	55	73	201	298	964	105	149	532	75	107	387
Sub-total-I	58	67	198	267	851	113	147	468	74	98	321
Min	12	29	17	17	57	7	7	7	7	7	7
Max	100	100	736	1882	3720	463	615	2420	283	421	1700
4. Inorganic chemicals	57	62	182	315	800	107	185	440	75	147	313
5. Organic chemicals	63	66	266	415	1300	168	263	817	115	183	544
6. Drugs	51	67	196	286	1587	96	146	620	59	88	375
7. Drug intermediates	70	71	241	327	1326	171	234	1092	128	174	829
8. Medical products	58	76	108	169	1023	66	105	608	44	67	359
9. Solvents & plasticizers	54	73	261	357	1551	141	191	563	98	134	418
10. Resins and allied	43	65	260	481	1825	115	190	623	79	130	395
11. Others	55	63	202	298	1142	105	152	551	65	95	366
Sub-total-II	56	67	223	355	1289	127	196	655	87	139	447
Min	6	20	27	27	189	8	8	35	3	3	27
Max	100	100	911	3400	9708	620	2000	3717	583	2000	3500
All	57	67	212	314	1099	120	173	574	81	120	393

Note: TC = total capital, FC= fixed capital, PM = plant and machinery, E = employees, W = workers, and SW = skilled workers.

products). This is expected, for different products' need varying proportion of working capital while the share of plant and machinery in total fixed capital is about the same across products.

A review of the capital-labour ratios across products indicate that organic chemicals, and solvents and plasticizers are the most capital intensive products while medical products and pigments, in general, are the least capital intensive ones. In terms of fixed capital alone, while organic chemicals and drug intermediates are the most capital intensive, medical products and drugs are the most labour intensive products. With respect to investment in plant and machinery only, drug intermediates is the most capital intensive, and medical products and pigments are more labour intensive ones. Thus, if employment generation is the objective, one needs to encourage firms engaged in the production of pigments and medical products. In terms of actual technical ratios, an average firm had Rs.2.12 lakhs of investment in total capital per employee, Rs.3.14 lakhs of that per worker, and Rs.10.99 lakhs of that per skilled worker. The corresponding figures for fixed capital are Rs.1.20 lakhs, Rs.1.73 lakhs, and Rs.5.74 lakhs, and for plant and machinery Rs.0.81 lakh, Rs.1.2 lakhs and Rs.3.93 lakhs, respectively.

5. Industry Performance

Industry performance is analyzed through several parameters, which are classified into financial, physical and economic factors. Due to the confidential nature, no data could be obtained on various measures of the profitability. Data on physical performance as measured by growth rates in turnover, and all three measures of capital input, and capacity utilization,

and on economic performance as measured by factor productivities, value added and contribution to subsidy ratio by products are provided in Table 4.

The growth rate in turnover is very impressive. For all the firms, it stands at 46.6% per annum, with a maximum of 67.3% for firms in dyes/ pigments intermediates and a minimum of 19.1% for units engaged in drugs' manufacturing. The growth rates in various measures of capital have been close to that in national income. In particular, for all firms, while total capital has grown at the rate of 7.2%, the fixed, and plant and machinery each have grown at about 5% per annum. This implies that the working capital has grown faster than the fixed capital. An analysis of product-wise growth rates reveals that the growth rate in capital has generally been more in products like resins and organic chemicals, and less in pigments and medical products. Capacity utilization for all firms has averaged at 56.2%, with the maximum of 86.8% in inorganic chemicals and the minimum of 37.5% in drug intermediaries. Thus, the various measures of physical performance rank different products differently.

Looking at the labour productivity, one finds that an average employee contributes Rs.5.77 lakhs to the turnover for all chemical products. The said productivity is the maximum at Rs.7.68 lakhs in organic chemicals and the minimum at Rs.1.17 lakhs in medical products. The corresponding figures for workers' productivity are Rs.9.14 lakhs (all products), Rs.15.22 lakhs (inorganic chemicals), and Rs.1.72 lakhs (medical products), and for skilled workers' productivity are Rs.32.57 lakhs (all products), Rs.67.35 lakhs (drugs) and Rs.11.47 lakhs (medical products), respectively. Thus, in terms of labour productivity, medical products is the least attractive goods to produce. The findings on capital productivity suggest that a rupee of investment in total capital has produced Rs.3.2 worth of sales for an average product, with

Table 4: Industry Performance

(Mean Values)

Product Group	Annual growth rate in TO	TC	FC	PM	Cap Utili.	TO/E	TO/W	TO/SW	TO/TC	TO/FC	TO/PM	Value added	Contribution subsidy
	(%)					(Rs. '000)			(Ratios)			%	(Ratios)
1. Dyes	35.9	5.4	3	4.3	53.9	439	549	1908	2.9	5.7	8.5	34	2.8
2. Pigments	31.1	3.2	1.3	1.5	61.5	463	612	1888	2.7	5.7	9.6	46.1	16.4
3. Dyes/Pigment intermediates	67.3	6.8	4.7	4.5	52.8	723	1080	3331	4.2	6.8	9.5	32.7	19.9
Sub-total I	47.1	5.6	3.4	3.9	54.7	554	770	1945	3.4	6.1	8.9	34.7	8.5
Mini.	-54	-14	-15	-20	1.7	27	27	50	0.1	0.1	0.1	5.6	0
Max.	867	42	38	38	299	8750	12069	29167	50	25	45	156	176
4. Inorganic chemicals	46.1	7.5	6.1	6.7	86.8	627	1522	2974	3.2	7	12.2	48.9	85.7
5. Organic chemicals	48.6	7.7	6.9	8	49.8	768	1090	4172	3.9	6.7	9.6	45.1	34.5
6. Drugs	19.1	8.7	6.7	3.8	46.5	557	784	6735	2.9	13.3	16.4	33	20.8
7. Drug intermediates	33.7	7.9	5.9	6.8	37.5	490	649	2435	2	3.7	6.7	32.8	38.9
8. Medical products	24.3	3.8	3.7	3.6	80.1	117	172	1147	1.3	2.6	4.4	67.8	0.1
9. Solvents & plasti.	24.3	7.1	6.3	6.8	42.7	666	933	4120	2.7	7.3	9.6	36.7	4.2
10. Resins and allied	43.1	15.8	10.5	3.3	38.1	728	1338	5517	3.4	12.3	19.4	39.7	85.1
11. Others	66.1	6.3	5.3	9.8	67.3	316	485	1807	1.9	6.1	8.2	33.9	7.6
Sub-total II	41.9	8.6	6.8	6.5	61.3	593	1031	3712	2.9	7.6	11.4	41.9	45.6
Mini.	-41	-1.2	-24	0	1.7	27	27	200	0.2	0.3	0.4	9.9	0
Max.	413	157	147	50	599	6800	27200	27200	25	80	80	170	596
All	46.6	7.2	5.2	5.3	56.2	577	914	3257	3.2	6.9	10.3	38.8	28.4

Note: TO = turnover (annual), TC = total capital, FC = fixed capital
PM = plant and machinery, E = employees, W = workers, SW = skilled workers

the maximum of Rs.4.2 in dyes/ pigments intermediates and the minimum of Rs.1.3 in medical products. The fixed capital, and plant and machinery form about one-half and one-third of total capital, respectively and accordingly their productivities are about twice and thrice of that of the total capital. Again, while there is no uniformity with regard to the maximum capital productivity across products, medical products happens to have the least capital productivity on all the three measures.

Two new measures of economic performance have been used in this study. These are value added fraction and contribution to subsidy ratio. The former (VA) is defined as the ratio of sales revenue (S) minus value of raw-materials consumed (RM) divided by the value of raw-materials consumed: VA = (S-RM)/RM. The latter is computed as the ratio of the firms' contribution to the exchequer (by way of excise, sales tax, octroi and corporate tax) to the amount of subsidy (including sales tax incentives) received by it during its existence. An analysis of the findings reveal that the value added for all products stood at 38.8%, with the maximum of 67.8% in medical products and the minimum of 32.7% in dyes/ pigments intermediates. It is interesting to note that while medical products have the least factor productivities, it has the most value added fraction. Since value addition is shared by labour and capital, inspite of the low factor productivities, firms would be tempted to go for medical products. The last measure, viz. contribution to subsidy ratio stands at 28.4 for all firms, with the maximum of 85.7 for inorganic chemicals and minimum of 0.1 in medical products. Thus, from the government revenue mobilization point of view, inorganic chemicals and resins manufacturing units are the ones to encourage.

Thus, as usual, different performance measures do not yield consistent results. Nevertheless, they generally suggest above average performance for firms producing resins, dyes/ pigments intermediates, organic chemicals and inorganic chemicals, and below average performance for those engaged in manufacturing pigments and medical products.

6. Analysis and Implications

There is a nexus between structure, conduct and performance. While the traditional theory argues for the uni-directional relationship, in which, structure affects conduct and conduct influences performance, the modern theory suggests the inter-dependence of these three aspects [6]. To assess these relationships, we have analyzed the data through cross-variable tabulation, which are presented in Table 5. In this table, rows contain performance/conduct variables and the columns the significant structural variables. The entries in the table give the values of the structural variable when the performance variable takes the maximum and minimum values. For example, turnover was maximum at the firm's age of 28.9 years and minimum at the age of 7.9 years. Two of the six structural variables in the table are quantitative. It is useful to note their minimum and maximum values in the sample firm. Thus, the minimum age was one year and maximum age was 59 years. The said values for the promoters' time spent per month were one day and 30 days respectively.

The findings in table 5 do reveal the interdependence between performance/conduct and structure. However, there appears no definite relationship between most of them. The striking findings may be summarized as follows:

Table 5 : Performance/Conduct by Structural Variables

erformance/ onduct easures	Product		Age		Promoters' time		Org. form		Tech. Source		Location	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
	(Name)		(Years)		(Days)		(Type)		(Source)		(District)	
Turnover	DRU	DYE	28.9	7.9	3.4	19.1	Pvt	Prop	NA	NA	Baroda	Kheda
Value Added	MED	DPI	29.9	7.9	19.3	30	Part	Prop	NA	NA	Mehsana	Baroda
Cap. Util.	INO	DI	25.1	3.1	30	11.4	Part	Pvt	NA	NA	Kheda	Bharuch
	DPI	MED	28.9	12.7	11.5	19.1	Pvt	Prop	Hir	Bot	Ahd	Other
	DRU	MED	28.9	3.1	11.5	19.1	Part	Prop	Dev	Bot	Baroda	Bharuch
	RES	MED	28.9	3.1	11.5	19.1	Part	Prop	Sef	Bot	Baroda	Bharuch
	ORG	MED	3.1	12.7	30	19.1	Pvt	Prop	Hir	Bot	Ahd	Other
	INO	MED	3.1	12.7	30	19.1	Pvt	Prop	Dev	Bot	Baroda	Other
	DRU	MED	17.8	7.9	2.8	18.9	Pvt	Prop	Sef	Oth	Ahd	Other
	ORG	MED	3.1	28.9	3.2	11.4	Pvt	Part	Dev	Bot	Mehsana	Other
	RES	MED	3.1	28.9	3.2	19.1	Pvt	Part	Dev	Bot	Baroda	Other
	RES	PIG	17.8	8	11.4	18.9	Pvt	Prop	Sef	Oth	Kheda	Other
	DI	MED	3.1	28.9	3.2	11.4	Prop	Part	Hir	Bot	Mehsana	Ahd
	ORG	MED	3.1	28.9	3.2	11.4	Pvt	Part	Dev	Bot	Mehsana	Other
	DI	PIG	3	29.2	30	18.9	Pvt	Prop	Dev	Oth	Mehsana	Other
	DI	MED	3.1	28.9	3.2	11.4	Pvt	Part	Dev	Bot	Mehsana	Other
	ORG	MED	3.1	28.9	3.2	11.4	Pvt	Prop	Dev	Bot	Baroda	Other
	DI	PIG	3	29.2	2.6	18.9	Pvt	Prop	Dev	Oth	Kheda	Other

DPI = dye/pigments intermediates, DRU = drugs, MED = med. products, DYE = dyes
INO = inorganic chemicals, DI = drug intermediates, RES = resins, ORG = org. chem.
PIG = pigments; Pvt = private, Prop = proprietorship, Part = partnership;
Hir = hiring exp. persons, Dev = developed in-house, Sef = self-experience
Bot = bought indigenously, Oth = taken from other plants, NA = not available
Ahd = Ahmedabad, Other = Other districts

(a) Among various products, drug attained the maximum turnover, medical products the maximum value addition fraction, and inorganic chemicals the maximum capacity utilization. Organic chemicals and dye/ pigments intermediates, in general, had the most labour and capital productivities. Capital intensity was, in general, the least in medical products.

(b) The middle aged firms (around 25-29 years) were ideal to maximise turnover, value addition fraction, capacity utilization and capital productivity, and also to minimise the capital-labour ratio. In contrast, relatively young firms (around 3 years age), in general, had attained maximum values for labour productivity.

(c) Relationship between performance and promoters' time appears quite dubious. While capacity utilization and two of the three measures of labour productivity are maximum, the value addition fraction is minimum, if the time spent is maximum at 30 days/month. Capital productivity is the most if the time spent is 11-12 days/month, and the least if it is 19 days. Both the turnover as well as the capital intensity are maximum if the time spent is around 3 days/month.

(d) Partnership form of organization, in general, has performed better than others in terms of value addition, capacity utilization, capital productivity and low capital intensity. In contrast, the private limited firms have outperformed others with regard to turnover and labour productivity. Proprietorship firms, in general, performed poorly on most of the fronts.

(e) While technology sourced through hired persons yielded maximum total capital as well as total employees productivity, that sourced through in-house development ensured maximum fixed capital and workers productivity, and that sourced through self-experience gave maximum productivities for plant and machinery and skilled workers. The capital intensity was consistently the lowest when the technology was sourced either through buying indigenously or taken from other plants.

(f) Firms located in Baroda and Ahmedabad districts attained the maximum capital and labour productivities, those in Baroda the maximum turnover, and those located in Kheda, the maximum capacity utilization. The capital intensity was generally low in firms located in "other" districts, and high in Mehsana located units.

From the above findings, no clear pattern emerges. Nevertheless, the following generalizations could be suggested:

If physical performance is the yardstick, then go for drugs, medical products and inorganic chemicals production, middle aged, partnership and Baroda-Mehsana location.

If labour productivity is to be maximised, then produce organic chemicals, inorganic chemicals or drugs; the most suitable organization would have about 3 years age. a private limited form, located in Ahmedabad/ Baroda districts, and the promoters will be spending all their time in the works.

If capital productivity is the criterion for success, then produce drug/pigment intermediates, drugs or resins, have around 30 years aged firm, partnership form, promoters' spending about one-third of their time, and located in Baroda/Ahmedabad districts.

If labour intensity is to be maximised, then produce medical products or pigments, go for about 30 years age, proprietorship/ partnership form, promoters' spending about one-half of their time, sourcing technology through buying indigenously, and locate in "other" districts.

If government revenue maximization is the criterion, then go for inorganic chemicals, and resins and allied products.

7. Conclusion

The paper has presented the first hand information on the structure, conduct and performance, and analyzed the nexus among them for the small scale chemical industry in Gujarat. The findings are subject to the sample but since the sample is more or less unbiased, we expect them to be generally valid for the industry. No causation model was developed and thus we offer no clues to one way or the two way relationship among structure, conduct and performance. The paper has examined the association among their various measures, and has thrown some light on their patterns. We hope the study would be useful to the entrepreneurs, financial institutions, policy makers and researchers in the field.

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