Technological Upgradation in the Informal Manufacturing Sector: Possibilities and Problems

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Technological Upgradation in the Informal Manufacturing Sector : Possibilities and Problems

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The informal sector in India has proved to be a persisting phenomenon, thereby proving that all forecasts regarding its transitory character are nothing but a myth. Instead of fading away with time, it has consolidated its position in the economy, both in terms of providing employment opportunities and contributing to National Income. A decade of opening up and globalisation of the economy has been accepted well by this sector, and it has moulded itself accordingly. While a few areas and activities have been adversely affected, in general this sector has taken up the challenges of the new economic dispension with vigorous competitiveness and amazing adaptation & enthusiasm. However, one of the serious problems related to this sector has been the generally low level of income derived from such activities, both by the employees and the employers. Such low income levels are generally associated with the low labour productivity of this sector. It has been argued that this low productivity is a major cause of vulnerability of the participants and the units, and of the instability of the sector itself. The death rate of units in this sector is quite high, and is accompanied (and compensated) by high birth rates. This condition of flux prevents proper development of this sector on a long term basis. Also, since the entrepreneurs and workers keep on changing, efforts towards poverty eradication and income stability become ineffective.

Economists have argued that the problems of low productivity can be mitigated substantially by improving technology employed in this sector. It is generally evident that the level of technology (measured by simple structural parameters like fixed capital-labour ratio) is generally low in this sector. Higher capital-labour ratio would usually lead to higher productivity levels and raise both wage and profit levels in this sector. However, considering the scarcity of investible funds in our economy, it becomes imperative that sectors and activities must be properly identified where such technological upgradation is not only possible, but profitable, viable and sustainable. This paper attempts to identify the areas within the informal manufacturing sector where such technological upgradation would be fruitful both at the National and Regional level. It will start with a brief overview of informal manufacturing sector in India and the following sections would then attempt to identify possible areas of technological upgradation using different bench marks both at the national and regional level. It would conclude by briefly discussing the policy issues related to successful technological upgradation of this sector.

Overview of the Informal Manufacturing Sector in India

Informal sector can be, and has been, conceptualised by different researchers in different ways, using different criteria. Consequently, macro level studies on informal sector using secondary data can be undertaken using various alternative definitions and data sources, the choice of which would depend on the criteria used to define informal sector and the objective of the study.

In the present study Informal Manufacturing Sector consists of the following:-

1. Own Account Manufacturing Enterprises (henceforth OAMEs) - Manufacturing enterprises operating with no hired workers employed on a fairly regular basis.
2. Non-Directory Manufacturing Establishments (henceforth NDMEs) - Units employing less than 6 workers including household workers.
3. Directory Manufacturing Establishments (henceforth DMEs) - Units employing 6 or more workers with at least one hired worker but not registered under the Factory Act.

The data source has been the NSSO survey reports on unorganised manufacturing sector for the 33rd, 40th, 45th and 51st rounds, corresponding to the years 1978-79, 1984-85, 1989-90 & 1994-95, supplemented by the CSO publication on DMEs for the years 1978, 1984 and 1989. The data from the 55th Round Survey could not be incorporated due to its definitional incomparability with the earlier rounds.

Informal Manufacturing Sector in India has grown in leaps and bounds (Table 1). From a mere 85 Lakh units providing jobs to 182 Lakh people in 1978, it increased to 145 Lakh units providing employment to 332 Lakh people in 1994. However, this increase has been neither smooth nor homogeneous. After more than doubling itself during 1978-84, both enterprise number and employment decreased in the next two quinquenna. However, employment in the Urban NDMEs and Urban DMEs have increased during 1984-89 and 1989-94 period also. This sector can be thus unambiguously identified as the continuously expanding sector. The largest component within the informal sector has been the Rural OAMEs with over 95 Lakh units and 178 Lakh employees in 1994. Considering both rural and urban areas together, the OAMEs provide jobs to more than 226 lakh people, followed by the DMEs with 57 lakh employees and the NDMEs with 49 lakh employees.

Table - 1

Enterprises, Employment and Value Added in the Informal Manufacturing Sector in India 1978 - 1994

		Enterprise Nos. (in thousands)			Employment (in thousands)			Value Added (in Rs. Crores)		
		Rural	**Urban**	**Total**	**Rural**	**Urban**	**Total**	**Rural**	**Urban**	**Total**
1978	OAME	6228.2 (73.5)	1906.0 (22.5)	8134.3 (96.0)	10585.5 (58.2)	3790.3 (20.8)	14375.7 (79.0)	1480 (48.0)	1101 (35.7)	2581 (83.7)
	NDME	*	*	*	*	*	*	*	*	*
	DME	*	*	334.9 (4.0)	*	*	3813.5 (21.0)	*	*	502.8 (16.3)
	Total	*	*	8469.2 (100.0)	*	*	18189.2 (100.0)	*	*	3083.8 (100.0)
1984	OAME	13438.5 (68.1)	3648.1 (18.5)	17086.7 (86.6)	21912.5 (59.5)	5315.2 (14.4)	27227.7 (73.9)	3461 (31.6)	1695.8 (15.5)	5156.9 (47.0)
	NDME	1025.2 (5.2)	1133.6 (5.7)	2158.8 (10.9)	2362.3 (6.4)	2537.0 (6.9)	4899.3 (13.3)	774.8 (7.1)	2049.3 (18.7)	2824.1 (25.7)
	DME	179.2 (0.9)	295.7 (1.5)	474.9 (2.4)	1993.8 (5.4)	2704.6 (7.3)	4698.4 (12.8)	575.3 (5.2)	2413.1 (22.0)	2988.4 (27.2)
	Total	14642.9 (74.3)	5077.4 (25.7)	19720.4 (100.0)	26268.6 (71.3)	10556.8 (28.7)	36825.3 (100.0)	4811.1 (43.9)	6158.2 (56.1)	10969.3 (100.0)
1989	OAME	11281.7 (69.2)	2822.1 (17.3)	14103.8 (86.5)	19530.9 (55.1)	4985.2 (14.1)	24516.2 (69.1)	3314.4 (29.9)	1592.5 (14.4)	4906.8 (44.3)
	NDME	737.7 (4.5)	889.4 (5.5)	1627.2 (10.0)	2174.9 (6.1)	2937.4 (8.3)	5112.3 (14.4)	762.6 (6.9)	1952.6 (17.6)	2715.2 (24.5)
	DME	224.0 (1.4)	343.1 (2.1)	567.1 (3.5)	2752.0 (7.8)	3093.5 (8.7)	5845.5 (16.5)	947.1 (8.5)	2516.3 (22.7)	3463.5 (31.2)
	Total	12243.4 (75.1)	4054.6 (24.9)	16298.0 (100.0)	24457.8 (68.9)	11016.1 (31.1)	35473.9 (100.0)	5024.1 (45.3)	6061.4 (54.7)	11085.5 (100.0)
1994	OAME	9534.9 (65.7)	2714.8 (18.7)	12249.7 (84.5)	17844.7 (53.7)	4817.3 (14.5)	22662.0 (68.3)	3144.5 (26.2)	1984.4 (16.5)	5128.9 (42.7)
	NDME	668.0 (4.6)	932.0 (6.4)	1600.0 (11.0)	1828.9 (5.5)	3057.0 (9.2)	4885.9 (14.7)	727.0 (6.1)	2122.4 (17.7)	2849.3 (23.7)
	DME	294.2 (2.0)	360.2 (2.5)	654.4 (4.5)	2452.4 (7.4)	3202.5 (9.6)	5654.9 (17.0)	1056.1 (8.8)	2974.4 (24.8)	4030.6 (33.6)
	Total	10497.1 (72.4)	4007.0 (27.6)	14504.1 (100.0)	22126.0 (66.6)	11076.8 (33.4)	33202.8 (100.0)	4927.6 (41.0)	7081.2 (59.0)	12008.8 (100.0)

*1978 figures on OAME include those of NDMEs. For DMEs only Total figures without Rural-Urban break-up are available. Value Added is at Constant 1981-82 prices. Figures in parenthesis are Percentages to Total informal manufacturing sector. Percentage figures may not add up due to rounding off.

Source: Author's calculations based on data sources mentioned in the Appendix.

Highest numbers of people were engaged in Food Product sector (56 lakh) followed by Wood Products (54 lakh), Repair Services (36 lakh) and Textile Products (30 lakh). The activity groups where the informal sector has relatively lower employment are Electrical & Electronic Machinery (1.5 lakh), Basic Metal (1.2 lakh) and Transport Equipment (1.3 lakh).

The size of the informal sector in terms of Value Added (VA) and Output also increased over time. Measured at constant 1981-82 prices, the VA by the informal sector increased from Rs 3084 crores in 1978 to Rs 10969 crores in 1984, Rs 11085 in 1989 and further to Rs 12009 crores in 1994. The highest VA is provided by the Rural OAME sector followed by the Urban DMEs and the urban NDMEs in

all the years. Thus, though the employment is declining, Output and Value Added are rising in real terms, indicating improved performance of the remaining units.

Considering activity groups, Value Added in the informal sector has been highest in Food products, followed by Miscellaneous Manufacturing items, Repair Services, Textile Products and Wood Products. Relatively lower Value Added comes from the Natural Fibre Products, followed by the Basic Metals and Transport Equipment sectors.

The share of informal sector in total manufacturing sector employment[1] had also grown from 70% during 1978 to 84.2% in 1984, but decreased thereafter to 83.3% in 1989 and 80.5% in 1994. Its share in total manufacturing sector output also followed similar pattern and increased from 14% in 1978 to 22% in 1984, but thereafter decreased to 20% in 1989, and 15% in 1994.

Within the informal manufacturing sector, the highest employers have been the Rural OAMEs, followed by the Urban OAMEs and Urban DMEs. The shares of different components of informal manufacturing sector in Output level indicate that highest output comes from the Urban DMEs. (Table 2). While the employment has been highest in the OAMEs, its share in Output is not commensurate to its size. The productivity levels are thus highest in the DMEs.

[1] Total Manufacturing Sector comprises of OAME, NDME, DME and the Factory sector in this study.

Table 2

Share of Different Components of Informal Manufacturing Sector in Employment and Output

		EMPLOYMENT				OUTPUT		
		O.A.M.E.	N.D.M.E.	D.M.E.		O.A.M.E.	N.D.M.E.	D.M.E.
1978	rural	58.2	*	*		6.83	*	*
	urban	20.8	*	*		8.23	*	*
	total	79.0	*	21.0		15.06	*	84.94
1984	rural	59.5	6.4	5.4		24.39	6.30	6.95
	urban	14.4	6.9	7.3		12.53	16.89	32.93
	total	73.9	13.3	12.8		36.92	23.20	39.88
1989	rural	55.1	6.1	7.8		20.02	5.44	11.41
	urban	14.1	8.3	8.7		8.84	15.95	38.33
	total	69.1	14.4	16.5		28.86	21.39	49.74
1994	rural	53.7	5.5	7.4		20.28	5.71	10.22
	urban	14.5	9.2	9.6		12.96	16.60	34.24
	total	68.3	14.7	17.0		33.23	22.31	44.46

- 1978 figures on OAME include those of NDMEs. For DMEs only Total figures without Rural-Urban break-up are available.
- Source: Same as Table 1.

It has often been accused that the informal sector is a low productive sector where returns are poor. The comment may be true for a part of the informal sector, but not for all. Labour productivity, measured in terms of Value Added per Worker per annum increased from Rs 1897 in 1978 to Rs 2979 in 1984, Rs 3125 in 1989, and to Rs 3617 in 1994, at constant 1981-82 prices (Tables 3a - 3d). On an aggregative sense, Labour productivity is higher in the Urban segment than in the Rural segment, and highest in the DMEs followed by NDMEs and OAMEs. Among industry groups labour productivity is lowest in Rural OAMEs producing Natural Fibre Products and highest in Rural DMEs producing Basic Metal Products.

The salient features of informal sector may be summarised. It can be observed that the extent of the informal sector had increased tremendously during 1978-84, but has marginally decreased thereafter. This reversal of trend may have been caused by consolidation within the informal sector whereby inefficient and less profitable units went out of business leaving the competitive units behind. Another major feature has been the variation in the extent, output and productivity across the states and activity groups for all three enterprise types in both Rural and Urban areas. This variation within the informal sector, specially among activity groups, is noteworthy, as it signifies that different activity groups have different attractiveness, ease of entry, survival chances and productivity levels. We have to keep this diversity in mind when we are trying to identify the areas within this sector where technological upgradation is possible.

Table - 3 (a)

Value added per Worker by Informal Manufacturing Sector 1978
At Constant 1981-82 prices (Rupees per Worker) - By Industry Groups

Industry Groups		OAME &NDME		DME	Informal
		RURAL	URBAN	Total	Total
20-21	Food Products	1923	4558	2356	2407
22	Tobacco & Beverages	1466	1768	1935	1681
23	Cotton Textiles	968	1780	2394	1311
24	Wool & Silk Textiles	1468	2279	2503	1954
25	Natural Fibre Products	227	1016	2789	276
26	Textile Products	1050	1984	1780	1383
27	Wood Products	1372	3118	5056	1689
28	Paper Products	1742	3693	4526	3418
29	Leather Products	1619	3107	12506	2082
30	Basic Chemicals	756	4049	8929	2966
31	Rubber & Plastic	1250	2160	5936	2892
32	Non-metallic Mineral Prod	1065	1944	2376	1576
33	Basic Metals	2467	4028	5158	3722
34	Metal Products	1569	4087	4712	2286
35	Non-electrical Machinery	1704	4452	8751	3417
36	Electrical Machinery	3176	4751	13174	6855
37	Transport Equipment	2226	4956	7901	2985
38	Miscellaneous Manufacture	1446	3488	4133	2483
39	Repair of Capital Goods	1969	2799	4584	2367
0	**All Industry**	1398	2905	2671	1897

- Source: Same as Table 1.

Table - 3 (b)

Value added per Worker by Informal Manufacturing Sector 1984
At Constant 1981-82 prices (Rupees per Worker) - By Industry Groups

Industry		OAME		NDME		DME		Total Informal		
Groups		RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	TOTAL
20-21	Food Products	1478	4338	3773	8947	2231	10597	1892	6955	2939
22	Tobacco & Beverages	1474	1540	2204	4459	1646	7727	1547	2249	1715
23	Cotton Textiles	1042	1992	2124	8074	2646	4666	1179	3664	1706
24	Wool & Silk Textiles	1587	1997	3626	4805	3822	10453	2060	5848	3586
25	Natural Fibre Products	873	598	1402	1037	1534	5290	889	1684	993
26	Textile Products	1641	2773	3017	4916	2459	6126	1866	3996	2585
27	Wood Products	1812	2478	3906	6608	3602	7341	1975	4400	2419
28	Paper Products	1048	2006	2946	7979	10413	7687	3093	6427	5895
29	Leather Products	3640	4911	3757	6145	3928	11911	3652	6934	4837
30	Basic Chemicals	932	3478	3895	7260	7043	14987	3003	10441	8285
31	Rubber & Plastic	1067	1290	5740	17745	6318	6607	3275	5002	4573
32	Non-metallic Mineral Prod	1199	2970	1599	5255	2570	3075	1464	3387	1715
33	Basic Metals	1794	4057	5114	6563	12549	12020	4767	9037	8124
34	Metal Products	2024	5205	3270	69591	6369	15419	2433	15210	6475
35	Non-electrical Machinery	4086	4961	4290	9557	5340	11832	4244	10605	8694
36	Electrical Machinery	4435	9397	3331	17289	6795	12410	6032	12948	12230
37	Transport Equipment	4894	7605	3948	197781	5417	38933	4631	67391	42448
38	Miscellaneous Manufacture	1824	3902	3407	6231	3337	6985	2055	5160	3659
39	Repair of Capital Goods	2113	5573	3964	5592	5950	6210	2327	5654	3947
0	**All Industry**	1579	3191	3280	8078	2885	8922	1831	5833	2979

- Source: Same as Table 1.

Table - 3 (c)

Value added per Worker by Informal Manufacturing Sector 1989

At Constant 1981-82 prices (Rupees per Worker) - By Industry Groups

Industry Groups		OAME		NDME		DME		Total Informal		
		RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	TOTAL
20	Food Products	2663	6600	3744	6878	2714	9569	2877	7263	3699
21	Food Products	1432	3268	3941	6825	7111	7095	1749	4729	2524
22	Tobacco & Beverages	1197	1164	2432	3518	903	4172	1176	1471	1239
23	Cotton Textiles	1328	1799	3411	6336	4759	4720	1822	3472	2298
24	Wool & Silk Textiles	1622	2753	3103	11903	5087	10745	2398	8229	6219
25	Natural Fibre Products	483	451	714	1907	881	3023	546	1116	665
26	Textile Products	1539	2692	2878	5948	1851	8991	1796	5378	2803
27	Wood Products	1627	3215	4607	6285	662	7994	1735	4958	2182
28	Paper Products	957	1820	4206	5672	4453	9727	2289	6164	5643
29	Leather Products	2215	3878	5770	4854	4035	4968	2329	4471	3088
30	Basic Chemicals	780	1479	6900	11850	13079	10900	4791	6397	5538
31	Rubber & Plastic	2132	2613	8532	8911	8559	14087	6829	10287	9552
32	Non-metallic Mineral Prod	1340	2219	2055	6530	2916	4536	1812	3771	2115
33	Basic Metals	2432	2786	3909	6942	89684	884	32041	7525	11792
34	Metal Products	1603	3902	3922	5347	7192	8126	2548	6140	4537
35	Non-electrical Machinery	1976	6011	5879	9943	11443	14927	3844	12928	10764
36	Electrical Machinery	3408	4570	6776	9118	14952	2953	9003	1007	1735
37	Transport Equipment	2520	3619	5248	7507	7182	14297	4905	11839	10051
38	Miscellaneous Manufacture	2243	5707	5575	10741	4857	12240	3005	9046	5708
39	Repair of Capital Goods	2595	4939	3707	5131	5487	7241	2815	5524	4198
97	Repair Services	3108	4583	3075	4858	5808	5583	3140	4800	4080
99	Other Manufacturing	2463	4063	3587	5017	0	0	2553	4449	3406
0	**All Industry**	1697	3194	15239	5421	2771	5427	2054	5502	3125

- Source: Same as Table 1.

Table - 3 (d)

Value added per Worker by Informal Manufacturing Sector 1994

At Constant 1981-82 prices (Rupees per Worker) - By Industry Groups

Industry Groups		OAME		NDME		DME		Total Informal		
		RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	RURAL	URBAN	TOTAL
20	Food Products	2434	5223	4147	6852	3120	8700	2770	6460	3572
21	Food Products	1493	3062	3826	7295	2230	8805	1723	5013	2332
22	Tobacco & Beverages	1096	1970	4334	3550	2741	3510	1324	2121	1486
23	Cotton Textiles	1403	1944	3518	6199	4549	7197	2066	4754	2842
24	Wool & Silk Textiles	2351	3323	3604	8371	5806	8941	3517	6742	4986
25	Natural Fibre Products	692	1203	1552	4981	1869	1900	1215	2398	1407
26	Textile Products	1317	2732	2857	5930	4412	8652	1826	6270	3215
27	Wood Products	1107	2180	2966	6181	2739	6377	1233	4180	1798
28	Paper Products	1038	3139	3883	6124	2163	7690	2195	5782	4922
29	Leather Products	2945	5312	5717	5597	6333	7648	3214	6236	5094
30	Basic Chemicals	1408	2212	5820	7166	5381	11870	3058	6129	4753
31	Rubber & Plastic	1500	6252	7872	12883	13744	14025	7599	12851	11978
32	Non-metallic Mineral Prod	1481	2478	3190	4707	4768	4746	2364	3603	2533
33	Basic Metals	1603	6577	4633	7425	18229	12602	6734	9038	8668
34	Metal Products	2029	4204	4361	6510	4462	8163	2611	6795	5158
35	Non-electrical Machinery	2376	6531	4472	9109	9822	12680	3181	10424	8027
36	Electrical Machinery	3464	4283	5570	8754	8287	18496	6374	14809	13346
37	Transport Equipment	3942	4975	4925	13475	7509	12224	5213	11558	10419
38	Miscellaneous Manufacture	1323	9310	6020	10723	8796	16701	2229	11968	6436
39	Repair of Capital Goods	3014	5765	3836	5817	7336	17954	3201	8632	5501
97	Repair Services	3270	5419	3760	5524	5203	6646	3336	5575	4676
99	Other Manufacturing	2048	5734	3856	4893	10864	4179	2518	5075	4029

0	**All Industry**	1762	4119	3975	6943	4307	9288	2227	6393	3617

- Source: Same as Table 1.

Scope for Technological Upgradation in the Informal Manufacturing Sector

National level

Technological Upgradation and Productivity

Technological upgradation in manufacturing process is always welcome and there is hardly any activity (in this paper we use the term 'activity' interchangeably with NIC group) which would not benefit from improved technology. But if we are to identify a few areas where such improvements would prove beneficial, we can get some idea by looking at the association between technological change and the resultant increase in productivity across regions, which are taken to be 16 major states of India. Consequently, the relationship between growth of capital-labour ratio and growth of labour productivity was examined. (Annual Compound Growth Rates were used. Values were transformed to Real values at constant 1981-82 prices using All India subsectoral WPI and 'Single Deflation' Method. Technology was measured by Fixed Capital-Labour ratio and Productivity by Value Added per unit of Labour). It is evident from the correlation coefficients that for most of the activity groups the association is positive when the states are used as observation (Table 4). This is true for all the six components of the informal manufacturing sector. Among them significant positive association of substantial magnitude is observed for the following activity groups.

Table 4 : Correlation Coefficients

Product Groups		OAME		NDME		DME		All Informal		
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Total
22	Tobacco and Beverages	0.858*	0.985*	0.875*	0.805*	0.665*	0.769*	0.782*	0.781*	0.856*
23	Cotton Textiles	0.997*	0.917*	0.922*	0.817*	0.860*	0.780*	0.428	0.475	0.700*
24	Woollen and Silk Textile	0.897*	0.944*	0.891*	0.975*	0.990*	0.986*	0.989*	0.841*	0.877*
25	Natural Fibre Products	0.843*	0.972*	0.924*	0.914*	0.989*	0.989*	0.961*	0.970*	0.686*
26	Textile Products	0.994*	0.697*	0.976*		0.603*	0.869*	0.413	0.516*	0.629*
35	Non-electrical Machinery	0.994*	0.949*	0.976*		0.950*	0.720*			
36	Electrical Machinery	0.970*	0.858*	0.981*	0.880*	0.985*		0.756*		
37	Transport Equipment	0.961*	0.965*	0.981*	0.902*	0.614*	0.655*	0.989*	0.881*	0.815*
29	Leather Products (Rural)	0.987*		0.972*		0.929*		0.992*	0.623*	0.544*
30	Basic Chemicals (Rural)	0.858*		0.949*		0.962*		0.508*		0.700*

- Significant at 1% level.
- Source: Same as Table 1.

A regression analysis revealed that one percentage point rise in the growth rate of Capital-Labour ratio leads to substantial rise in growth rate of labour productivity for the above mentioned activities, as shown in Table 5.

Table 5 : Regression Coefficients

Product Groups	OAME		NDME		DME		Total Informal		
	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Total
22 Tobacco and Beverages	0.931 (0.717)	0.250 (0.968)	0.973 (0.750)	0.792 (0.624)	0.273 (0.402)	0.620 (0.562)	0.681 (0.584)	0.644 (0.583)	0.695 (0.713)
23 Cotton Textiles	0.410 (0.994)	0.867 (0.829)	0.829 (0.840)	0.924 (0.644)	0.211 (0.721)	0.679 (0.580)			0.637 (0.453)
24 Woollen and Silk Textile	0.191 (0.791)	0.823 (0.884)	0.216 (0.778)	0.323 (0.947)	0.355 (0.978)	0.368 (0.971)	0.911 (0.977)	0.917 (0.686)	1.028 (0.753)
25 Natural Fibre Products	0.410 (0.689)	0.335 (0.942)	0.321 (0.844)	0.342 (0.823)	0.339 (0.978)	0.423 (0.976)	0.809 (0.918)	1.234 (0.937)	0.746 (0.433)
26 Textile Products	0.312 (0.987)	0.636 (0.449)	0.358 (0.950)	0.225 (0.151)	0.387 (0.318)	0.665 (0.737)			0.417 (0.352)
33 Basic Metals	0.479 (0.938)		0.316 (0.852)			0.735 (0.719)		0.753 (0.555	0.666 (0.508)
35 Non-electrical Machinery	0.439 (0.987)	0.263 (0.894)	0.343 (0.949)		0.785 (0.895)	0.586 (0.484)			
36 Electrical Machinery	0.302 (0.936)	0.938 (0.716)	0.335 (0.959)	0.836 (0.758)	0.345 (0.968)		0.948 (0.541)		
37 Transport Equipment	0.310 (0.918)	0.410 (0.926)	0.299 (0.959)	0.912 (0.801)	0.382 (0.333)	1.778 (0.388)	0.761 (0.977)	0.838 (0.761)	0.681 (0.641)
28 Paper Products (Rural)	0.245 (0.782)		0.287 (0.958)		0.672 (0.870)		0.628 (0.986)		
29 Leather Products (Rural)	0.161 (0.972)	0.601 (0.502)	0.127 (0.942)		0.313 (0.853)	0.569 (0.612)	0.424 (0.984)	0.406 (0.344)	
30 Basic Chemicals (Rural)	0.222 (0.717)	0.895 (0.696)	0.337 (0.893)	0.939 (0.287)	0.356 (0.919)				0.667 (0.453)

Figures in parenthesis are Adjusted R^2 Source: Same as Table 1.

This suggests that for the sectors like Tobacco and Beverages, Textile and Textile products (including Wool & Silk), Natural Fibre products, Machinery and Equipment sector, and Leather and Basic Chemical sector in the Rural areas, improvement in technology and labour productivity have gone hand in hand.

Dynamic Activity-groups

The above section identified the activity groups where technological progress has been associated with rise in the labour productivity. One can also take a broader view and argue that not only actual historical experience, but prospective potential should also be a basis of such identification. Activity groups that are vibrant and showing signs of improvement and dynamism are also suitable candidates for getting the benefits of technological upgradation programmes, as far as viability is concerned. Such dynamic activity groups are also sought to be identified.

A key feature of economic dynamism today is productivity growth. The structural view of development suggests that the growth process is accelerated

when the importance shifts from low productivity sectors to high productivity sectors, which start to contribute substantially to National income. The section of informal manufacturing sector where productivity levels are increasing over time may be termed as dynamic activities[2]. It is observed that for a few activity groups, all the three productivity levels (VA per unit of labour, VA per unit of capital, and VA per enterprise) are rising. They are cited in Box 1.

Box 1

Urban Areas	Tobacco and Beverages, Natural fibre products, Paper products, Rubber and Plastic, Basic Metal, Metal products, Repair of Capital goods.
Rural Areas	Food & Food products.

Total Factor Productivity Growth

These conventional measures of Partial productivity levels have well-known limitations. As has been evident in the earlier section, if capital intensity increases over time, partial labour productivity increases due to rising capital labour ratio. Under such situation the problem can be resolved by analysing Total Factor Productivity Growth (TFPG). TFPG measures the contribution of factors other than the factor inputs to an increase in output. Using the growth accounting approach TFPG can be defined as:

$$T = (\dot{V}/V) - [\alpha.(\dot{L}/L) + (1-\alpha).(\dot{K}/K)]$$

where, $\dot{V}/V$ = Growth Rate of value added, $\dot{L}/L$ = Growth Rate of Labour, $\dot{K}/K$ = Growth Rate of Fixed Capital, A and (1-A) are shares of Labour and Capital in Total Value Added respectively. Using this method, TFPG for the Rural and Urban NDMEs and DMEs were determined. The OAMEs were left out of the analysis as emoluments for them could not be obtained. It was observed that the activity groups like Food & Food products, Natural Fibre products, Textile products and Machinery & Equipment have experienced positive TFPG during 1989-94 period.

It is to be noted that the rise in TFP reflects the contribution of all factors other than capital and labour on growth in VA. It thus encompasses a broad spectrum of improvement in production process or technique and includes technical progress, better utilisation of capacity, 'Learning by Doing', and also improved skill of the workers. The activity groups already exhibiting such improvements can be further boosted by initiating programmes for their technological upgradation.

[2] Dynamism in the informal manufacturing sector at the National level was also studied by Kundu et al. (2001).

Thus, we have identified different activity groups where technological upgradation is likely to yield substantial results. It was observed that activity groups like Cotton Textiles, Textile Products and Machinery & Equipment sector have been experiencing a close association with the organised sector. The association between growth rate of informal employment and growth rate of Factory sector employment has been significantly positive for those product groups. This may be viewed as some sort of 'ex post' measure of linkages between the informal and formal sectors. Thus, if these products are really enjoying such linkages, it is highly likely that technological upgradation herein will reap rich dividends, as they will be able to exploit their linkages in a better way.

Scope for Technological Upgradation in the States

So far, we have looked at the national perspective regarding possibilities of technological upgradation in the informal manufacturing sector. However, substantial regional variation exists in India and one must not iron out such differences. And when the effort is to draw out programmes and policies for improvement of certain sector, disaggregated regional analysis becomes both fruitful and indispensable. We now try to identify the activity groups for each of the states where scope for technological improvement exists.

Dynamic Activity-groups

We start by identifying the sectors that are already showing signs of dynamism in the states. As has been mentioned, activities with all three productivity levels rising were termed as dynamic. This measure thus reflects improved performance of the units over time. A variety of activity groups, different for different enterprise types and location, are showing signs of dynamism. An overall view suggests the following.

Andhra Pradesh: In the Urban areas of this state Dynamic activity groups are Food Products (20), Paper Products (28), Basic Metal (33), Electrical & Electronic Equipment (36), Transport Equipment (37), Repair of Capital goods (39) and Miscellaneous Manufacturing Products (38). In The Rural areas Food Products (21), Cotton Textile (23) and Textile Products (26) are showing signs of dynamism.

The criteria used were somewhat different.

Bihar: It was found that Paper and Leather Products (28,29) are showing increasing productivity levels in Urban Bihar, while in the Rural areas increasing productivity levels are observed in Wool & Silk Textile (24), Basic Metal (33) and Electrical & Electronic Equipment (36).

Delhi : In this predominantly Urban area dynamic activity groups are Paper Products (28), Rubber & Plastic (31)and Electrical & Electronic Equipment (36).

Gujarat : In Urban Gujarat Non-metallic Mineral Products (32) and Metal Products (34) are showing signs of dynamism. In the Rural areas Non-Electrical Equipment is showing dynamism. OAMEs in both Rural and Urban areas producing Non Metallic Mineral Products are Dynamic.

Haryana : An overall view shows that in urban Haryana the dynamic activity groups are Food Products (21), Paper Products (28), Rubber & Plastic (31), Transport Equipment (37) and Miscellaneous Manufacturing Products (38). In the Rural areas Food Products (20), Textile Products (26), Non Metallic Mineral Products (32) and Repair of Capital goods (39) are found to be dynamic across all enterprise type. OAMEs in both Rural & Urban areas producing Food Products (20,21), Textile Products (26), Paper Products (28), Non Metallic Mineral Products (32) are also dynamic.

Himachal Pradesh : While in Urban Himachal Pradesh no overall pattern is envisaged, in Rural areas dynamic activity groups are Food Products (21), Paper Products (28), and Metal Products (34).

Karnataka : Dynamic activity groups in an overall sense are Beverages (22), Metal Products(34), Electrical Equipment(36) and Transport Equipment(37) in Urban areas and Cotton Textile and Non-metallic Mineral Products(32) in Rural areas.

Kerala : It was found that Natural Fibre Products (25) are dynamic among all enterprise types in both rural & urban areas in Kerala. Apart from that Food Products (21), and Electrical & Electronic Equipment (36) industries are showing dynamism in Rural areas. OAMEs and NDMEs producing Food Products are dynamic in both rural and urban areas.

Madhya Pradesh : No overall pattern was evident in Rural Madhya Pradesh. In the Urban areas, units producing Cotton Textile (23), Paper Products (28), Wood Products (27), Rubber & Plastic (31) and Non Metallic Mineral Products (32) are dynamic. OAMEs producing Transport Equipment & NDMEs

producing Food Products (20) and Metal Products (34) in both Rural and urban areas are also dynamic.

Maharashtra : An overall picture suggests that urban units producing Food Products (20) and Paper Products (28) are dynamic. Also OAMEs in both Rural and Urban areas producing Textile product (26), Basic Chemicals (30) and Non-metallic Mineral Products (32) are found to be dynamic.

Orissa : In Urban Orissa, units producing Beverages (22), Basic Chemicals (30), Metal Products and Miscellaneous Manufacturing items (38) are found to be dynamic for all enterprise types. The same is true for rural units producing Textile Products (26), Rubber & Plastic (31) and Non-metallic Mineral Products (32).

Punjab : In Urban Punjab, Leather Products (29) and Rubber & Plastic Products (31) are found to be dynamic for all enterprise types. Also, in both rural and urban areas, OAMEs producing Cotton Textile (23), Natural Fibre Products (25), Basic Metal (33) and Non-electrical Machinery (35) and NDMEs producing Food Products (20) and Transport Equipment are found to be dynamic.

Rajasthan : In Urban Rajasthan, dynamic activity groups are Food Products (21), Textile Products (26) and Repair of Capital goods (39). In Rural areas Food Products (20), Cotton Textile (23) and Non-metallic Mineral Products are showing signs of dynamism. Also, OAMEs producing Wool & Silk Textile (24) and Basic Metal (33), and NDMEs Producing Non-Electrical Machinery (35) in both rural and urban areas are dynamic.

Tamil Nadu : Overall view suggests that dynamic activity groups are Food Products (20) Cotton Textile(23), Basic Metal & Metal Products (33-34) and Transport Equipment (37) in Urban areas, and Beverages (22), Wool & Silk Textile (24), Basic Chemicals (30), Non-metallic Mineral Products (32) and Non-Electrical Machinery (35) in Rural Areas. Apart from these, OAMEs producing Miscellaneous Manufacturing items (38) in both rural and urban areas are also dynamic.

Uttar Pradesh : In Uttar Pradesh, units producing Beverages (22), Basic Metal & Metal Products (33-34) and Electrical & Electronic Equipment (36) in all Urban enterprise types are found to be dynamic. Rural units producing Wool & Silk Textile(24) and also Textile Products (26) are found to be dynamic.

West Bengal : Units producing Paper Products (28) and Electrical & Electronic Equipment (36) are found to be dynamic for all three enterprise types in both Rural and Urban areas. Moreover Urban units producing Rubber & Plastic (31), Metal Products (34) and Miscellaneous Manufacturing items (38) are found to have rising Productivity levels.

Activity-groups with Positive TFPG

An enquiry into the TFPG levels was also undertaken to study the Composite improvement in productivity levels. It is observed that positive TFPG has been exhibited by different product groups in different states during 1989-94. Salient results are summarised below:-

Andhra Pradesh	Food Products (20-21), Tobacco & Beverages (22), Cotton Textiles (23), Paper Products (28), Leather Products (29), Non-Electrical, Electrical & Electronic Equipment (35-36).
Bihar	Food Products (21), Tobacco & Beverages (22), Wool & Silk Textile (24), Wood Products (27), Basic Chemicals (30), Metal Products (34), Non-Electrical, Electrical & Electronic Equipment (35-36).
Delhi	Natural Fibre products (25), Leather products (29), Basic Chemicals (30), Basic Metals (33).
Gujarat	Natural Fibre products (25), Leather products (29).
Haryana	Wool & Silk Textile (24), Natural Fibre products (25).
Himachal Pradesh	Food Products (20-21), Wood Products (27), Paper Products (28) and Basic Chemicals (30).
Karnataka	Cotton Textile (23), Textile Products (26), Basic Chemicals (30), Electrical & Electronic Equipment (36).
Kerala	Food Products (21), Textile Products (26), Metal Products (34) and Electrical & Electronic Equipment (36).
Madhya Pradesh	Food Products (21), Textile Products (26), Metal Products (34), Electrical & Electronic Equipment (36).
Maharashtra	Food Products (20).
Orissa	Food Products (20), Textile Products (26), Wood Products (27).
Punjab	Wood Products (27), Basic Metal (33), Leather Products (29).
Rajasthan	Food Products (20-21), Textile Products (26), Non-metallic Mineral Products (32).
Tamil Nadu	Non-metallic Mineral Products (32), Electrical & Electronic Equipment (36).

Uttar Pradesh	Basic Metals (33).
West Bengal	Wool & Silk Textile (24), Textile Products (26), Non-metallic Mineral Product (32), Non-Electrical Equipment (35).

It can thus be commented that these activity groups are those that are experiencing improved operational efficiency over the years - both in terms of improved factor use (as reflected by rising partial productivity levels) and a rise in the standard of the production process involved (as reflected by positive TFPG). These activities are, therefore, the areas within the informal manufacturing sector where technological upgradation shall lead to a marked rise in income level accruing to the participants.

Sustainable Activity-groups

However one factor that needs attention is whether these activities are sustainable in the long run. It is expected that the activity groups likely to have assured demand would be sustainable in the long run. Such demand for the products would come from two sources - Intermediate Users, and Final Consumers. For the consumer non-durables like Food and Food products, Tobacco & Beverages, Textile products, Leather products, etc. linkages with the organised sector (through subcontracting and outsourcing of jobs) may well exist, but they are more likely to be dependent on the final demand factor for their sustainability. On the other hand, demand for the intermediaries depend crucially on the linkages with the organised factories and the demand created by them. Since the informal units cater mainly to local demand, the primary purchaser of intermediate products manufactured by the informal units are mainly the local industries. So, demand for such products would depend mainly on two factors - predominant industries in the factory sector in that region, and the commodities demanded by them (i.e. Backward Linkages of the Factory sector). Thus, the regional industrial structure of each of the states was studied and using the INPUT-OUTPUT TRANSACTION TABLE for the Indian Economy (1989-90), the backward linkages of those predominant regional industries were determined. These product lines are likely to be sustainable in the long run as far as intermediate demand is concerned.

It is observed that Basic Chemicals (30), Rubber & Plastic (31), Metal Products (34) and Non-Electrical Equipment (35) are some of the basic ingredients demanded by the factory sector in all the major states. So, these activities are likely to have assured market demand in all the states. Moreover, as the pattern of

industrialisation is different for different states, predominant industries and their backward linkages would also be different. Consequently, different intermediary product groups will be demanded in different states. State specific results reveal the following.

Apart from the four intermediate industries already mentioned above, activity groups likely to have sustainability are:-

- Food products, Paper products and Basic Metal in Andhra Pradesh;
- Food Products and Paper Products in Gujarat;
- Food products, Basic Metal and Transport Equipment in Haryana;
- Basic metal, Wool & Silk textile in Himachal Pradesh;
- Basic Metal, Paper and Food Products in Karnataka;
- Paper Products, Food Products and Natural Fibre Products in Kerala;
- Basic Metal, Food Products and Non-metallic Mineral Products in Madhya Pradesh;
- Paper Products, Basic Metal, Food Products and Transport Equipment in Maharashtra;
- Paper products, Natural Fibre Products and Non-metallic Mineral Products in Orissa;
- Paper Products, Food Products, Transport Equipment and Wool & Silk Textile in Punjab;
- Food Products, Non-metallic Mineral Products and Wool & Silk Textile in Rajasthan;
- Basic Metals and Cotton Textile in Tamil Nadu;
- Basic Metals and Food Products in Uttar Pradesh;
- Basic Metals in West Bengal;
- Cotton Textile, Wool & Silk Textile, Natural Fibre Products, Paper Products, Basic Metals and Textile Products in Delhi.

The above list outlines the product groups that are likely to have forward linkage with the factory sector in each state. Other than them, the consumer goods like Food and Food products, Tobacco and Beverages, Textile and allied products may also enjoy demand from final consumers.

Identification of Focus Groups

We have, so far, identified the product groups in different states that are showing signs of dynamism and also those that are likely to be sustainable. The dynamic product groups are exhibiting improvement in efficiency in the recent past. The sustainable product groups, on the other hand, are either likely to have close linkages with the factory sector (because the latter demand those products for their intermediate use), or are likely to have demand from final consumers[3]. Now, the product groups that are both dynamic and sustainable, are therefore those that are not only experiencing betterment of internal performance but are also likely to enjoy external conditions conducive to their growth (as far as demand is concerned). So they have the potential of not only survival but also of prosperity. These products thus form the Focus Group of our study where technological upgradation is likely to be most successful.

The product groups having such potential have been identified for each state. They are -

- Food Products, Paper Products and Basic Metals in Andhra Pradesh;
- Wool and Silk Textiles and Basic Metals in Bihar;
- Paper Products and Rubber & Plastic in Delhi;
- Food Products, Textile and Textile Products in Gujarat;
- Food Products and Transport Equipment in Haryana;
- Wool & Silk Textile and Food Products in Himachal Pradesh;
- Metal Products in Karnataka;
- Food Products and Natural Fibre Products in Kerala;
- Food Products and Non-metallic Mineral Products in Madhya Pradesh;
- Food Products and Paper Products in Maharashtra;
- Non-metallic Mineral Products in Orissa;
- Food Products, Rubber & Plastic and Transport Equipment in Punjab;
- Food Products, Wool & Silk Textile and Non-metallic Mineral Products in Rajasthan;
- Cotton Textile, Basic Chemicals, Metal Products and Non Electrical Equipment in Tamil Nadu;
- Food Products and Metal Products in Uttar Pradesh; and

[3] The Consumer non-durables are likely to have a ready market because of the final demand factor. Out of this total final demand, the informal sector is supposed to have an ample share because of its ability to produce cheap and indigenous products conforming to local tastes and preferences.

- Rubber & Plastic, Basic Metal and Metal Products in West Bengal.

[It is to be noted that sustainability is viewed both in terms of intermediate demand resulting from prospective linkage with the factory sector, and the likely final demand factor.]

These product groups are naturally those where the attention must be focused. Since they are already showing improved performance and are likely to be enjoying stable market demand in the near future, they defy the common belief that the informal sector is a transitory phenomenon and only a stop gap solution to problems of unemployment and poverty. It would not be wrong to conclude that technological upgradation in these sections of the informal sector is likely to be effective, productive, viable and sustainable.

Policy Issues for Technological Improvements in the Informal Manufacturing Sector

Let us now shift attention towards the Policy related issues of technological upgradation. The areas where such improvements are to be attempted have already been identified. But there are various operational problems regarding such upgradation.

Availability of Resources

Improved technology generally involves a rise in Capital intensity. It has been a general experience that the informal sector suffers from capital scarcity and cannot accumulate enough resources to upgrade their production technique. This situation is worsened by the fact that capital available to this sector is low. It is frequently observed that the financial institutions are not forthcoming in extending credit to the small and medium sized informal units, since they do not have any asset to serve as collateral. This mindset (and regulation) must be changed, and viability of a project and unit must be given more importance while sanctioning loans. Moreover, using the expertise available to them, the financial institutions must offer guidance to the entrepreneurs so as to make the projects viable. Certain indigenous solutions like creation of a Micro Credit system for the informal units will also help the situation. A common fund where entrepreneurs deposit small sums whenever possible and can borrow from it when needed, can be set up. The system may be such that for a sum of loan up to their accumulated saving they won't be charged any interest. But for loans in excess of that, they should be charged a moderate rate of interest. Such micro credit system using revolving fund

is likely to solve the problem of capital availability to the micro enterprises to a great extent. This can be made more attractive by linking them to some insurance schemes. Formation of Co-operatives among the entrepreneurs will also increase their collective bargaining power with the financial institutions.

Similarly, formation of Self Help Groups (SHG) can aid the viability of loan finance to small enterprises. It has been found, for example from the experience of Grameen Bank in Bangladesh and similar other experiments, that those taking loan feel much more conscious of their responsibility of returning loans when they are answerable to their fellow peers within the SHG since non-repayment of loans means loss of face among the peers. At the same time SHG can monitor the progress of projects of their clients in a much better way from close quarters and can also provide timely assistance. For these reasons loan recovery rate among the SHG tends to be much higher than in case of impersonal relationships with officials of financial institutions.

Apart from the apathy of the financial institutions, the factor that discourages credit off-take to the informal units has been the Cost of Credit. These units generally operate with very low profit margin and often find that the cost of credit is too high for them. Thus, the resultant rise in productivity and income must be greater than the cost of capital required for technological upgradation, so that the process becomes viable and sustainable. Selective credit policy, directed towards the efficient, viable and sustainable sections of the informal sector should be pursued. Care must be taken to ensure that credit availability to them becomes hassle-free, cheap and free from corruption.

Appropriate Technology

The second area that merits attention is that of availability of advanced technology for this sector. Any technological upgradation programme for this sector must keep in mind that it is predominantly a labour intensive sector and this is one of its basic characteristics. The upgradation process must not destabilise this character. So, the stress should not be on drastically changing the technology to a Capital intensive one, but on evolution of innovative and adaptive technology for this sector. This requires an active role by the research institutes, specially the Central Research Institutes, Industrial Training Institutes, Polytechnics, and the Regional Engineering Institutes. They must innovate new techniques suitable for these units, train the workers and help them to upgrade the production process. These programmes should have two simultaneous

sections. One of them may deal with transmitting sophisticated techniques to the informal sector so that they can strengthen their linkage with the factory sector and emerge as a complementary to it. The other should stress on using indigenous technology and resources in a more innovative and efficient manner. The focus should be to extend all kind of support to the sector so that they can use new techniques and mould the existing ones to yield better results.

Sustainability

Thirdly, success of any upgradation programme would depend crucially on the sustainability and viability of the units. Such viability, in turn, can be ensured by strengthening the linkages with the factory sector so that the sections where technological progress has been initiated do not wither away. Many of the activities that have been identified as 'Focus Group' in this paper, depend on this linkage with the factory sector for their future prosperity. Such prospective linkages must actually materialise and the existing ones must be strengthened. Subcontracting and outsourcing of jobs to the informal units by the factories, specially the public sector units, must not only be encouraged but may also be enforced by regulations and legislation. The formal institutions must take a more active role by encouraging local informal sector suppliers to upgrade themselves by providing product specifications, quality control methods and transfer of technology. In-house training programmes for local entrepreneurs, apprenticeships, and greater partnership with local technical training institutes will go a long way in creating growth centres where a host of informal manufacturing units flourishes under the leadership of one or more factories. While the latter are supplied with cheap, locally available and custom built inputs, the former are assured of a ready market, making the system mutually beneficial and sustainable. A major part of the policy package should also ensure adequate demand for the consumer goods by attempting a general upliftment of the national economy.

Conclusion

As a concluding comment it must be pointed out that the informal sector has broken the myth that it is a temporary phenomenon. It is also observed that there are certain segments within this sector that are showing signs of dynamism, operational efficiency, and where technological upgradation will be viable, sustainable and is likely to yield substantial improvements in their performance. The policies must be framed appropriately so that this sector retains its distinctly unique characteristics while taking advantage of State support and develops not as a replica of the formal sector but in a perfect complementary relationship to it.

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